



# SCIENCE

## Exemplar Problems

Class IX

## **INTRODUCTION**

The task of building an enlightened, knowledgeable and prosperous nation rests on the shoulders of its children, the future citizens, who are to be cherished, nurtured and taken care with tenderness. Education, particularly school education has always played this important role. It has emerged as an important segment of the total educational system expected to contribute significantly to the individual, social as well as the national developmental processes. In order to effectively fulfill this role, its progress and processes including curriculum need to be continuously reviewed, restructured and updated. The present National Curriculum Framework–2005 (NCF–2005), has identified five guiding principles for curriculum planning, development and transaction —

- Connecting knowledge to life outside the school.
- Ensuring that learning shifts away from rote methods.
- Enriching the curriculum so that it goes beyond textbooks.
- Making examinations more flexible and integrating them with classroom life.
- Nurturing an overriding identity informed by caring concerns within the democratic polity of the country.

Most pertinent of these guiding principles is perhaps the one pertaining to evaluation system which expects to make examination processes more flexible and to integrate them with everyday life. It can be implemented effectively only if evaluation is designed in such a manner that it can be used as a powerful means of influencing the quality of classroom instructional transactions so as to help the learners internalise the subject matter rather than make them a store house of information. But the evaluation system, as it exists today, is such that it focuses only on cognitive learning outcomes and completely ignores the non-cognitive aspects, which are equally vital components of human personality.

### **CHILD AS A CONSTRUCTOR OF KNOWLEDGE**

Traditionally, it is believed that students learn from teachers and it is their responsibility to ensure that students learn. A teacher is classified as effective or otherwise depending on the achievements of his/her students in examinations. Actually the examination system in India occupies a central place in the entire

education system that it tends to thwart any attempt to innovate teaching-learning process. In order to improve the quality of school education, it is imperative that examination system ought to be debated in detail at the highest policy levels and transformed radically throughout the country. Examinations in their present form are not the real measure of student's potential because these are limited to test only one aspect i.e., content knowledge of the course that the students strive to learn over a period of one year.

NCF-2005 suggests that teaching should be learner centred where learner is placed at the centre of teaching processes. It envisages the primacy of children's experiences, their voices and their active involvement in the process of learning. Learning experiences at school should pave the way for construction of knowledge and fostering creativity so that it becomes a source of joy and not a stress. The syllabi and textbooks developed on the basis of NCF-2005 signify an attempt to implement this basic idea. The syllabus designers have tried to address the problem of curriculum burden by restructuring and reorienting knowledge at different stages with greater consideration for child psychology. The textbooks, particularly in science, attempts to enhance this endeavour by giving higher priority and space for contemplation and wonder in the texts, and suggesting discussions in small groups and activities requiring hands on experiences, through exercises and practical work.

In the present Science Textbook for Class IX the science concepts are framed not along disciplinary lines, but rather organised around themes that are potentially cross disciplinary in nature. The themes are— Food, Materials, The World of the Living, Moving Things, People and Ideas and Natural Resources. There are fifteen chapters in Class IX Science Textbook and these cover the above mentioned themes.

**Chapter-1 “ Matter in Our Surrounding”** deals with three states of matter that is solid, liquid and gas. These states of matter are inter-convertible and can be changed by changing temperature or pressure. This chapter also deals with the process of sublimation, evaporation, latent heat of evaporation and latent heat of fusion.

**Chapter-2 “ Is Matter Around Us Pure”** deals with elements, compounds and mixtures. Mixtures can be separated into pure substances using appropriate separation techniques. This chapter also highlights about homogenous mixtures, heterogenous mixtures, colloids, physical and chemical changes.

**Chapter-3 “ Atoms and Molecules”** explains about law of conservation of mass and law of definite proportions. It introduces the idea of an atom as the smallest particle of an element that can exist independently and retain all its chemical properties. It also explains about writing of chemical formulae of simple compounds, formula unit mass and mole concept.

**Chapter-4 “ Structure of the Atom”** presents a brief historical account of development of the model of an atom from Thomson, Rutherford and Bohr, including distribution of electrons in different orbits. The concepts of valency, atomic number, mass number, isotopes and isobars have also been introduced.

**Chapter-5 “ The Fundamental Unit of Life”** deals with the building blocks in cell, tissue, organ and various systems in multicellular organisms. The chapter describes structure of various types of cells viz, eukaryotic, prokaryotic, animal or plant cell. The text provides ample knowledge about the various organelles present inside the cell and their functions which are characteristic of all living forms.

**Chapter-6 “Tissue”** highlights the various types of plant and animal tissues, their structure and function. An attempt has been made to help learners ponder over as to how different organs and organ systems in plant and animal bodies are made up of different types of tissues, function together in a coordinated manner in a system to perform specific functions of the living body.

**Chapter-7 “Diversity in Living Organisms”** deals with classification and evolution of various living organisms. The five kingdom classification of Whittaker is discussed in detail. The text highlights the salient features of different classes under plant and animal kingdom.

**Chapter-8 “Motion”** introduces physical quantities like distance, displacement, speed, velocity and acceleration that are essential to describe motion of an object which could be uniform or non-uniform. The motion of an object moving with uniform acceleration has been described algebraically with the help of three equations. Graphical method for investigating motion has also been discussed.

**Chapter-9 “Force and Laws of Motion”** describes the three laws of motion. The concepts of inertia and mass, momentum and conservation of momentum have been introduced.



**Chapter-10 “Gravitation”** explains that law of gravitation is universal as it applies to all objects anywhere. The weight of a body is the force with which the earth attracts it. It is equal to the product of mass and acceleration due to gravity. An object experiences an upward force called buoyancy when it is immersed in a fluid. If the density of the fluid (or liquid) is less than that of the object, it sinks, while it floats in the liquid if the density is more.

**Chapter-11 “Work and Energy”** introduces work done on an object as the product of force and displacement. The concepts of potential energy and kinetic energy have been introduced together with the law of conservation of energy. The idea that energy can neither be created nor destroyed but can only be transformed from one form to another have been discussed. Power is defined as rate of doing work.

**Chapter-12 “Sound”** explains that sound is a form of mechanical wave that is produced by vibrating objects. The distinction between two types of waves — longitudinal and transverse have been explained. Sound can be described by frequency, amplitude and speed. It is characterised by loudness, amplitudes, pitch. Speed of sound depends on medium and it obeys Laws of reflection. Echo is reflection of sound. Audible range of human ear is 20 Hz to 20,000 Hz. Ultrasound has many medical and industrial applications. This chapter discusses about SONAR which is used to determine the depth of the sea.

**Chapter-13 “Why do We Fall Ill”** deals with the human health and some common diseases. The chapter highlights various types of diseases, their causal organisms, their mode of infection and transmission of infectious diseases in humans. It also provides information about prevention of diseases and importance of immunisation for various diseases in human beings.

**Chapter-14 “Natural Resources”** discusses about various types of resources, pollution, biogeochemical cycle, ozone layer and green house effect. In this chapter various causes and effects of pollution, effects of depletion of natural resources and cycling of materials and its conservation has been discussed.

**Chapter-15 “Improvement in Food Resources”** deals with the various techniques used in improving the crops and other food resources. The chapter deals with crop variety improvement, agricultural practices and management techniques. This also discusses the different cropping patterns and protective

strategies. Some aspects of animal husbandry, poultry, fisheries and bee-keeping have been discussed as an integrated management of food resources along with agriculture.

### **ASSESSMENT IN SCHOOL**

National Focus Group Position Paper on 'Examination Reforms' strongly recommends a System of Continuous and Comprehensive Evaluation (CCE) in order to reduce stress on children, make evaluation comprehensive and regular, provide space for the teachers for developing creative thinking, provide a tool for diagnosis and for equipping learners with greater skill. The CCE scheme is simple, flexible and implementable in any type of school from the elite one to a school located in rural or tribal areas.

### **SUGGESTED TYPES OF QUESTIONS**

National Focus Group Position Paper on 'Teaching of Science' asserts that the major deficiency in current examination system in science is that it does not really assess genuine understanding of the subject. It is mostly confined to elicit information through theoretical questions, which can often be handled by rote learning without proper understanding of the concepts. The tests rarely include questions that require students to apply their understanding of concepts to new situations or that compel them to correlate or even to interpret phenomenon that they experience in daily life or the ones that are based on experimental data. Usually, it is seen that language of questions framed is vague, ambiguous and misleading. Most questions seek a direct answer.

In the present book an attempt has been made to include a few **Multiple Choice Questions** in each chapter which can be used to test real understanding of the concepts. These questions are likely to help learners to develop proper discriminating power and thereby reduce guess work factor to a minimum. Efforts have been made that each one of the options given in MCQ's appear equally probable. Further, sentence structure and language used often gives sufficient clue for the correct answer defeating the very purpose for which it has been framed. Therefore, utmost care needs to be taken while framing multiple-choice questions, so that, these may be used to test real understanding of concepts, which in-turn would also help reduce student anxiety.

**Some open ended questions** are given in each chapter to test the expression and the ability to formulate an argument using relevant facts. A method has to be developed in marking these questions as multiple answers, all equally

appropriate, are possible. Further direct answers to such questions may not be available in textbooks.

**The activity based questions** i.e., 'learning by doing' not only increase the sense of observations among children but also help in better understanding of the concepts.

**Some challenging questions are also framed for the children with higher mental ability.** Good question setting needs drastic reforms. Good questions can be canvassed from experts in their discipline, school teachers, educators and even from students. These questions can be pooled together and can be used in the examination after careful vetting by evaluation experts. Certain conditions must be met in order to frame a good question. Unambiguous language, clarity about expected task, provision of proper data and values of constants are some of the pre-requisites for framing a good question.

Design of the two sample question papers of Science Class IX theory are given in **Appendix-I** Definition of the SI base units is given in **Appendix-II**. Elements, their symbols, atomic number and atomic mass are given in **Appendix-III**.

# EXEMPLAR PROBLEMS

## SCIENCE

CLASS IX



राष्ट्रीय शैक्षिक अनुसंधान और प्रशिक्षण परिषद्  
NATIONAL COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING



ISBN 978-81-7450-976-5

**First Edition**

July 2009 Sravana 1931

**Reprinted**

March 2010 Chaitra 1932

**PD 15T VK**

© **National Council of Educational  
Research and Training, 2009**

**Rs. 140.00**

*Printed on 80 GSM paper with NCERT  
watermark*

Published at the Publication Department  
by the Secretary, National Council of  
Educational Research and Training,  
Sri Aurobindo Marg, New Delhi 110 016  
and printed at Nilam Offset B-147  
DDA Sheds, Okhla Industrial Area  
Phase-II, New Delhi 110 020

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## FOREWORD

The National Curriculum Framework (NCF) 2005 initiated a new phase of development of syllabi and textbooks for all stages of school education. In this phase, a conscious effort has been made to discourage rote learning and to enhance comprehension. This is well in tune with the NPE-1986 and Learning Without Burden-1993 that recommend child centred system of education. The textbooks for Class IX were released in February, 2006 and for Class X in December, 2006. Overall the books have been well received by students and teachers.

NCF-2005 notes that treating the prescribed textbooks as the sole basis of examination is one of the key reasons why other resources and sites of learning are ignored. It further reiterates that the methods used for teaching and evaluation will also determine how effective these textbooks prove for making children's life at school a happy experience, rather than source of stress or boredom. It calls for reforms in examination system currently prevailing in the country.

The position papers of the National Focus Group on Teaching of Science, Teaching of Mathematics and Examination Reforms envisage that the question papers, set in annual examinations conducted by the various Boards do not really assess genuine understanding of the subjects. The quality of question papers is often not up to the mark. They usually seek mere information based on rote memorisation and fail to test higher-order skills, like reasoning and analysis, let alone lateral thinking, creativity and judgment. Good unconventional questions, challenging problems and experiment-based problems rarely find a place in question papers. In order to address the issue and also to provide additional learning material, the Department of Education in Science and Mathematics (DESM) has made an attempt to develop resource books of exemplar problems in different subjects at secondary and higher-secondary stages. Each resource book contains different types of questions of varying difficulty level. Some questions would require the students to apply simultaneously understanding of more than one concept. These problems are not meant to serve merely as questions bank for examinations but are primarily meant to improve the quality of teaching/learning process in schools. It is expected that these problems would encourage

teachers to design quality questions on their own. Students and teachers should always keep in mind that examination and assessment should test comprehension, information recall, analytical thinking and problem-solving ability, creativity and speculative ability.

A team of experts and teachers with an understanding of the subject and a proper role of examinations worked hard to accomplish this task. The material was discussed, edited, and finally included in this resource book.

NCERT would welcome suggestions from students, teachers and parents which would help us to further improve the quality of the material in subsequent editions.

New Delhi  
*May 2008*

Prof. Yash Pal

## **PREFACE**

The Department of Education in Science and Mathematics (DESM), National Council of Educational Research and Training (NCERT), initiated the programme for the development of 'Exemplar Problems' in science and mathematics for secondary and higher secondary stages based on the subject textbooks developed on the basis of the NCF-2005. The present book is based on the contents of the Science Textbook for Class IX published by the Council in 2006.

The main objective of the book on 'Exemplar Problems in Science' is to provide the teachers and students a large number of quality problems in various forms and format with varying levels of difficulty to facilitate teaching-learning of concepts in Science that are presented through the textbook for Class IX. It is envisaged that the problems included in this book would help the teachers to design tasks to assess effectiveness of their preparation of balanced question papers for unit and terminal tests. The feedback based on the analysis of students' responses may help the teachers in further improving the quality of classroom instructions. In addition, the problems given in this book are also expected to help the teachers to perceive the basic characteristics of good quality questions and motivate them to frame similar problems on their own. Students can benefit themselves by attempting the problems given in the book for self assessment and also in mastering the basic techniques of problem solving. Some of the problems given in the book are expected to challenge the students understanding of Science concepts and to apply them in new situations.

The problems included in this book were developed in workshop mode organised by the DESM involving practicing teachers, subject experts from universities and institutes of higher learning and the members of the Science group of the DESM whose names appear separately. I gratefully acknowledge their efforts and thank them for their valuable contribution in our endeavour to provide good quality

instructional material for the school system. I especially thank Professor Krishna Kumar, *Director*, and Professor G. Ravindra, *Joint Director*, NCERT for their administrative support and keen interest in the development of the book. I acknowledge with thanks the dedicated efforts and valuable contribution of Dr. Anjni Koul, *coordinator* of this programme.

I also thank Dr. K.T. Chitralkha, *Copy Editor* and Shri Mohd. Jabir Hussain, *DTP Operator* for typing the manuscript and preparing a press-ready copy.

We look forward to feedback from students, teachers and parents for further improvement of the contents of the book.

Dr. Hukum Singh  
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## ACKNOWLEDGEMENTS

The National Council of Educational Research and Training is grateful to the members of Development Committee, whose names are given separately, for their contribution in the development of *Exemplar Problems in Science* for Class IX. The Council also gratefully acknowledges the contribution of the following members for reviewing, refining and finalisation of the manuscript of the book: Kanhiya Lal, *Principal (Retd.)*, Directorate of Education, NCT, Delhi; H.C. Jain, *Principal (Retd.)*, RIE Ajmer, 264-Saket Colony, Vaishali Nagar, Ajmer; Sunita Hodda, *Reader*, Acharya Narendar Dev College, Delhi Univeristy, Delhi; A.K. Kawathekar, *Reader*, Shri Venkateshwar College, Delhi Univeristy, Delhi; K.K. Kaul, *Reader*, Hindu College, Delhi University, Delhi; S.L. Varte, *Lecturer*, DESM, NCERT, New Delhi; Meenambika Menon, *TGT*, Cambridge School, Noida; Vandana Saxena, *TGT*, Kendriya Vidyalaya No.-3, Naraina, Delhi Cantt., New Delhi; D.S. Shankar, *Lecturer*, RIE, Ajmer; R.P. Singh, *Lecturer*, Rajkiya Pratibha Vikas Vidyalaya, Kishanganj, Delhi.

Special thanks are due to Hukum Singh, *Professor and Head*, Department of Education in Science and Mathematics, NCERT, New Delhi for providing all academic and administrative support.

The Council also gratefully acknowledges the support provided by the APC Office of DESM, administrative staff of DESM; Deepak Kapoor, *Incharge*, Computer Centre, DESM; Mohd. Jabir Hussain and Narender Verma, *DTP Operator*; K.T. Chitralkha, *Copy Editor*; Abhimanu Mohanty, *Proof Reader*. The efforts of the Publication Department, NCERT are also highly appreciated.

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# Chapter 1

## MATTER IN OUR SURROUNDINGS

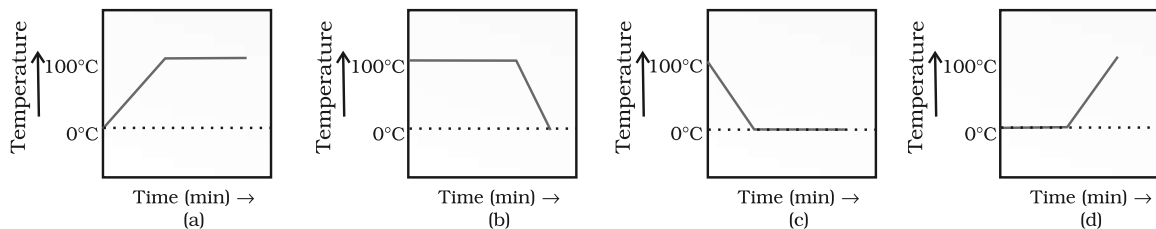
### Multiple Choice Questions

1. Which one of the following sets of phenomena would increase on raising the temperature?
  - (a) Diffusion, evaporation, compression of gases
  - (b) Evaporation, compression of gases, solubility
  - (c) Evaporation, diffusion, expansion of gases
  - (d) Evaporation, solubility, diffusion, compression of gases
2. Seema visited a Natural Gas Compressing Unit and found that the gas can be liquefied under specific conditions of temperature and pressure. While sharing her experience with friends she got confused. Help her to identify the correct set of conditions
  - (a) Low temperature, low pressure
  - (b) High temperature, low pressure
  - (c) Low temperature, high pressure
  - (d) High temperature, high pressure
3. The property to flow is unique to fluids. Which one of the following statements is correct?
  - (a) Only gases behave like fluids
  - (b) Gases and solids behave like fluids
  - (c) Gases and liquids behave like fluids
  - (d) Only liquids are fluids
4. During summer, water kept in an earthen pot becomes cool because of the phenomenon of
  - (a) diffusion
  - (b) transpiration
  - (c) osmosis
  - (d) evaporation
5. A few substances are arranged in the increasing order of 'forces of attraction' between their particles. Which one of the following represents a correct arrangement?
  - (a) Water, air, wind
  - (b) Air, sugar, oil
  - (c) Oxygen, water, sugar
  - (d) Salt, juice, air

6. On converting 25 C, 38 C and 66 C to kelvin scale, the correct sequence of temperature will be
- (a) 298 K, 311 K and 339 K
  - (b) 298 K, 300 K and 338 K
  - (c) 273 K, 278 K and 543 K
  - (d) 298 K, 310 K and 338 K
7. Choose the correct statement of the following
- (a) conversion of solid into vapours without passing through the liquid state is called vapourisation.
  - (b) conversion of vapours into solid without passing through the liquid state is called sublimation.
  - (c) conversion of vapours into solid without passing through the liquid state is called freezing.
  - (d) conversion of solid into liquid is called sublimation.
8. The boiling points of diethyl ether, acetone and *n*-butyl alcohol are 35 C, 56 C and 118 C respectively. Which one of the following correctly represents their boiling points in kelvin scale?
- (a) 306 K, 329 K, 391 K
  - (b) 308 K, 329 K, 392 K
  - (c) 308 K, 329 K, 391 K
  - (d) 329 K, 392 K, 308 K
9. Which condition out of the following will increase the evaporation of water?
- (a) Increase in temperature of water
  - (b) Decrease in temperature of water
  - (c) Less exposed surface area of water
  - (d) Adding common salt to water
10. In which of the following conditions, the distance between the molecules of hydrogen gas would increase?
- (i) Increasing pressure on hydrogen contained in a closed container
  - (ii) Some hydrogen gas leaking out of the container
  - (iii) Increasing the volume of the container of hydrogen gas
  - (iv) Adding more hydrogen gas to the container without increasing the volume of the container
- (a) (i) and (iii)
  - (b) (i) and (iv)
  - (c) (ii) and (iii)
  - (d) (ii) and (iv)

## Short Answer Questions

- 11.** A sample of water under study was found to boil at 102 C at normal temperature and pressure. Is the water pure? Will this water freeze at 0 C? Comment.
- 12.** A student heats a beaker containing ice and water. He measures the temperature of the content of the beaker as a function of time. Which of the following (Fig. 1.1) would correctly represent the result? Justify your choice.



**Fig. 1.1**

- 13.** Fill in the blanks:
- Evaporation of a liquid at room temperature leads to a—— effect.
  - At room temperature the forces of attraction between the particles of solid substances are——than those which exist in the gaseous state.
  - The arrangement of particles is less ordered in the —— state. However, there is no order in the —— state.
  - is the change of gaseous state directly to solid state without going through the ——state.
  - The phenomenon of change of a liquid into the gaseous state at any temperature below its boiling point is called——.

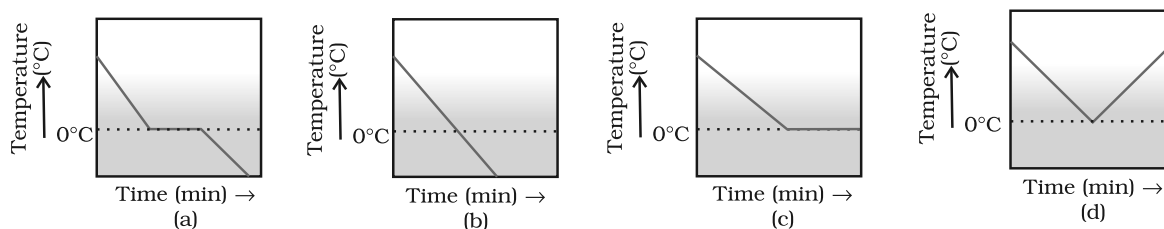
- 14.** Match the physical quantities given in column **A** to their S I units given in column **B** :

<b>(A)</b>	<b>(B)</b>
(a) Pressure	(i) cubic metre
(b) Temperature	(ii) kilogram
(c) Density	(iii) pascal
(d) Mass	(iv) kelvin
(e) Volume	(v) kilogram per cubic metre

- 15.** The non S I and S I units of some physical quantities are given in column **A** and column **B** respectively. Match the units belonging to the same physical quantity:

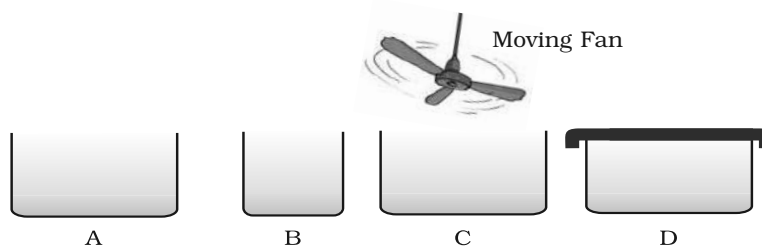
<b>(A)</b>	<b>(B)</b>
(a) degree celsius	(i) kilogram
(b) centimetre	(ii) pascal
(c) gram per centimetre cube	(iii) metre
(d) bar	(iv) kelvin
(e) milligram	(v) kilogram per metre cube

16. 'Osmosis is a special kind of diffusion'. Comment.
17. Classify the following into osmosis/diffusion
- Swelling up of a raisin on keeping in water.
  - Spreading of virus on sneezing.
  - Earthworm dying on coming in contact with common salt.
  - Shrinking of grapes kept in thick sugar syrup.
  - Preserving pickles in salt.
  - Spreading of smell of cake being baked through out the house.
  - Aquatic animals using oxygen dissolved in water during respiration.
18. Water as ice has a cooling effect, whereas water as steam may cause severe burns. Explain these observations.
19. Alka was making tea in a kettle. Suddenly she felt intense heat from the puff of steam gushing out of the spout of the kettle. She wondered whether the temperature of the steam was higher than that of the water boiling in the kettle. Comment.
20. A glass tumbler containing hot water is kept in the freezer compartment of a refrigerator (temperature  $< 0\text{ }^{\circ}\text{C}$ ). If you could measure the temperature of the content of the tumbler, which of the following graphs (Fig. 1.2) would correctly represent the change in its temperature as a function of time.



**Fig. 1.2**

21. Look at Fig. 1.3 and suggest in which of the vessels A, B, C or D the rate of evaporation will be the highest? Explain.



**Fig. 1.3**

22. (a) Conversion of solid to vapour is called sublimation. Name the term used to denote the conversion of vapour to solid.
- (b) Conversion of solid state to liquid state is called fusion; what is meant by latent heat of fusion?

## Long Answer Questions

- 23.** You are provided with a mixture of naphthalene and ammonium chloride by your teacher. Suggest an activity to separate them with well labelled diagram.
- 24.** It is a hot summer day, Priyanshi and Ali are wearing cotton and nylon clothes respectively. Who do you think would be more comfortable and why?
- 25.** You want to wear your favourite shirt to a party, but the problem is that it is still wet after a wash. What steps would you take to dry it faster?
- 26.** Comment on the following statements:
- (a) Evaporation produces cooling.
  - (b) Rate of evaporation of an aqueous solution decreases with increase in humidity.
  - (c) Sponge though compressible is a solid.
- 27.** Why does the temperature of a substance remain constant during its melting point or boiling point?

# Chapter 2

## IS MATTER AROUND US PURE

### Multiple Choice Questions

- Which of the following statements are true for pure substances?
  - Pure substances contain only one kind of particles
  - Pure substances may be compounds or mixtures
  - Pure substances have the same composition throughout
  - Pure substances can be exemplified by all elements other than nickel
  - (i) and (ii)
  - (i) and (iii)
  - (iii) and (iv)
  - (ii) and (iii)
- Rusting of an article made up of iron is called
  - corrosion and it is a physical as well as chemical change
  - dissolution and it is a physical change
  - corrosion and it is a chemical change
  - dissolution and it is a chemical change
- A mixture of sulphur and carbon disulphide is
  - heterogeneous and shows Tyndall effect
  - homogeneous and shows Tyndall effect
  - heterogeneous and does not show Tyndall effect
  - homogeneous and does not show Tyndall effect
- Tincture of iodine has antiseptic properties. This solution is made by dissolving
  - iodine in potassium iodide
  - iodine in vaseline
  - iodine in water
  - iodine in alcohol
- Which of the following are homogeneous in nature?
  - ice
  - wood
  - soil
  - air
  - (i) and (iii)
  - (ii) and (iv)
  - (i) and (iv)
  - (iii) and (iv)

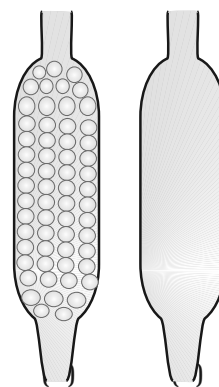
6. Which of the following are physical changes?
- (i) Melting of iron metal
  - (ii) Rusting of iron
  - (iii) Bending of an iron rod
  - (iv) Drawing a wire of iron metal
- (a) (i), (ii) and (iii)
  - (b) (i), (ii) and (iv)
  - (c) (i), (iii) and (iv)
  - (d) (ii), (iii) and (iv)
7. Which of the following are chemical changes?
- (i) Decaying of wood
  - (ii) Burning of wood
  - (iii) Sawing of wood
  - (iv) Hammering of a nail into a piece of wood
- (a) (i) and (ii)
  - (b) (ii) and (iii)
  - (c) (iii) and (iv)
  - (d) (i) and (iv)
8. Two substances, A and B were made to react to form a third substance,  $A_2B$  according to the following reaction
- $$2A + B \rightarrow A_2B$$
- Which of the following statements concerning this reaction are incorrect?
- (i) The product  $A_2B$  shows the properties of substances A and B
  - (ii) The product will always have a fixed composition
  - (iii) The product so formed cannot be classified as a compound
  - (iv) The product so formed is an element
- (a) (i), (ii) and (iii),
  - (b) (ii), (iii) and (iv)
  - (c) (i), (iii) and (iv)
  - (d) (ii), (iii) and (iv)
9. Two chemical species X and Y combine together to form a product P which contains both X and Y
- $$X + Y \rightarrow P$$
- X and Y cannot be broken down into simpler substances by simple chemical reactions. Which of the following concerning the species X, Y and P are correct?
- (i) P is a compound
  - (ii) X and Y are compounds
  - (iii) X and Y are elements

(iv) P has a fixed composition

- (a) (i), (ii) and (iii),
- (b) (i), (ii) and (iv)
- (c) (ii), (iii) and (iv)
- (d) (i), (iii) and (iv)

### Short Answer Questions

- 10.** Suggest separation technique(s) one would need to employ to separate the following mixtures.
- (a) Mercury and water
  - (b) Potassium chloride and ammonium chloride
  - (c) Common salt, water and sand
  - (d) Kerosene oil, water and salt
- 11.** Which of the tubes in Fig. 2.1 (a) and (b) will be more effective as a condenser in the distillation apparatus?
- 12.** Salt can be recovered from its solution by evaporation. Suggest some other technique for the same?
- 13.** The 'sea-water' can be classified as a homogeneous as well as heterogeneous mixture. Comment.
- 14.** While diluting a solution of salt in water, a student by mistake added acetone (boiling point 56 C). What technique can be employed to get back the acetone? Justify your choice.
- 15.** What would you observe when
- (a) a saturated solution of potassium chloride prepared at 60 C is allowed to cool to room temperature.
  - (b) an aqueous sugar solution is heated to dryness.
  - (c) a mixture of iron filings and sulphur powder is heated strongly.
- 16.** Explain why particles of a colloidal solution do not settle down when left undisturbed, while in the case of a suspension they do.
- 17.** Smoke and fog both are aerosols. In what way are they different?
- 18.** Classify the following as physical or chemical properties
- (a) The composition of a sample of steel is: 98% iron, 1.5% carbon and 0.5% other elements.
  - (b) Zinc dissolves in hydrochloric acid with the evolution of hydrogen gas.
  - (c) Metallic sodium is soft enough to be cut with a knife.
  - (d) Most metal oxides form alkalis on interacting with water.

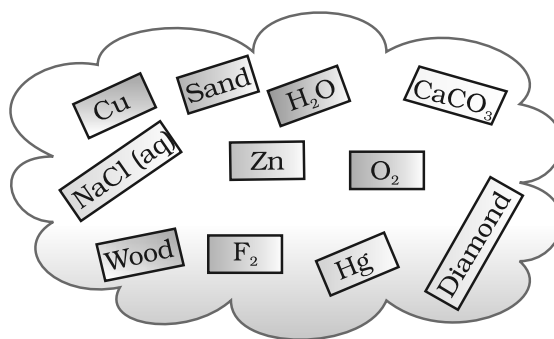


**Fig. 2.1**



19. The teacher instructed three students 'A', 'B' and 'C' respectively to prepare a 50% (mass by volume) solution of sodium hydroxide (NaOH). 'A' dissolved 50g of NaOH in 100 mL of water, 'B' dissolved 50g of NaOH in 100g of water while 'C' dissolved 50g of NaOH in water to make 100 mL of solution. Which one of them has made the desired solution and why?
20. Name the process associated with the following
- Dry ice is kept at room temperature and at one atmospheric pressure.
  - A drop of ink placed on the surface of water contained in a glass spreads throughout the water.
  - A potassium permanganate crystal is in a beaker and water is poured into the beaker with stirring.
  - An acetone bottle is left open and the bottle becomes empty.
  - Milk is churned to separate cream from it.
  - Settling of sand when a mixture of sand and water is left undisturbed for some time.
  - Fine beam of light entering through a small hole in a dark room, illuminates the particles in its paths.
21. You are given two samples of water labelled as 'A' and 'B'. Sample 'A' boils at 100 C and sample 'B' boils at 102 C. Which sample of water will not freeze at 0 C? Comment.
22. What are the favourable qualities given to gold when it is alloyed with copper or silver for the purpose of making ornaments?
23. An element is sonorous and highly ductile. Under which category would you classify this element? What other characteristics do you expect the element to possess?
24. Give an example each for the mixture having the following characteristics. Suggest a suitable method to separate the components of these mixtures
- A volatile and a non-volatile component.
  - Two volatile components with appreciable difference in boiling points.
  - Two immiscible liquids.
  - One of the components changes directly from solid to gaseous state.
  - Two or more coloured constituents soluble in some solvent.
25. Fill in the blanks
- A colloid is a \_\_\_\_\_ mixture and its components can be separated by the technique known as \_\_\_\_\_.
  - Ice, water and water vapour look different and display different \_\_\_\_\_ properties but they are \_\_\_\_\_ the same.
  - A mixture of chloroform and water taken in a separating funnel is mixed and left undisturbed for some time. The upper layer in the separating funnel will be of \_\_\_\_\_ and the lower layer will be that of \_\_\_\_\_.
  - A mixture of two or more miscible liquids, for which the difference in the boiling points is less than 25 K can be separated by the process called \_\_\_\_\_.

- (e) When light is passed through water containing a few drops of milk, it shows a bluish tinge. This is due to the \_\_\_\_\_ of light by milk and the phenomenon is called \_\_\_\_\_. This indicates that milk is a \_\_\_\_\_ solution.
- 26.** Sucrose (sugar) crystals obtained from sugarcane and beetroot are mixed together. Will it be a pure substance or a mixture? Give reasons for the same.
- 27.** Give some examples of Tyndall effect observed in your surroundings?
- 28.** Can we separate alcohol dissolved in water by using a separating funnel? If yes, then describe the procedure.  
If not, explain.
- 29.** On heating calcium carbonate gets converted into calcium oxide and carbon dioxide.  
(a) Is this a physical or a chemical change?  
(b) Can you prepare one acidic and one basic solution by using the products formed in the above process? If so, write the chemical equation involved.
- 30.** Non metals are usually poor conductors of heat and electricity. They are non-lustrous, non-sonorous, non-malleable and are coloured.  
(a) Name a lustrous non-metal.  
(b) Name a non-metal which exists as a liquid at room temperature.  
(c) The allotropic form of a non-metal is a good conductor of electricity. Name the allotrope.  
(d) Name a non-metal which is known to form the largest number of compounds.  
(e) Name a non-metal other than carbon which shows allotropy.  
(f) Name a non-metal which is required for combustion.
- 31.** Classify the substances given in Fig. 2.2 into elements and compounds



**Fig. 2.2**

32. Which of the following are not compounds?

- (a) Chlorine gas
- (b) Potassium chloride
- (c) Iron
- (d) Iron sulphide
- (e) Aluminium
- (f) Iodine
- (g) Carbon
- (h) Carbon monoxide
- (i) Sulphur powder

### Long Answer Questions

33. Fractional distillation is suitable for separation of miscible liquids with a boiling point difference of about 25 K or less. What part of fractional distillation apparatus makes it efficient and possess an advantage over a simple distillation process. Explain using a diagram.

34. (a) Under which category of mixtures will you classify alloys and why?  
(b) A solution is always a liquid. Comment.  
(c) Can a solution be heterogeneous?

35. Iron filings and sulphur were mixed together and divided into two parts, 'A' and 'B'. Part 'A' was heated strongly while Part 'B' was not heated. Dilute hydrochloric acid was added to both the Parts and evolution of gas was seen in both the cases. How will you identify the gases evolved?

36. A child wanted to separate the mixture of dyes constituting a sample of ink. He marked a line by the ink on the filter paper and placed the filter paper in a glass containing water as shown in Fig.2.3. The filter paper was removed when the water moved near the top of the filter paper.

- (i) What would you expect to see, if the ink contains three different coloured components?
- (ii) Name the technique used by the child.
- (iii) Suggest one more application of this technique.

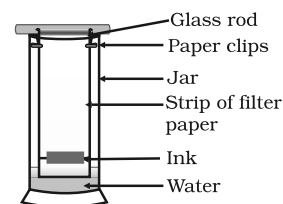


Fig. 2.3

37. A group of students took an old shoe box and covered it with a black paper from all sides. They fixed a source of light (a torch) at one end of the box by making a hole in it and made another hole on the other side to view the light. They placed a milk sample contained in a beaker/tumbler in the box as shown in the Fig.2.4. They were amazed to see that milk taken in the tumbler was

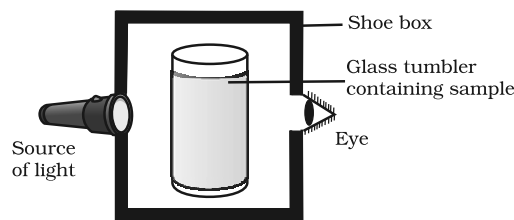


Fig. 2.4

illuminated. They tried the same activity by taking a salt solution but found that light simply passed through it?

- (a) Explain why the milk sample was illuminated. Name the phenomenon involved.
  - (b) Same results were not observed with a salt solution. Explain.
  - (c) Can you suggest two more solutions which would show the same effect as shown by the milk solution?
- 38.** Classify each of the following, as a physical or a chemical change. Give reasons.
- (a) Drying of a shirt in the sun.
  - (b) Rising of hot air over a radiator.
  - (c) Burning of kerosene in a lantern.
  - (d) Change in the colour of black tea on adding lemon juice to it.
  - (e) Churning of milk cream to get butter.
- 39.** During an experiment the students were asked to prepare a 10% (Mass/Mass) solution of sugar in water. Ramesh dissolved 10g of sugar in 100g of water while Sarika prepared it by dissolving 10g of sugar in water to make 100g of the solution.
- (a) Are the two solutions of the same concentration
  - (b) Compare the mass % of the two solutions.
- 40.** You are provided with a mixture containing sand, iron filings, ammonium chloride and sodium chloride. Describe the procedures you would use to separate these constituents from the mixture?
- 41.** Arun has prepared 0.01% (by mass) solution of sodium chloride in water. Which of the following correctly represents the composition of the solutions?
- (a) 1.00 g of NaCl + 100g of water
  - (b) 0.11g of NaCl + 100g of water
  - (c) 0.01 g of NaCl + 99.99g of water
  - (d) 0.10 g of NaCl + 99.90g of water
- 42.** Calculate the mass of sodium sulphate required to prepare its 20% (mass percent) solution in 100g of water?

# Chapter 3

## ATOMS AND MOLECULES

### Multiple Choice Questions

- Which of the following correctly represents 360 g of water?  
(i) 2 moles of  $\text{H}_2\text{O}$   
(ii) 20 moles of water  
(iii)  $6.022 \times 10^{23}$  molecules of water  
(iv)  $1.2044 \times 10^{25}$  molecules of water  
(a) (i)                      (b) (i) and (iv)  
(c) (ii) and (iii)      (d) (ii) and (iv)
- Which of the following statements is not true about an atom?  
(a) Atoms are not able to exist independently  
(b) Atoms are the basic units from which molecules and ions are formed  
(c) Atoms are always neutral in nature  
(d) Atoms aggregate in large numbers to form the matter that we can see, feel or touch
- The chemical symbol for nitrogen gas is  
(a) Ni                      (b)  $\text{N}_2$                       (c)  $\text{N}^+$                       (d) N
- The chemical symbol for sodium is  
(a) So                      (b) Sd                      (c) NA                      (d) Na
- Which of the following would weigh the highest?  
(a) 0.2 mole of sucrose ( $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ )  
(b) 2 moles of  $\text{CO}_2$   
(c) 2 moles of  $\text{CaCO}_3$   
(d) 10 moles of  $\text{H}_2\text{O}$
- Which of the following has maximum number of atoms?  
(a) 18g of  $\text{H}_2\text{O}$   
(b) 18g of  $\text{O}_2$   
(c) 18g of  $\text{CO}_2$   
(d) 18g of  $\text{CH}_4$
- Which of the following contains maximum number of molecules?  
(a) 1g  $\text{CO}_2$   
(b) 1g  $\text{N}_2$   
(c) 1g  $\text{H}_2$   
(d) 1g  $\text{CH}_4$

8. Mass of one atom of oxygen is

- (a)  $\frac{16}{6.023 \times 10^{23}}$  g      (b)  $\frac{32}{6.023 \times 10^{23}}$  g  
(c)  $\frac{1}{6.023 \times 10^{23}}$  g      (d) 8u

9. 3.42 g of sucrose are dissolved in 18g of water in a beaker. The number of oxygen atoms in the solution are

- (a)  $6.68 \times 10^{23}$   
(b)  $6.09 \times 10^{22}$   
(c)  $6.022 \times 10^{23}$   
(d)  $6.022 \times 10^{21}$

10. A change in the physical state can be brought about

- (a) only when energy is given to the system  
(b) only when energy is taken out from the system  
(c) when energy is either given to, or taken out from the system  
(d) without any energy change

### Short Answer Questions

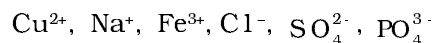
11. Which of the following represents a correct chemical formula? Name it.

- (a) CaCl (b) BiPO<sub>4</sub>      (c) NaSO<sub>4</sub>      (d) NaS

12. Write the molecular formulae for the following compounds

- (a) Copper (II) bromide  
(b) Aluminium (III) nitrate  
(c) Calcium (II) phosphate  
(d) Iron (III) sulphide  
(e) Mercury (II) chloride  
(f) Magnesium (II) acetate

13. Write the molecular formulae of all the compounds that can be formed by the combination of following ions



14. Write the cations and anions present (if any) in the following compounds

- (a) CH<sub>3</sub>COONa  
(b) NaCl  
(c) H<sub>2</sub>  
(d) NH<sub>4</sub>NO<sub>3</sub>

- 15.** Give the formulae of the compounds formed from the following sets of elements
- Calcium and fluorine
  - Hydrogen and sulphur
  - Nitrogen and hydrogen
  - Carbon and chlorine
  - Sodium and oxygen
  - Carbon and oxygen
- 16.** Which of the following symbols of elements are incorrect? Give their correct symbols
- Cobalt      CO
  - Carbon      c
  - Aluminium    AL
  - Helium      He
  - Sodium      So
- 17.** Give the chemical formulae for the following compounds and compute the ratio by mass of the combining elements in each one of them. (You may use appendix-III).
- Ammonia
  - Carbon monoxide
  - Hydrogen chloride
  - Aluminium fluoride
  - Magnesium sulphide
- 18.** State the number of atoms present in each of the following chemical species
- $\text{CO}_3^{2-}$
  - $\text{PO}_4^{3-}$
  - $\text{P}_2\text{O}_5$
  - CO
- 19.** What is the fraction of the mass of water due to neutrons?
- 20.** Does the solubility of a substance change with temperature? Explain with the help of an example.
- 21.** Classify each of the following on the basis of their atomicity.
- (a)  $\text{F}_2$     (b)  $\text{NO}_2$     (c)  $\text{N}_2\text{O}$     (d)  $\text{C}_2\text{H}_6$     (e)  $\text{P}_4$     (f)  $\text{H}_2\text{O}_2$   
(g)  $\text{P}_4\text{O}_{10}$     (h)  $\text{O}_3$     (i) HCl    (j)  $\text{CH}_4$     (k) He    (l) Ag
- 22.** You are provided with a fine white coloured powder which is either sugar or salt. How would you identify it without tasting?
- 23.** Calculate the number of moles of magnesium present in a magnesium ribbon weighing 12 g. Molar atomic mass of magnesium is  $24\text{g mol}^{-1}$ .

## Long Answer Questions

- 24.** Verify by calculating that
- 5 moles of  $\text{CO}_2$  and 5 moles of  $\text{H}_2\text{O}$  do not have the same mass.
  - 240 g of calcium and 240 g magnesium elements have a mole ratio of 3:5.
- 25.** Find the ratio by mass of the combining elements in the following compounds. (You may use Appendix-III)
- $\text{CaCO}_3$
  - $\text{MgCl}_2$
  - $\text{H}_2\text{SO}_4$
  - $\text{C}_2\text{H}_5\text{OH}$
  - $\text{NH}_3$
  - $\text{Ca(OH)}_2$
- 26.** Calcium chloride when dissolved in water dissociates into its ions according to the following equation.
- $$\text{CaCl}_2 (\text{aq}) \rightarrow \text{Ca}^{2+} (\text{aq}) + 2\text{Cl}^- (\text{aq})$$
- Calculate the number of ions obtained from  $\text{CaCl}_2$  when 222 g of it is dissolved in water.
- 27.** The difference in the mass of 100 moles each of sodium atoms and sodium ions is 5.48002 g. Compute the mass of an electron.
- 28.** Cinnabar ( $\text{HgS}$ ) is a prominent ore of mercury. How many grams of mercury are present in 225 g of pure  $\text{HgS}$ ? Molar mass of Hg and S are  $200.6 \text{ g mol}^{-1}$  and  $32 \text{ g mol}^{-1}$  respectively.
- 29.** The mass of one steel screw is 4.11 g. Find the mass of one mole of these steel screws. Compare this value with the mass of the Earth ( $5.98 \times 10^{24} \text{ kg}$ ). Which one of the two is heavier and by how many times?
- 30.** A sample of vitamic C is known to contain  $2.58 \times 10^{24}$  oxygen atoms. How many moles of oxygen atoms are present in the sample?
- 31.** Raunak took 5 moles of carbon atoms in a container and Krish also took 5 moles of sodium atoms in another container of same weight. (a) Whose container is heavier? (b) Whose container has more number of atoms?
- 32.** Fill in the missing data in the Table 3.1

**Table 3.1**

Species	$\text{H}_2\text{O}$	$\text{CO}_2$	Na atom	$\text{MgCl}_2$
<b>Property</b>				
No. of moles	2	—	—	0.5
No. of particles	—	$3.011 \times 10^{23}$	—	—
Mass	36g	—	115 g	—

- 33.** The visible universe is estimated to contain  $10^{22}$  stars. How many moles of stars are present in the visible universe?

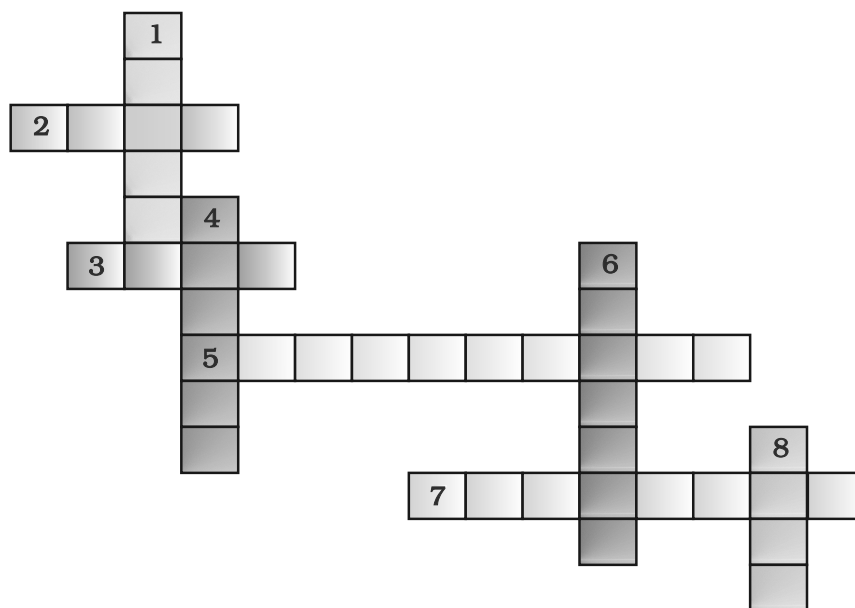


- 34.** What is the SI prefix for each of the following multiples and submultiples of a unit?  
 (a)  $10^3$  (b)  $10^{-1}$  (c)  $10^{-2}$  (d)  $10^{-6}$  (e)  $10^{-9}$  (f)  $10^{-12}$
- 35.** Express each of the following in kilograms  
 (a)  $5.84 \times 10^{-3}$  mg  
 (b) 58.34 g  
 (c) 0.584g  
 (d)  $5.873 \times 10^{-21}$  g
- 36.** Compute the difference in masses of  $10^3$  moles each of magnesium atoms and magnesium ions.  
 (Mass of an electron =  $9.1 \times 10^{-31}$  kg)
- 37.** Which has more number of atoms?  
 100g of  $N_2$  or 100 g of  $NH_3$
- 38.** Compute the number of ions present in 5.85 g of sodium chloride.
- 39.** A gold sample contains 90% of gold and the rest copper. How many atoms of gold are present in one gram of this sample of gold?
- 40.** What are ionic and molecular compounds? Give examples.
- 41.** Compute the difference in masses of one mole each of aluminium atoms and one mole of its ions. (Mass of an electron is  $9.1 \times 10^{-28}$  g). Which one is heavier?
- 42.** A silver ornament of mass 'm' gram is polished with gold equivalent to 1% of the mass of silver. Compute the ratio of the number of atoms of gold and silver in the ornament.
- 43.** A sample of ethane ( $C_2H_6$ ) gas has the same mass as  $1.5 \times 10^{20}$  molecules of methane ( $CH_4$ ). How many  $C_2H_6$  molecules does the sample of gas contain?
- 44.** Fill in the blanks  
 (a) In a chemical reaction, the sum of the masses of the reactants and products remains unchanged. This is called \_\_\_\_\_.  
 (b) A group of atoms carrying a fixed charge on them is called \_\_\_\_\_.  
 (c) The formula unit mass of  $Ca_3(PO_4)_2$  is \_\_\_\_\_.  
 (d) Formula of sodium carbonate is \_\_\_\_\_ and that of ammonium sulphate is \_\_\_\_\_.

45. Complete the following crossword puzzle (Fig. 3.1) by using the name of the chemical elements. Use the data given in Table 3.2.

**Table 3.2**

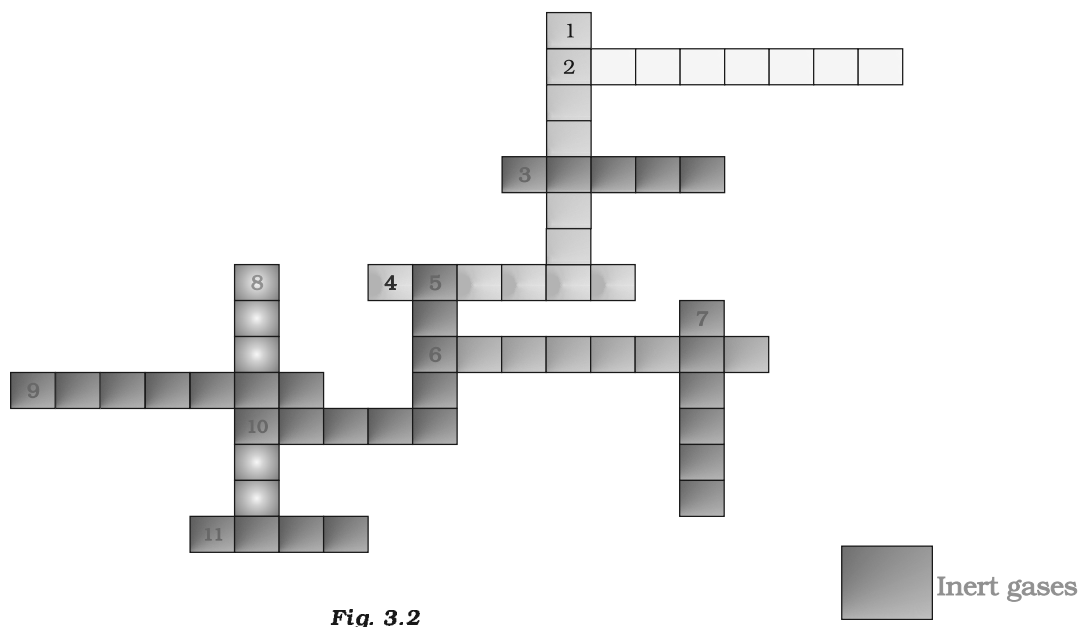
Across	Down
2. The element used by Rutherford during his $\alpha$ -scattering experiment	1. A white lustrous metal used for making ornaments and which tends to get tarnished black in the presence of moist air
3. An element which forms rust on exposure to moist air	4. Both brass and bronze are alloys of the element
5. A very reactive non-metal stored under water	6. The metal which exists in the liquid state at room temperature
7. Zinc metal when treated with dilute hydrochloric acid produces a gas of this element which when tested with burning splinter produces a pop sound.	8. An element with symbol Pb



**Fig. 3.1**

46. (a) In this crossword puzzle (Fig 3.2), names of 11 elements are hidden. Symbols of these are given below. Complete the puzzle.

- |       |        |
|-------|--------|
| 1. Cl | 7. He  |
| 2. H  | 8. F   |
| 3. Ar | 9. Kr  |
| 4. O  | 10. Rn |
| 5. Xe | 11. Ne |
| 6. N  |        |



**Fig. 3.2**

- (b) Identify the total number of inert gases, their names and symbols from this cross word puzzle.
- 47.** Write the formulae for the following and calculate the molecular mass for each one of them.
- Caustic potash
  - Baking powder
  - Lime stone
  - Caustic soda
  - Ethanol
  - Common salt
- 48.** In photosynthesis, 6 molecules of carbon dioxide combine with an equal number of water molecules through a complex series of reactions to give a molecule of glucose having a molecular formula  $C_6H_{12}O_6$ . How many grams of water would be required to produce 18 g of glucose? Compute the volume of water so consumed assuming the density of water to be  $1 \text{ g cm}^{-3}$ .

# Chapter 4

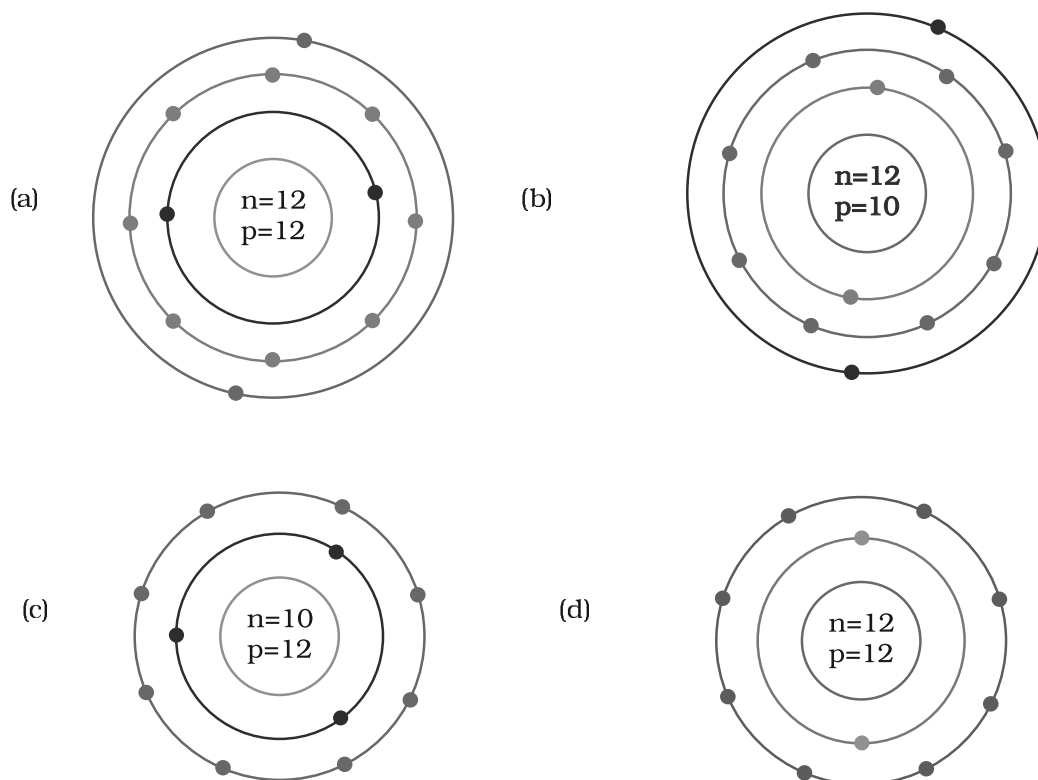
## STRUCTURE OF THE ATOM

### Multiple Choice Questions

- Which of the following correctly represent the electronic distribution in the Mg atom?
  - 3, 8, 1
  - 2, 8, 2
  - 1, 8, 3
  - 8, 2, 2
- Rutherford's 'alpha ( $\alpha$ ) particles scattering experiment' resulted in to discovery of
  - Electron
  - Proton
  - Nucleus in the atom
  - Atomic mass
- The number of electrons in an element X is 15 and the number of neutrons is 16. Which of the following is the correct representation of the element?
  - ${}_{15}^{31}\text{X}$
  - ${}_{16}^{31}\text{X}$
  - ${}_{15}^{16}\text{X}$
  - ${}_{16}^{15}\text{X}$
- Dalton's atomic theory successfully explained
  - Law of conservation of mass
  - Law of constant composition
  - Law of radioactivity
  - Law of multiple proportion
  - (i), (ii) and (iii)
  - (i), (iii) and (iv)
  - (ii), (iii) and (iv)
  - (i), (ii) and (iv)

5. Which of the following statements about Rutherford's model of atom are correct?
- (i) considered the nucleus as positively charged
  - (ii) established that the  $\alpha$ -particles are four times as heavy as a hydrogen atom
  - (iii) can be compared to solar system
  - (iv) was in agreement with Thomson's model
- (a) (i) and (iii)  
(b) (ii) and (iii)  
(c) (i) and (iv)  
(d) only (i)
6. Which of the following are true for an element?
- (i) Atomic number = number of protons + number of electrons
  - (ii) Mass number = number of protons + number of neutrons
  - (iii) Atomic mass = number of protons = number of neutrons
  - (iv) Atomic number = number of protons = number of electrons
- (a) (i) and (ii)  
(b) (i) and (iii)  
(c) (ii) and (iii)  
(d) (ii) and (iv)
7. In the Thomson's model of atom, which of the following statements are correct?
- (i) the mass of the atom is assumed to be uniformly distributed over the atom
  - (ii) the positive charge is assumed to be uniformly distributed over the atom
  - (iii) the electrons are uniformly distributed in the positively charged sphere
  - (iv) the electrons attract each other to stabilise the atom
- (a) (i), (ii) and (iii)  
(b) (i) and (iii)  
(c) (i) and (iv)  
(d) (i), (iii) and (iv)
8. Rutherford's  $\alpha$ -particle scattering experiment showed that
- (i) electrons have negative charge
  - (ii) the mass and positive charge of the atom is concentrated in the nucleus
  - (iii) neutron exists in the nucleus
  - (iv) most of the space in atom is empty
- Which of the above statements are correct?
- (a) (i) and (iii)  
(b) (ii) and (iv)  
(c) (i) and (iv)  
(d) (iii) and (iv)

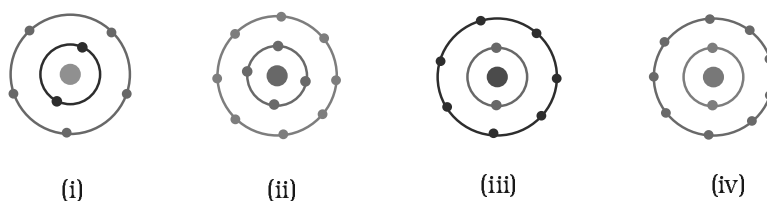
9. The ion of an element has 3 positive charges. Mass number of the atom is 27 and the number of neutrons is 14. What is the number of electrons in the ion?
- (a) 13  
 (b) 10  
 (c) 14  
 (d) 16
10. Identify the  $\text{Mg}^{2+}$  ion from the Fig. 4.1 where, n and p represent the number of neutrons and protons respectively



**Fig. 4.1**

11. In a sample of ethyl ethanoate ( $\text{CH}_3\text{COOC}_2\text{H}_5$ ) the two oxygen atoms have the same number of electrons but different number of neutrons. Which of the following is the correct reason for it?
- (a) One of the oxygen atoms has gained electrons  
 (b) One of the oxygen atoms has gained two neutrons  
 (c) The two oxygen atoms are isotopes  
 (d) The two oxygen atoms are isobars.

- 12.** Elements with valency 1 are  
 (a) always metals  
 (b) always metalloids  
 (c) either metals or non-metals  
 (d) always non-metals
- 13.** The first model of an atom was given by  
 (a) N. Bohr  
 (b) E. Goldstein  
 (c) Rutherford  
 (d) J.J. Thomson
- 14.** An atom with 3 protons and 4 neutrons will have a valency of  
 (a) 3  
 (b) 7  
 (c) 1  
 (d) 4
- 15.** The electron distribution in an aluminium atom is  
 (a) 2, 8, 3  
 (b) 2, 8, 2  
 (c) 8, 2, 3  
 (d) 2, 3, 8
- 16.** Which of the following in Fig. 4.2 do not represent Bohr's model of an atom correctly?



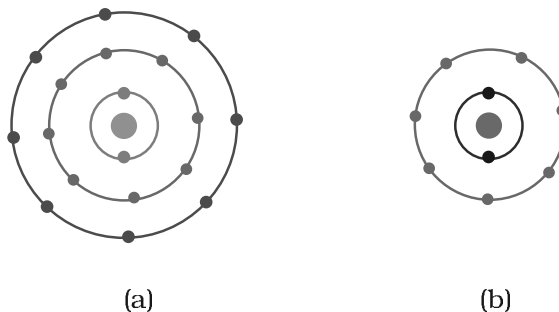
**Fig. 4.2**

- (a) (i) and (ii)  
 (b) (ii) and (iii)  
 (c) (ii) and (iv)  
 (d) (i) and (iv)
- 17.** Which of the following statement is always correct?  
 (a) An atom has equal number of electrons and protons.  
 (b) An atom has equal number of electrons and neutrons.  
 (c) An atom has equal number of protons and neutrons.  
 (d) An atom has equal number of electrons, protons and neutrons.

18. Atomic models have been improved over the years. Arrange the following atomic models in the order of their chronological order
- Rutherford's atomic model
  - Thomson's atomic model
  - Bohr's atomic model
- (i), (ii) and (iii)
  - (ii), (iii) and (i)
  - (ii), (i) and (iii)
  - (iii), (ii) and (i)

### Short Answer Questions

19. Is it possible for the atom of an element to have one electron, one proton and no neutron. If so, name the element.
20. Write any two observations which support the fact that atoms are divisible.
21. Will  $^{35}\text{Cl}$  and  $^{37}\text{Cl}$  have different valencies? Justify your answer.
22. Why did Rutherford select a gold foil in his  $\alpha$ -ray scattering experiment?
23. Find out the valency of the atoms represented by the Fig. 4.3 (a) and (b).



**Fig. 4.3**

24. One electron is present in the outer most shell of the atom of an element X. What would be the nature and value of charge on the ion formed if this electron is removed from the outer most shell?
25. Write down the electron distribution of chlorine atom. How many electrons are there in the L shell? (Atomic number of chlorine is 17).
26. In the atom of an element X, 6 electrons are present in the outermost shell. If it acquires noble gas configuration by accepting requisite number of electrons, then what would be the charge on the ion so formed?





33. Helium atom has 2 electrons in its valence shell but its valency is not 2, Explain.
34. Fill in the blanks in the following statements
- Rutherford's  $\alpha$ -particle scattering experiment led to the discovery of the \_\_\_\_\_
  - Isotopes have same \_\_\_\_\_but different\_\_\_\_\_.
  - Neon and chlorine have atomic numbers 10 and 17 respectively. Their valencies will be\_\_\_\_\_and\_\_\_\_\_respectively.
  - The electronic configuration of silicon is \_\_\_\_\_and that of sulphur is \_\_\_\_\_.
35. An element X has a mass number 4 and atomic number 2. Write the valency of this element?

### Long Answer Questions

36. Why do Helium, Neon and Argon have a zero valency?
37. The ratio of the radii of hydrogen atom and its nucleus is  $\sim 10^5$ . Assuming the atom and the nucleus to be spherical, (i) what will be the ratio of their sizes? (ii) If atom is represented by planet earth ' $R_e$ ' =  $6.4 \times 10^6$  m, estimate the size of the nucleus.
38. Enlist the conclusions drawn by Rutherford from his  $\alpha$ -ray scattering experiment.
39. In what way is the Rutherford's atomic model different from that of Thomson's atomic model?
40. What were the drawbacks of Rutherford's model of an atom?
41. What are the postulates of Bohr's model of an atom?
42. Show diagrammatically the electron distributions in a sodium atom and a sodium ion and also give their atomic number.
43. In the Gold foil experiment of Geiger and Marsden, that paved the way for Rutherford's model of an atom,  $\sim 1.00\%$  of the  $\alpha$ -particles were found to deflect at angles  $> 50^\circ$ . If one mole of  $\alpha$ -particles were bombarded on the gold foil, compute the number of  $\alpha$ -particles that would deflect at angles less than  $50^\circ$ .

# Chapter 5

## THE FUNDAMENTAL UNIT OF LIFE

### Multiple Choice Questions

1. Which of the following can be made into crystal?
  - (a) A Bacterium
  - (b) An Amoeba
  - (c) A Virus
  - (d) A Sperm
2. A cell will swell up if
  - (a) The concentration of water molecules in the cell is higher than the concentration of water molecules in surrounding medium
  - (b) The concentration of water molecules in surrounding medium is higher than water molecules concentration in the cell
  - (c) The concentration of water molecules is same in the cell and in the surrounding medium
  - (d) Concentration of water molecules does not matter
3. Chromosomes are made up of
  - (a) DNA
  - (b) protein
  - (c) DNA and protein
  - (d) RNA
4. Which of these options are not a function of Ribosomes?
  - (i) It helps in manufacture of protein molecules
  - (ii) It helps in manufacture of enzymes
  - (iii) It helps in manufacture of hormones
  - (iv) It helps in manufacture of starch molecules
  - (a) (i) and (ii)
  - (b) (ii) and (iii)
  - (c) (iii) and (iv)
  - (d) (iv) and (i)

5. Which of these is not related to endoplasmic reticulum?
- (a) It behaves as transport channel for proteins between nucleus and cytoplasm
  - (b) It transports materials between various regions in cytoplasm
  - (c) It can be the site of energy generation
  - (d) It can be the site for some biochemical activities of the cell
6. Following are a few definitions of osmosis  
Read carefully and select the correct definition
- (a) Movement of water molecules from a region of higher concentration to a region of lower concentration through a semipermeable membrane
  - (b) Movement of solvent molecules from its higher concentration to lower concentration
  - (c) Movement of solvent molecules from higher concentration to lower concentration of solution through a permeable membrane
  - (d) Movement of solute molecules from lower concentration to higher concentration of solution through a semipermeable membrane
7. Plasmolysis in a plant cell is defined as
- (a) break down (lysis ) of plasma membrane in hypotonic medium
  - (b) shrinkage of cytoplasm in hypertonic medium
  - (c) shrinkage of nucleoplasm
  - (d) none of them
8. Which of the following are covered by a single membrane?
- (a) Mitochondria
  - (b) Vacuole
  - (c) Lysosome
  - (d) Plastid
9. Find out the false sentences
- (a) Golgi apparatus is involved with the formation of lysosomes
  - (b) Nucleus, mitochondria and plastid have DNA; hence they are able to make their own structural proteins
  - (c) Mitochondria is said to be the power house of the cell as ATP is generated in them.
  - (d) Cytoplasm is called as protoplasm
10. Find out the correct sentence
- (a) Enzymes packed in Lysosomes are made through RER (rough endoplasmic reticulum)
  - (b) Rough endoplasmic reticulum and smooth endoplasmic reticulum produce lipid and protein respectively
  - (c) Endoplasmic reticulum is related with the destruction of plasma membrane
  - (d) Nucleoid is present inside the nucleoplasm of eukaryotic nucleus

11. Which cell organelle plays a crucial role in detoxifying many poisons and drugs in a cell?
- (a) Golgi apparatus
  - (b) Lysosomes
  - (c) Smooth endoplasmic reticulum
  - (d) Vacuoles
12. The proteins and lipids, essential for building the cell membrane, are manufactured by
- (a) rough endoplasmic reticulum
  - (b) golgi apparatus
  - (c) plasma membrane
  - (d) mitochondria
13. The undefined nuclear region of prokaryotes are also known as
- (a) nucleus
  - (b) nucleolus
  - (c) nucleic acid
  - (d) nucleoid
14. The cell organelle involved in forming complex sugars from simple sugars are
- (a) endoplasmic reticulum
  - (b) ribosomes
  - (c) plastids
  - (d) golgi apparatus
15. Which out of the following is not a function of vacuole?
- (a) Storage
  - (b) Providing turgidity and rigidity to the cell
  - (c) Waste excretion
  - (d) Locomotion
16. Amoeba acquires its food through a process, termed
- (a) exocytosis
  - (b) endocytosis
  - (c) plasmolysis
  - (d) exocytosis and endocytosis both
17. Cell wall of which one of these is not made up of cellulose?
- (a) Bacteria
  - (b) *Hydrilla*
  - (c) Mango tree
  - (d) Cactus

18. Silver nitrate solution is used to study
- (a) endoplasmic reticulum
  - (b) golgi apparatus
  - (c) nucleus
  - (d) mitochondria
19. Organelle other than nucleus, containing DNA is
- (a) endoplasmic reticulum
  - (b) golgi apparatus
  - (c) mitochondria
  - (d) lysosome
20. Kitchen of the cell is
- (a) mitochondria
  - (b) endoplasmic reticulum
  - (c) chloroplast
  - (d) golgi apparatus
21. Lipid molecules in the cell are synthesized by
- (a) smooth endoplasmic reticulum
  - (b) rough endoplasmic reticulum
  - (c) golgi apparatus
  - (d) plastids
22. Cell arises from pre-existing cell was stated by
- (a) Haeckel
  - (b) Virchow
  - (c) Hooke
  - (d) Schleiden
23. Cell theory was given by
- (a) Schleiden and Schwann
  - (b) Virchow
  - (c) Hooke
  - (d) Haeckel
24. The only cell organelle seen in prokaryotic cell is
- (a) mitochondria
  - (b) ribosomes
  - (c) plastids
  - (d) lysosomes
25. Organelle without a cell membrane is
- (a) ribosome
  - (b) golgi apparatus
  - (c) chloroplast
  - (d) nucleus

- 26.** 1  $\mu\text{m}$  is  
(a)  $10^{-6}$  m  
(b)  $10^{-9}$  m  
(c)  $10^{-10}$  m  
(d)  $10^{-3}$  m
- 27.** Lysosome arises from  
(a) endoplasmic reticulum  
(b) golgi apparatus  
(c) nucleus  
(d) mitochondria
- 28.** Living cells were discovered by  
(a) Robert Hooke  
(b) Purkinje  
(c) Leeuwenhoek  
(d) Robert Brown
- 29.** Select the odd one out  
(a) The movement of water across a semi permeable membrane is affected by the amount of substances dissolved in it.  
(b) Membranes are made of organic molecules like proteins and lipids  
(c) Molecules soluble in organic solvents can easily pass through the membrane.  
(d) Plasma membranes contain chitin sugar in plants

### Short Answer Questions

- 30.** Why are lysosomes known as 'suicide-bags' of a cell?
- 31.** Do you agree that "A cell is a building unit of an organism". If yes, explain why?
- 32.** Why does the skin of your finger shrink when you wash clothes for a long time?
- 33.** Why is endocytosis found in animals only?
- 34.** A person takes concentrated solution of salt, after sometime, he starts vomiting. What is the phenomenon responsible for such situation? Explain.
- 35.** Name any cell organelle which is non membranous.
- 36.** We eat food composed of all the nutrients like carbohydrates, proteins, fats, vitamins, minerals and water. After digestion, these are absorbed in the form of glucose, aminoacids, fatty acids, glycerol etc.  
What mechanisms are involved in absorption of digested food and water?

37. If you are provided with some vegetables to cook. You generally add salt into the vegetables during cooking process. After adding salt, vegetables release water. What mechanism is responsible for this?
38. If cells of onion peel and RBC are separately kept in hypotonic solution, what among the following will take place? Explain the reason for your answer.
- Both the cells will swell.
  - RBC will burst easily while cells of onion peel will resist the bursting to some extent.
  - a and b both are correct.
  - RBC and onion peel cells will behave similarly.
39. Bacteria do not have chloroplast but some bacteria are photoautotrophic in nature and perform photosynthesis. Which part of bacterial cell performs this?
40. Match the following **A** and **B**
- | <b>(A)</b>                           | <b>(B)</b>          |
|--------------------------------------|---------------------|
| (a) Smooth endoplasmic reticulum     | (i) <i>Amoeba</i>   |
| (b) Lysosome                         | (ii) Nucleus        |
| (c) Nucleoid                         | (iii) Bacteria      |
| (d) Food vacuoles                    | (iv) Detoxification |
| (e) Chromatin material and nucleolus | (v) Suicidal bag    |
41. Write the name of different plant parts in which chromoplast, chloroplast and leucoplast are present.
42. Name the organelles which show the analogy written as under
- Transporting channels of the cell—
  - Power house of the cell—
  - Packaging and dispatching unit of the cell—
  - Digestive bag of the cell—
  - Storage sacs of the cell—
  - Kitchen of the cell—
  - Control room of the cell—
43. How is a bacterial cell different from an onion peel cell?
44. How do substances like carbon dioxide ( $\text{CO}_2$ ) and water ( $\text{H}_2\text{O}$ ) move in and out of the cell?
45. How does amoeba obtain its food?
46. Name the two organelles in a plant cell that contain their own genetic material and ribosomes.
47. Why are lysosomes also known as “scavengers of the cells”?
48. Which cell organelle controls most of the activities of the cell?



49. Which kind of plastid is more common in  
(a) roots of the plant  
(b) leaves of the plant  
(c) flowers and fruits
50. Why do plant cells possess large sized vacuole?
51. How are chromatin, chromatid and chromosomes related to each other?
52. What are the consequences of the following conditions?  
(a) A cell containing higher water concentration than the surrounding medium  
(b) A cell having low water concentration than the surrounding medium.  
(c) A cell having equal water concentration to its surrounding medium.

### Long Answer Questions

53. Draw a plant cell and label the parts which  
(a) determines the function and development of the cell  
(b) packages materials coming from the endoplasmic reticulum  
(c) provides resistance to microbes to withstand hypotonic external media without bursting  
(d) is site for many biochemical reactions necessary to sustain life.  
(e) is a fluid contained inside the nucleus
54. Illustrate only a plant cell as seen under electron microscope. How is it different from animal cell?
55. Draw a neat labelled diagram of an animal cell.
56. Draw a well labelled diagram of an eukaryotic nucleus. How is it different from nucleoid?
57. Differentiate between rough and smooth endoplasmic reticulum. How is endoplasmic reticulum important for membrane biogenesis?
58. In brief state what happens when  
(a) dry apricots are left for sometime in pure water and later transferred to sugar solution?  
(b) a Red Blood Cell is kept in concentrated saline solution?  
(c) the Plasma-membrane of a cell breaks down?  
(d) rheo leaves are boiled in water first and then a drop of sugar syrup is put on it?  
(e) golgi apparatus is removed from the cell?
59. Draw a neat diagram of plant cell and label any three parts which differentiate it from animal cell.

# Chapter 6

## TISSUES

### Multiple Choice Questions

1. Which of the following tissues has dead cells?
  - (a) Parenchyma
  - (b) Sclerenchyma
  - (c) Collenchyma
  - (d) Epithelial tissue
2. Find out incorrect sentence
  - (a) Parenchymatous tissues have intercellular spaces
  - (b) Collenchymatous tissues are irregularly thickened at corners
  - (c) Apical and intercalary meristems are permanent tissues
  - (d) Meristematic tissues, in its early stage, lack vacuoles
3. Girth of stem increases due to
  - (a) apical meristem
  - (b) lateral meristem
  - (c) intercalary meristem
  - (d) vertical meristem
4. Which cell does not have perforated cell wall?
  - (a) Tracheids
  - (b) Companion cells
  - (c) Sieve tubes
  - (d) Vessels
5. Intestine absorb the digested food materials. What type of epithelial cells are responsible for that?
  - (a) Stratified squamous epithelium
  - (b) Columnar epithelium
  - (c) Spindle fibres
  - (d) Cuboidal epithelium
6. A person met with an accident in which two long bones of hand were dislocated. Which among the following may be the possible reason?
  - (a) Tendon break
  - (b) Break of skeletal muscle
  - (c) Ligament break
  - (d) Areolar tissue break

7. While doing work and running, you move your organs like hands, legs etc. Which among the following is correct?
- (a) Smooth muscles contract and pull the ligament to move the bones
  - (b) Smooth muscles contract and pull the tendons to move the bones
  - (c) Skeletal muscles contract and pull the ligament to move the bones
  - (d) Skeletal muscles contract and pull the tendon to move the bones
8. Which muscles act involuntarily?
- (i) Striated muscles
  - (ii) Smooth muscles
  - (iii) Cardiac muscles
  - (iv) Skeletal muscles
- (a) (i) and (ii)
  - (b) (ii) and (iii)
  - (c) (iii) and (iv)
  - (d) (i) and (iv)
9. Meristematic tissues in plants are
- (a) localised and permanent
  - (b) not limited to certain regions
  - (c) localised and dividing cells
  - (d) growing in volume
10. Which is *not* a function of epidermis?
- (a) Protection from adverse condition
  - (b) Gaseous exchange
  - (c) Conduction of water
  - (d) Transpiration
11. Select the incorrect sentence
- (a) Blood has matrix containing proteins, salts and hormones
  - (b) Two bones are connected with ligament
  - (c) Tendons are non-fibrous tissue and fragile
  - (d) Cartilage is a form of connective tissue
12. Cartilage is not found in
- (a) nose
  - (b) ear
  - (c) kidney
  - (d) larynx

13. Fats are stored in human body as
- (a) cuboidal epithelium
  - (b) adipose tissue
  - (c) bones
  - (d) cartilage
14. Bone matrix is rich in
- (a) fluoride and calcium
  - (b) calcium and phosphorus
  - (c) calcium and potassium
  - (d) phosphorus and potassium
15. Contractile proteins are found in
- (a) bones
  - (b) blood
  - (c) muscles
  - (d) cartilage
16. Voluntary muscles are found in
- (a) alimentary canal
  - (b) limbs
  - (c) iris of the eye
  - (d) bronchi of lungs
17. Nervous tissue is not found in
- (a) brain
  - (b) spinal cord
  - (c) tendons
  - (d) nerves
18. Nerve cell does not contain
- (a) axon
  - (b) nerve endings
  - (c) tendons
  - (d) dendrites
19. Which of the following helps in repair of tissue and fills up the space inside the organ?
- (a) Tendon
  - (b) Adipose tissue
  - (c) Areolar
  - (d) Cartilage

20. The muscular tissue which function throughout the life continuously without fatigue is
- (a) skeletal muscle
  - (b) cardiac muscle
  - (c) smooth muscle
  - (d) voluntary muscle
21. Which of the following cells is found in the cartilaginous tissue of the body?
- (a) Mast cells
  - (b) Basophils
  - (c) Osteocytes
  - (d) Chondrocytes
22. The dead element present in the phloem is
- (a) companion cells
  - (b) phloem fibres
  - (c) phloem parenchyma
  - (d) sieve tubes
23. Which of the following does not lose their nucleus at maturity?
- (a) Companion cells
  - (b) Red blood cells
  - (c) Vessel
  - (d) Sieve tube cells
24. In desert plants, rate of water loss gets reduced due to the presence of
- (a) cuticle
  - (b) stomata
  - (c) lignin
  - (d) suberin
25. A long tree has several branches. The tissue that helps in the side ways conduction of water in the branches is
- (a) collenchyma
  - (b) xylem parenchyma
  - (c) parenchyma
  - (d) xylem vessels
26. If the tip of sugarcane plant is removed from the field, even then it keeps on growing in length. It is due to the presence of
- (a) cambium
  - (b) apical meristem
  - (c) lateral meristem
  - (d) intercalary meristem

27. A nail is inserted in the trunk of a tree at a height of 1 metre from the ground level. After 3 years the nail will
- (a) move downwards
  - (b) move upwards
  - (c) remain at the same position
  - (d) move sideways
28. Parenchyma cells are
- (a) relatively unspecified and thin walled
  - (b) thick walled and specialised
  - (c) lignified
  - (d) none of these
29. Flexibility in plants is due to
- (a) collenchyma
  - (b) sclerenchyma
  - (c) parenchyma
  - (d) chlorenchyma
30. Cork cells are made impervious to water and gases by the presence of
- (a) cellulose
  - (b) lipids
  - (c) suberin
  - (d) lignin
31. Survival of plants in terrestrial environment has been made possible by the presence of
- (a) intercalary meristem
  - (b) conducting tissue
  - (c) apical meristem
  - (d) parenchymatous tissue
32. Choose the wrong statement
- (a) The nature of matrix differs according to the function of the tissue
  - (b) Fats are stored below the skin and in between the internal organs
  - (c) Epithelial tissues have intercellular spaces between them
  - (d) Cells of striated muscles are multinucleate and unbranched

- 33.** The water conducting tissue generally present in gymnosperm is
- (a) vessels
  - (b) sieve tube
  - (c) tracheids
  - (d) xylem fibres

### Short Answer Questions

- 34.** Animals of colder regions and fishes of cold water have thicker layer of subcutaneous fat. Describe why?

- 35.** Match the column **(A)** with the column **(B)**

<b>(A)</b>	<b>(B)</b>
(a) Fluid connective tissue	(i) Subcutaneous layer
(b) Filling of space inside the organs	(ii) Cartilage
(c) Striated muscle	(iii) Skeletal muscle
(d) Adipose tissue	(iv) Areolar tissue
(e) Surface of joints	(v) Blood
(f) Stratified squamous epithelium	(vi) Skin

- 36.** Match the column **(A)** with the column **(B)**

<b>(A)</b>	<b>(B)</b>
(a) Parenchyma	(i) Thin walled, packing cells
(b) Photosynthesis	(ii) Carbon fixation
(c) Aerenchyma	(iii) Localized thickenings
(d) Collenchyma	(iv) Buoyancy
(e) Permanent tissue	(v) Sclerenchyma

- 37.** If a potted plant is covered with a glass jar, water vapours appear on the wall of glass jar. Explain why?

- 38.** Name the different components of xylem and draw a living component?

- 39.** Draw and identify different elements of phloem.

40. Write true (T) or false (F)
- (a) Epithelial tissue is protective tissue in animal body.
  - (b) The lining of blood vessels, lung alveoli and kidney tubules are all made up of epithelial tissue.
  - (c) Epithelial cells have a lot of intercellular spaces.
  - (d) Epithelial layer is permeable layer.
  - (e) Epithelial layer does not allow regulation of materials between body and external environment.
41. Differentiate between voluntary and involuntary muscles. Give one example of each type.
42. Differentiate the following activities on the basis of voluntary (V) or involuntary (I V) muscles.
- (a) Jumping of frog
  - (b) Pumping of the heart
  - (c) Writing with hand
  - (d) Movement of chocolate in your intestine
43. Fill in the blanks
- (a) Lining of blood vessels is made up of——.
  - (b) Lining of small intestine is made up of——.
  - (c) Lining of kidney tubules is made up of——.
  - (d) Epithelial cells with cilia are found in——of our body.
44. Water hyacinth float on water surface. Explain.
45. Which structure protects the plant body against the invasion of parasites?
46. Fill in the blanks
- (a) Cork cells possesses——on their walls that makes it impervious to gases and water.
  - (b) —— have tubular cells with perforated walls and are living in nature.
  - (c) Bone possesses a hard matrix composed of——and ——.
47. Why is epidermis important for the plants?



**48.** Fill in the blanks

- (a) \_\_\_\_\_are forms of complex tissue.
- (b) \_\_\_\_\_have guard cells.
- (c) Cells of cork contain a chemical called\_\_\_\_\_
- (d) Husk of coconut is made of \_\_\_\_\_tissue.
- (e) \_\_\_\_\_gives flexibility in plants.
- (f) \_\_\_\_\_and\_\_\_\_\_are both conducting tissues.
- (g) Xylem transports\_\_\_\_\_and\_\_\_\_\_from soil.
- (h) Phloem transport\_\_\_\_\_from\_\_\_\_\_to other parts of the plant.

### Long Answer Questions

- 49.** Differentiate between sclerenchyma and parenchyma tissues. Draw well labelled diagram.
- 50.** Describe the structure and function of different types of epithelial tissues. Draw diagram of each type of epithelial tissue.
- 51.** Draw well labelled diagrams of various types of muscles found in human body.
- 52.** Give reasons for
  - (a) Meristematic cells have a prominent nucleus and dense cytoplasm but they lack vacuole.
  - (b) Intercellular spaces are absent in sclerenchymatous tissues.
  - (c) We get a crunchy and granular feeling, when we chew pear fruit.
  - (d) Branches of a tree move and bend freely in high wind velocity.
  - (e) It is difficult to pull out the husk of a coconut tree.
- 53.** List the characteristics of cork. How are they formed? Mention their role.
- 54.** Why are xylem and phloem called complex tissues? How are they different from one other?
- 55.** (a) Differentiate between meristematic and permanent tissues in plants  
(b) Define the process of differentiation  
(c) Name any two simple and two complex permanent tissues in plants.

# Chapter 7

## DIVERSITY IN LIVING ORGANISMS

### Multiple Choice Questions

1. Find out incorrect sentence
  - (a) Protista includes unicellular eukaryotic organisms
  - (b) Whittaker considered cell structure, mode and source of nutrition for classifying the organisms in five kingdoms
  - (c) Both Monera and Protista may be autotrophic and heterotrophic
  - (d) Monerans have well defined nucleus
2. Which among the following has specialised tissue for conduction of water?
  - (i) Thallophyta
  - (ii) Bryophyta
  - (iii) Pteridophyta
  - (iv) Gymnosperms
  - (a) (i) and (ii)
  - (b) (ii) and (iii)
  - (c) (iii) and (iv)
  - (d) (i) and (iv)
3. Which among the following produce seeds?
  - (a) Thallophyta
  - (b) Bryophyta
  - (c) Pteridophyta
  - (d) Gymnosperms
4. Which one is a true fish?
  - (a) Jellyfish
  - (b) Starfish
  - (c) Dogfish
  - (d) Silverfish
5. Which among the following is exclusively marine?
  - (a) Porifera
  - (b) Echinodermata
  - (c) Mollusca
  - (d) Pisces

6. Which among the following have open circulatory system?  
(i) Arthropoda  
(ii) Mollusca  
(iii) Annelida  
(iv) Coelenterata  
(a) (i) and (ii)  
(b) (iii) and (iv)  
(c) (i) and (iii)  
(d) (ii) and (iv)
7. In which group of animals, coelom is filled with blood?  
(a) Arthropoda  
(b) Annelida  
(c) Nematoda  
(d) Echinodermata
8. Elephantiasis is caused by  
(a) Wuchereria  
(b) Pinworm  
(c) Planarians  
(d) Liver flukes
9. Which one is the most striking or (common) character of the vertebrates?  
(a) Presence of notochord  
(b) Presence of triploblastic condition  
(c) Presence of gill pouches  
(d) Presence of coelom
10. Which among the following have scales?  
(i) Amphibians  
(ii) Pisces  
(iii) Reptiles  
(iv) Mammals  
(a) (i) and (iii)  
(b) (iii) and (iv)  
(c) (ii) and (iii)  
(d) (i) and (ii)
11. Find out the false statement  
(a) Aves are warm blooded, egg laying and have four chambered heart  
(b) Aves have feather covered body, fore limbs are modified as wing and breathe through lungs  
(c) Most of the mammals are viviparous  
(d) Fishes, amphibians and reptiles are oviparous

12. Pteridophyta do not have
- (a) root
  - (b) stem
  - (c) flowers
  - (d) leaves
13. Identify a member of porifera
- (a) *Spongilla*
  - (b) *Euglena*
  - (c) *Penicillium*
  - (d) *Hydra*
14. Which is not an aquatic animal?
- (a) Hydra
  - (b) Jelly fish
  - (c) Corals
  - (d) Filaria
15. Amphibians do not have the following
- (a) Three chambered heart
  - (b) Gills or lungs
  - (c) Scales
  - (d) Mucus glands
16. Organisms without nucleus and cell organelles belong to
- (i) fungi
  - (ii) protista
  - (iii) cyano bacteria
  - (iv) archae bacteria
- (a) (i) and (ii)
  - (b) (iii) and (iv)
  - (c) (i) and (iv)
  - (d) (ii) and (iii)
17. Which of the following is not a criterion for classification of living organisms?
- (a) Body design of the organism
  - (b) Ability to produce one's own food
  - (c) Membrane bound nucleus and cell organelles
  - (d) Height of the plant
18. The feature that is not a characteristic of protochordata?
- (a) Presence of notochord
  - (b) Bilateral symmetry and coelom
  - (c) Jointed legs
  - (d) Presence of circulatory system

19. The locomotory organs of Echinodermata are  
(a) tube feet  
(b) muscular feet  
(c) jointed legs  
(d) parapodia
20. Corals are  
(a) Poriferans attached to some solid support  
(b) Cnidarians, that are solitary living  
(c) Poriferans present at the sea bed  
(d) Cnidarians that live in colonies
21. Who introduced the system of scientific nomenclature of organisms  
(a) Robert Whittaker  
(b) Carolus Linnaeus  
(c) Robert Hooke  
(d) Ernst Haeckel
22. Two chambered heart occurs in  
(a) crocodiles  
(b) fish  
(c) aves  
(d) amphibians
23. Skeleton is made entirely of cartilage in  
(a) Sharks  
(b) Tuna  
(c) Rohu  
(d) None of these
24. One of the following is not an Annelid  
(a) Nereis  
(b) Earthworm  
(c) Leech  
(d) Urchins
25. The book Systema Naturae was written by  
(a) Linnaeus  
(b) Haeckel  
(c) Whittaker  
(d) Robert Brown
26. Karl Von Linne was involved with which branch of science?  
(a) Morphology  
(b) Taxonomy  
(c) Physiology  
(d) Medicine

27. Real organs are absent in  
(a) Mollusca  
(b) Coelenterata  
(c) Arthropoda  
(d) Echinodermata
28. Hard calcium carbonate structures are used as skeleton by  
(a) Echinodermata  
(b) Protochordata  
(c) Arthropoda  
(d) Nematoda
29. Differentiation in segmental fashion occurs in  
(a) Leech  
(b) Starfish  
(c) Snails  
(d) Ascaris
30. In taxonomic hierarchy family comes between  
(a) Class and Order  
(b) Order and Genus  
(c) Genus and Species  
(d) Division and Class
31. 5-Kingdom classification has given by  
(a) Morgan  
(b) R. Whittaker  
(c) Linnaeus  
(d) Haeckel
32. Well defined nucleus is absent in  
(a) blue green algae  
(b) diatoms  
(c) algae  
(d) yeast
33. The 'Origin of Species' is written by  
(a) Linnaeus  
(b) Darwin  
(c) Hackel  
(d) Whittaker

34. Meena and Hari observed an animal in their garden. Hari called it an insect while Meena said it was an earthworm. Choose the character from the following which confirms that it is an insect.
- (a) Bilateral symmetrical body
  - (b) Body with jointed legs
  - (c) Cylindrical body
  - (d) Body with little segmentation

### Short Answer Questions

35. Write true (T) or false (F)
- (a) Whittaker proposed five kingdom classification.
  - (b) Monera is divided into Archaeobacteria and Eubacteria.
  - (c) Starting from Class, Species comes before the Genus.
  - (d) *Anabaena* belongs to the kingdom Monera.
  - (e) Blue green algae belongs to the kingdom Protista.
  - (f) All prokaryotes are classified under Monera.
36. Fill in the blanks
- (a) Fungi shows——mode of nutrition.
  - (b) Cell wall of fungi is made up of ——.
  - (c) Association between blue green algae and fungi is called as——.
  - (d) Chemical nature of chitin is ——.
  - (e) ——has smallest number of organisms with maximum number of similar characters
  - (f) Plants without well differentiated stem, root and leaf are kept in ——.
  - (g) ——are called as amphibians of the plant kingdom.
37. You are provided with the seeds of gram, wheat, rice, pumpkin, maize and pea. Classify them whether they are monocot or dicot.
38. Match items of column (A) with items of column (B)
- | (A)                    | (B)                |
|------------------------|--------------------|
| (a) Naked seed         | (A) Angiosperms    |
| (b) Covered seed       | (B) Gymnosperms    |
| (c) Flagella           | (C) Bryophytes     |
| (d) <i>Marchantia</i>  | (D) <i>Euglena</i> |
| (e) <i>Marsilea</i>    | (E) Thallophyta    |
| (f) <i>Cladophora</i>  | (F) Pteridophyta   |
| (g) <i>Penicillium</i> | (G) Fungi          |

39. Match items of column (A) with items of column (B)

(A)

(B)

- |                            |                   |
|----------------------------|-------------------|
| (a) Pore bearing animals   | (A) Arthropoda    |
| (b) Diploblastic           | (B) Coelenterata  |
| (c) Metameric segmentation | (C) Porifera      |
| (d) Jointed legs           | (D) Echinodermata |
| (e) Soft bodied animals    | (E) Mollusca      |
| (f) Spiny skinned animals  | (F) Annelida      |

40. Classify the following organisms based on the absence/presence of true coelom (i.e., acoelomate, pseudocoelomate and coelomate)

- |                     |                  |                 |             |
|---------------------|------------------|-----------------|-------------|
| <i>Spongilla</i> ,  | Sea anemone,     | Planaria,       | Liver fluke |
| <i>Wuchereria</i> , | <i>Ascaris</i> , | <i>Nereis</i> , | Earthworm,  |
| Scorpion,           | Birds,           | Fishes,         | Horse.      |

41. Endoskeleton of fishes are made up of cartilage and bone; classify the following fishes as cartilagenous or bony

- |          |              |            |
|----------|--------------|------------|
| Torpedo, | Sting ray,   | Dog fish,  |
| Rohu,    | Angler fish, | Exocoetus. |

42. Classify the following based on number of chambers in their heart.

- Rohu, *Scoliodon*, Frog, Salamander, Flying lizard, King Cobra,  
Crocodile, Ostrich, Pigeon, Bat, Whale

43. Classify Rohu, *Scoliodon*, Flying lizard, King Cobra, Frog, Salamander, Ostrich, Pigeon, Bat, Crocodile and Whale into the cold blooded/warm blooded animals.

44. Name two egg laying mammals.

45. Fill in the blanks

- Five kingdom classification of living organisms is given by \_\_\_\_\_.
- Basic smallest unit of classification is \_\_\_\_\_.
- Prokaryotes are grouped in Kingdom \_\_\_\_\_.
- Paramecium* is a protista because of its \_\_\_\_\_.
- Fungi do not contain \_\_\_\_\_.
- A fungus \_\_\_\_\_ can be seen without microscope.
- Common fungi used in preparing the bread is \_\_\_\_\_.
- Algae and fungi form symbiotic association called \_\_\_\_\_.

46. Give True (T) and False (F)

- Gymnosperms differ from Angiosperms in having covered seed.
- Non flowering plants are called Cryptogamae.
- Bryophytes have conducting tissue.
- Funaria* is a moss.
- Compound leaves are found in many ferns.
- Seeds contain embryo.



47. Give examples for the following
- Bilateral, dorsiventral symmetry is found in——.
  - Worms causing disease elephantiasis is——.
  - Open circulatory system is found in——where coelomic cavity is filled with blood.
  - are known to have pseudocoelom.
48. Label a,b,c and d. given in Fig. 7.1 Give the function of (b)

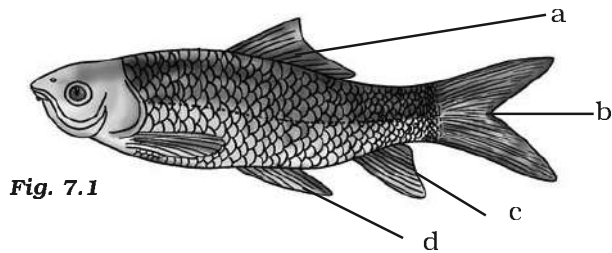


Fig. 7.1

49. Fill in the boxes given in Fig. 7.2 with appropriate characteristics/plant group (s)

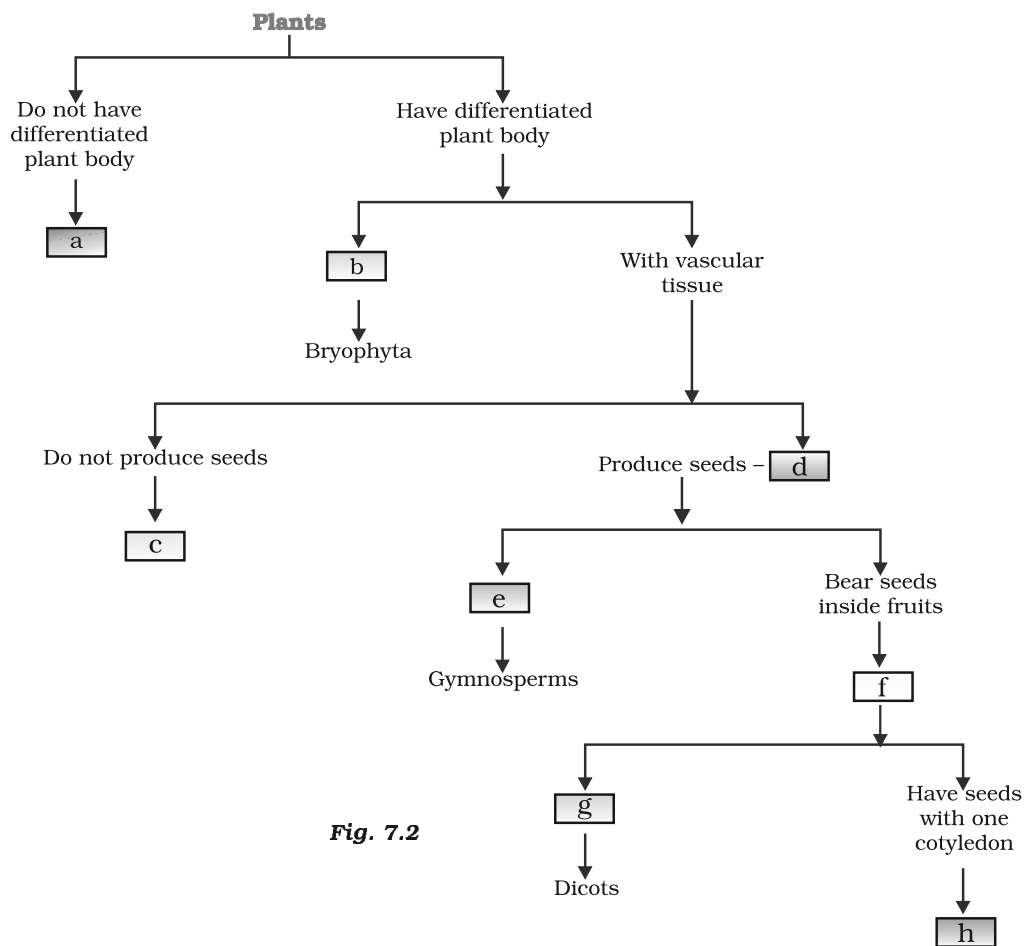


Fig. 7.2

## Long Answer Questions

50. Write names of few thallophytes. Draw a labelled diagram of *Spirogyra*.
51. Thallophyta, bryophyta and pteridophyta are called as 'Cryptogams'. Gymnosperms and Angiosperms are called as 'phanerogams'. Discuss why? Draw one example of Gymnosperm.
52. Define the terms and give one example of each
  - (a) Bilateral symmetry
  - (b) Coelom
  - (c) Triploblastic
53. You are given leech, *Nereis*, *Scolopendra*, prawn and scorpion; and all have segmented body organisation. Will you classify them in one group? If no, give the important characters based on which you will separate these organisms into different groups.
54. Which organism is more complex and evolved among Bacteria, Mushroom and Mango tree. Give reasons.
55. Differentiate between flying lizard and bird. Draw the diagram.
56. List out some common features in cat, rat and bat.
57. Why do we keep both snake and turtle in the same class?

# Chapter 8

## MOTION

### Multiple Choice Questions

1. A particle is moving in a circular path of radius  $r$ . The displacement after half a circle would be:
  - (a) Zero
  - (b)  $\pi r$
  - (c)  $2r$
  - (d)  $2\pi r$
2. A body is thrown vertically upward with velocity  $u$ , the greatest height  $h$  to which it will rise is,
  - (a)  $u/g$
  - (b)  $u^2/2g$
  - (c)  $u^2/g$
  - (d)  $u/2g$
3. The numerical ratio of displacement to distance for a moving object is
  - (a) always less than 1
  - (b) always equal to 1
  - (c) always more than 1
  - (d) equal or less than 1
4. If the displacement of an object is proportional to square of time, then the object moves with
  - (a) uniform velocity
  - (b) uniform acceleration
  - (c) increasing acceleration
  - (d) decreasing acceleration
5. From the given  $v-t$  graph (Fig. 8.1), it can be inferred that the object is
  - (a) in uniform motion
  - (b) at rest
  - (c) in non-uniform motion
  - (d) moving with uniform acceleration

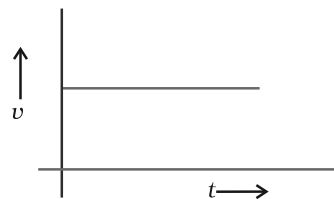
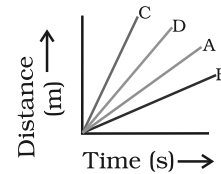


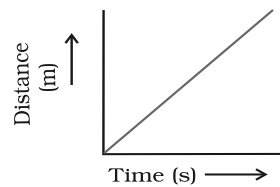
Fig. 8.1

6. Suppose a boy is enjoying a ride on a *merry-go-round* which is moving with a constant speed of  $10 \text{ m s}^{-1}$ . It implies that the boy is
- at rest
  - moving with no acceleration
  - in accelerated motion
  - moving with uniform velocity
7. Area under  $a - v - t$  graph represents a physical quantity which has the unit
- $\text{m}^2$
  - $\text{m}$
  - $\text{m}^3$
  - $\text{m s}^{-1}$
8. Four cars A, B, C and D are moving on a levelled road. Their distance versus time graphs are shown in Fig. 8.2. Choose the correct statement
- Car A is faster than car D.
  - Car B is the slowest.
  - Car D is faster than car C.
  - Car C is the slowest.

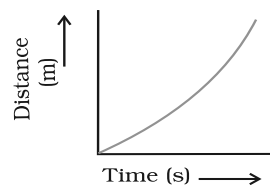


**Fig. 8.2**

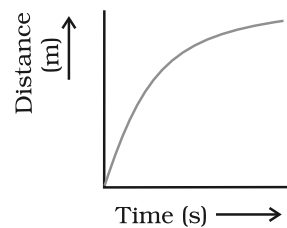
9. Which of the following figures (Fig. 8.3) represents uniform motion of a moving object correctly?



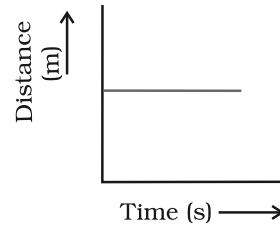
(a)



(b)



(c)



(d)

**Fig. 8.3**

10. Slope of a velocity – time graph gives
- the distance
  - the displacement
  - the acceleration
  - the speed

11. In which of the following cases of motions, the distance moved and the magnitude of displacement are equal?
- If the car is moving on straight road
  - If the car is moving in circular path
  - The pendulum is moving to and fro
  - The earth is revolving around the Sun

### Short Answer Questions

12. The displacement of a moving object in a given interval of time is zero. Would the distance travelled by the object also be zero? Justify your answer.
13. How will the equations of motion for an object moving with a uniform velocity change?
14. A girl walks along a straight path to drop a letter in the letterbox and comes back to her initial position. Her displacement–time graph is shown in Fig. 8.4. Plot a velocity–time graph for the same.

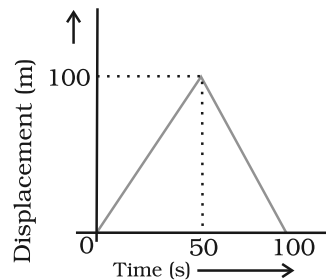


Fig. 8.4

15. A car starts from rest and moves along the  $x$ -axis with constant acceleration  $5 \text{ m s}^{-2}$  for 8 seconds. If it then continues with constant velocity, what distance will the car cover in 12 seconds since it started from the rest?
16. A motorcyclist drives from A to B with a uniform speed of  $30 \text{ km h}^{-1}$  and returns back with a speed of  $20 \text{ km h}^{-1}$ . Find its average speed.
17. The velocity-time graph (Fig. 8.5) shows the motion of a cyclist. Find (i) its acceleration (ii) its velocity and (iii) the distance covered by the cyclist in 15 seconds.

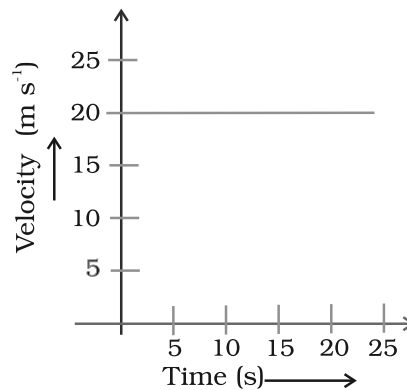


Fig. 8.5

18. Draw a velocity versus time graph of a stone thrown vertically upwards and then coming downwards after attaining the maximum height.

### Long Answer Questions

19. An object is dropped from rest at a height of 150 m and simultaneously another object is dropped from rest at a height 100 m. What is the difference in their heights after 2 s if both the objects drop with same accelerations? How does the difference in heights vary with time?
20. An object starting from rest travels 20 m in first 2 s and 160 m in next 4 s. What will be the velocity after 7 s from the start.
21. Using following data, draw time - displacement graph for a moving object:

Time (s)	0	2	4	6	8	10	12	14	16
Displacement (m)	0	2	4	4	4	6	4	2	0

Use this graph to find average velocity for first 4 s, for next 4 s and for last 6 s.

22. An electron moving with a velocity of  $5 \times 10^4 \text{ m s}^{-1}$  enters into a uniform electric field and acquires a uniform acceleration of  $10^4 \text{ m s}^{-2}$  in the direction of its initial motion.
- (i) Calculate the time in which the electron would acquire a velocity double of its initial velocity.
- (ii) How much distance the electron would cover in this time?
23. Obtain a relation for the distance travelled by an object moving with a uniform acceleration in the interval between 4<sup>th</sup> and 5<sup>th</sup> seconds.
24. Two stones are thrown vertically upwards simultaneously with their initial velocities  $u_1$  and  $u_2$  respectively. Prove that the heights reached by them would be in the ratio of  $u_1^2 : u_2^2$  ( Assume upward acceleration is  $-g$  and downward acceleration to be  $+g$ ).

# Chapter 9

## FORCE AND LAWS OF MOTION

### Multiple Choice Questions

1. Which of the following statement is **not** correct for an object moving along a straight path in an accelerated motion?
  - (a) Its speed keeps changing
  - (b) Its velocity always changes
  - (c) It always goes away from the earth
  - (d) A force is always acting on it
2. According to the third law of motion, action and reaction
  - (a) always act on the same body
  - (b) always act on different bodies in opposite directions
  - (c) have same magnitude and directions
  - (d) act on either body at normal to each other
3. A goalkeeper in a game of football pulls his hands backwards after holding the ball shot at the goal. This enables the goal keeper to
  - (a) exert larger force on the ball
  - (b) reduce the force exerted by the ball on hands
  - (c) increase the rate of change of momentum
  - (d) decrease the rate of change of momentum
4. The inertia of an object tends to cause the object
  - (a) to increase its speed
  - (b) to decrease its speed
  - (c) to resist any change in its state of motion
  - (d) to decelerate due to friction
5. A passenger in a moving train tosses a coin which falls behind him. It means that motion of the train is
  - (a) accelerated
  - (b) uniform
  - (c) retarded
  - (d) along circular tracks

5. An object of mass 2 kg is sliding with a constant velocity of  $4 \text{ m s}^{-1}$  on a frictionless horizontal table. The force required to keep the object moving with the same velocity is
- (a) 32 N
  - (b) 0 N
  - (c) 2 N
  - (d) 8 N
7. Rocket works on the principle of conservation of
- (a) mass
  - (b) energy
  - (c) momentum
  - (d) velocity
8. A water tanker filled up to  $\frac{2}{3}$  of its height is moving with a uniform speed. On sudden application of the brake, the water in the tank would
- (a) move backward
  - (b) move forward
  - (c) be unaffected
  - (d) rise upwards

### Short Answer Questions

9. There are three solids made up of aluminium, steel and wood, of the same shape and same volume. Which of them would have highest inertia?
10. Two balls of the same size but of different materials, rubber and iron are kept on the smooth floor of a moving train. The brakes are applied suddenly to stop the train. Will the balls start rolling? If so, in which direction? Will they move with the same speed? Give reasons for your answer.
11. Two identical bullets are fired one by a light rifle and another by a heavy rifle with the same force. Which rifle will hurt the shoulder more and why?
12. A horse continues to apply a force in order to move a cart with a constant speed. Explain why?
13. Suppose a ball of mass  $m$  is thrown vertically upward with an initial speed  $v$ , its speed decreases continuously till it becomes zero. Thereafter, the ball begins to fall downward and attains the speed  $v$  again before striking the ground. It implies that the magnitude of initial and final momentums of the ball are same. Yet, it is not an example of conservation of momentum. Explain why ?



14. Velocity versus time graph of a ball of mass 50 g rolling on a concrete floor is shown in Fig. 9.1. Calculate the acceleration and frictional force of the floor on the ball.

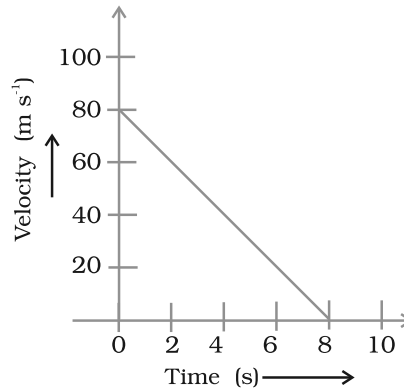


Fig. 9.1

15. A truck of mass  $M$  is moved under a force  $F$ . If the truck is then loaded with an object equal to the mass of the truck and the driving force is halved, then how does the acceleration change?
16. Two friends on roller-skates are standing 5 m apart facing each other. One of them throws a ball of 2 kg towards the other, who catches it. How will this activity affect the position of the two? Explain your answer.
17. Water sprinkler used for grass lawns begins to rotate as soon as the water is supplied. Explain the principle on which it works.

### Long Answer Questions

18. Using second law of motion, derive the relation between force and acceleration. A bullet of 10 g strikes a sand-bag at a speed of  $10^3$  m s<sup>-1</sup> and gets embedded after travelling 5 cm. Calculate
- the resistive force exerted by the sand on the bullet
  - the time taken by the bullet to come to rest.
19. Derive the unit of force using the second law of motion. A force of 5 N produces an acceleration of  $8$  m s<sup>-2</sup> on a mass  $m_1$  and an acceleration of  $24$  m s<sup>-2</sup> on a mass  $m_2$ . What acceleration would the same force provide if both the masses are tied together?
20. What is momentum? Write its SI unit. Interpret force in terms of momentum. Represent the following graphically
- momentum versus velocity when mass is fixed.
  - momentum versus mass when velocity is constant.

# Chapter 10

## GRAVITATION

### Multiple Choice Questions

- Two objects of different masses falling freely near the surface of moon would
  - have same velocities at any instant
  - have different accelerations
  - experience forces of same magnitude
  - undergo a change in their inertia
- The value of acceleration due to gravity
  - is same on equator and poles
  - is least on poles
  - is least on equator
  - increases from pole to equator
- The gravitational force between two objects is  $F$ . If masses of both objects are halved without changing distance between them, then the gravitational force would become
  - $F/4$
  - $F/2$
  - $F$
  - $2F$
- A boy is whirling a stone tied with a string in an horizontal circular path. If the string breaks, the stone
  - will continue to move in the circular path
  - will move along a straight line towards the centre of the circular path
  - will move along a straight line tangential to the circular path
  - will move along a straight line perpendicular to the circular path away from the boy
- An object is put one by one in three liquids having different densities. The object floats with  $\frac{1}{9}$ ,  $\frac{2}{11}$  and  $\frac{3}{7}$  parts of their volumes outside the liquid surface in liquids of densities  $d_1$ ,  $d_2$  and  $d_3$  respectively. Which of the following statement is correct?
  - $d_1 > d_2 > d_3$
  - $d_1 > d_2 < d_3$
  - $d_1 < d_2 > d_3$
  - $d_1 < d_2 < d_3$

6. In the relation  $F = G M m/d^2$ , the quantity  $G$
- (a) depends on the value of  $g$  at the place of observation
  - (b) is used only when the earth is one of the two masses
  - (c) is greatest at the surface of the earth
  - (d) is universal constant of nature
7. Law of gravitation gives the gravitational force between
- (a) the earth and a point mass only
  - (b) the earth and Sun only
  - (c) any two bodies having some mass
  - (d) two charged bodies only
8. The value of quantity  $G$  in the law of gravitation
- (a) depends on mass of earth only
  - (b) depends on radius of earth only
  - (c) depends on both mass and radius of earth
  - (d) is independent of mass and radius of the earth
9. Two particles are placed at some distance. If the mass of each of the two particles is doubled, keeping the distance between them unchanged, the value of gravitational force between them will be
- (a)  $\frac{1}{4}$  times      (b) 4 times      (c)  $\frac{1}{2}$  times      (d) unchanged
10. The atmosphere is held to the earth by
- (a) gravity
  - (b) wind
  - (c) clouds
  - (d) earth's magnetic field
11. The force of attraction between two unit point masses separated by a unit distance is called
- (a) gravitational potential
  - (b) acceleration due to gravity
  - (c) gravitational field
  - (d) universal gravitational constant
12. The weight of an object at the centre of the earth of radius  $R$  is
- (a) zero
  - (b) infinite
  - (c)  $R$  times the weight at the surface of the earth
  - (d)  $1/R^2$  times the weight at surface of the earth

13. An object weighs 10 N in air. When immersed fully in water, it weighs only 8 N. The weight of the liquid displaced by the object will be
- (a) 2 N
  - (b) 8 N
  - (c) 10 N
  - (d) 12 N
14. A girl stands on a box having 60 cm length, 40 cm breadth and 20 cm width in three ways. In which of the following cases, pressure exerted by the brick will be
- (a) maximum when length and breadth form the base
  - (b) maximum when breadth and width form the base
  - (c) maximum when width and length form the base
  - (d) the same in all the above three cases
15. An apple falls from a tree because of gravitational attraction between the earth and apple. If  $F_1$  is the magnitude of force exerted by the earth on the apple and  $F_2$  is the magnitude of force exerted by apple on earth, then
- (a)  $F_1$  is very much greater than  $F_2$
  - (b)  $F_2$  is very much greater than  $F_1$
  - (c)  $F_1$  is only a little greater than  $F_2$
  - (d)  $F_1$  and  $F_2$  are equal

### Short Answer Questions

16. What is the source of centripetal force that a planet requires to revolve around the Sun? On what factors does that force depend?
17. On the earth, a stone is thrown from a height in a direction parallel to the earth's surface while another stone is simultaneously dropped from the same height. Which stone would reach the ground first and why?
18. Suppose gravity of earth suddenly becomes zero, then in which direction will the moon begin to move if no other celestial body affects it?
19. Identical packets are dropped from two aeroplanes, one above the equator and the other above the north pole, both at height  $h$ . Assuming all conditions are identical, will those packets take same time to reach the surface of earth. Justify your answer.
20. The weight of any person on the moon is about  $1/6$  times that on the earth. He can lift a mass of 15 kg on the earth. What will be the maximum mass, which can be lifted by the same force applied by the person on the moon?
21. Calculate the average density of the earth in terms of  $g$ ,  $G$  and  $R$ .
22. The earth is acted upon by gravitation of Sun, even though it does not fall into the Sun. Why?

## Long Answer Questions

- 23.** How does the weight of an object vary with respect to mass and radius of the earth. In a hypothetical case, if the diameter of the earth becomes half of its present value and its mass becomes four times of its present value, then how would the weight of any object on the surface of the earth be affected?
- 24.** How does the force of attraction between the two bodies depend upon their masses and distance between them? A student thought that two bricks tied together would fall faster than a single one under the action of gravity. Do you agree with his hypothesis or not? Comment.
- 25.** Two objects of masses  $m_1$  and  $m_2$  having the same size are dropped simultaneously from heights  $h_1$  and  $h_2$  respectively. Find out the ratio of time they would take in reaching the ground. Will this ratio remain the same if (i) one of the objects is hollow and the other one is solid and (ii) both of them are hollow, size remaining the same in each case. Give reason.
- 26.** (a) A cube of side 5 cm is immersed in water and then in saturated salt solution. In which case will it experience a greater buoyant force. If each side of the cube is reduced to 4 cm and then immersed in water, what will be the effect on the buoyant force experienced by the cube as compared to the first case for water. Give reason for each case.
- (b) A ball weighing 4 kg of density  $4000 \text{ kg m}^{-3}$  is completely immersed in water of density  $10^3 \text{ kg m}^{-3}$ . Find the force of buoyancy on it. (Given  $g = 10 \text{ m s}^{-2}$ .)

# Chapter 11

## WORK AND ENERGY

### Multiple Choice Questions

1. When a body falls freely towards the earth, then its total energy
  - (a) increases
  - (b) decreases
  - (c) remains constant
  - (d) first increases and then decreases
2. A car is accelerated on a levelled road and attains a velocity 4 times of its initial velocity. In this process the potential energy of the car
  - (a) does not change
  - (b) becomes twice to that of initial
  - (c) becomes 4 times that of initial
  - (d) becomes 16 times that of initial
3. In case of negative work the angle between the force and displacement is
  - (a)  $0^\circ$
  - (b)  $45^\circ$
  - (c)  $90^\circ$
  - (d)  $180^\circ$
4. An iron sphere of mass 10 kg has the same diameter as an aluminium sphere of mass is 3.5 kg. Both spheres are dropped simultaneously from a tower. When they are 10 m above the ground, they have the same
  - (a) acceleration
  - (b) momenta
  - (c) potential energy
  - (d) kinetic energy
5. A girl is carrying a school bag of 3 kg mass on her back and moves 200 m on a levelled road. The work done against the gravitational force will be ( $g = 10 \text{ m s}^{-2}$ )
  - (a)  $6 \times 10^3 \text{ J}$
  - (b) 6 J
  - (c) 0.6 J
  - (d) zero
6. Which one of the following is not the unit of energy?
  - (a) joule
  - (b) newton metre
  - (c) kilowatt
  - (d) kilowatt hour

7. The work done on an object does not depend upon the  
 (a) displacement  
 (b) force applied  
 (c) angle between force and displacement  
 (d) initial velocity of the object
8. Water stored in a dam possesses  
 (a) no energy  
 (b) electrical energy  
 (c) kinetic energy  
 (d) potential energy
9. A body is falling from a height  $h$ . After it has fallen a height  $\frac{h}{2}$ , it will possess  
 (a) only potential energy  
 (b) only kinetic energy  
 (c) half potential and half kinetic energy  
 (d) more kinetic and less potential energy

### Short Answer Questions

10. A rocket is moving up with a velocity  $v$ . If the velocity of this rocket is suddenly tripled, what will be the ratio of two kinetic energies?
11. Avinash can run with a speed of  $8 \text{ m s}^{-1}$  against the frictional force of  $10 \text{ N}$ , and Kapil can move with a speed of  $3 \text{ m s}^{-1}$  against the frictional force of  $25 \text{ N}$ . Who is more powerful and why?
12. A boy is moving on a straight road against a frictional force of  $5 \text{ N}$ . After travelling a distance of  $1.5 \text{ km}$  he forgot the correct path at a round about (Fig. 11.1) of radius  $100 \text{ m}$ . However, he moves on the circular path for one and half cycle and then he moves forward upto  $2.0 \text{ km}$ . Calculate the work done by him.

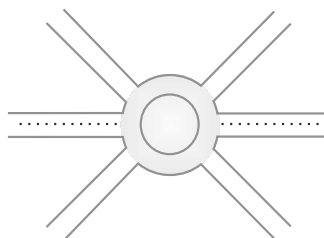


Fig. 11.1

13. Can any object have mechanical energy even if its momentum is zero? Explain.
14. Can any object have momentum even if its mechanical energy is zero? Explain.
15. The power of a motor pump is  $2 \text{ kW}$ . How much water per minute the pump can raise to a height of  $10 \text{ m}$ ? (Given  $g = 10 \text{ m s}^{-2}$ )
16. The weight of a person on a planet A is about half that on the earth. He can jump upto  $0.4 \text{ m}$  height on the surface of the earth. How high he can jump on the planet A?

17. The velocity of a body moving in a straight line is increased by applying a constant force  $F$ , for some distance in the direction of the motion. Prove that the increase in the kinetic energy of the body is equal to the work done by the force on the body.
18. Is it possible that an object is in the state of accelerated motion due to external force acting on it, but no work is being done by the force. Explain it with an example.
19. A ball is dropped from a height of 10 m. If the energy of the ball reduces by 40% after striking the ground, how much high can the ball bounce back? ( $g = 10 \text{ m s}^{-2}$ )
20. If an electric iron of 1200 W is used for 30 minutes everyday, find electric energy consumed in the month of April.

### Long Answer Questions

21. A light and a heavy object have the same momentum. Find out the ratio of their kinetic energies. Which one has a larger kinetic energy?
22. An automobile engine propels a 1000 kg car (A) along a levelled road at a speed of  $36 \text{ km h}^{-1}$ . Find the power if the opposing frictional force is 100 N. Now, suppose after travelling a distance of 200 m, this car collides with another stationary car (B) of same mass and comes to rest. Let its engine also stop at the same time. Now car (B) starts moving on the same level road without getting its engine started. Find the speed of the car (B) just after the collision.
23. A girl having mass of 35 kg sits on a trolley of mass 5 kg. The trolley is given an initial velocity of  $4 \text{ m s}^{-1}$  by applying a force. The trolley comes to rest after traversing a distance of 16 m. (a) How much work is done on the trolley? (b) How much work is done by the girl?
24. Four men lift a 250 kg box to a height of 1 m and hold it without raising or lowering it. (a) How much work is done by the men in lifting the box? (b) How much work do they do in just holding it? (c) Why do they get tired while holding it? ( $g = 10 \text{ m s}^{-2}$ )
25. What is power? How do you differentiate kilowatt from kilowatt hour? The Jog Falls in Karnataka state are nearly 20 m high. 2000 tonnes of water falls from it in a minute. Calculate the equivalent power if all this energy can be utilized? ( $g = 10 \text{ m s}^{-2}$ )
26. How is the power related to the speed at which a body can be lifted? How many kilograms will a man working at the power of 100 W, be able to lift at constant speed of  $1 \text{ m s}^{-1}$  vertically? ( $g = 10 \text{ m s}^{-2}$ )
27. Define watt. Express kilowatt in terms of joule per second. A 150 kg car engine develops 500 W for each kg. What force does it exert in moving the car at a speed of  $20 \text{ m s}^{-1}$ ?
28. Compare the power at which each of the following is moving upwards against the force of gravity? (given  $g = 10 \text{ m s}^{-2}$ )
- a butterfly of mass 1.0 g that flies upward at a rate of  $0.5 \text{ m s}^{-1}$ .
  - a 250 g squirrel climbing up on a tree at a rate of  $0.5 \text{ m s}^{-1}$ .

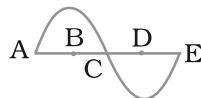


# Chapter 12

## SOUND

### Multiple Choice Questions

- Note is a sound
  - of mixture of several frequencies
  - of mixture of two frequencies only
  - of a single frequency
  - always unpleasant to listen
- A key of a mechanical piano struck gently and then struck again but much harder this time. In the second case
  - sound will be louder but pitch will not be different
  - sound will be louder and pitch will also be higher
  - sound will be louder but pitch will be lower
  - both loudness and pitch will remain unaffected
- In SONAR, we use
  - ultrasonic waves
  - infrasonic waves
  - radio waves
  - audible sound waves
- Sound travels in air if
  - particles of medium travel from one place to another
  - there is no moisture in the atmosphere
  - disturbance moves
  - both particles as well as disturbance travel from one place to another.
- When we change feeble sound to loud sound we increase its
  - frequency
  - amplitude
  - velocity
  - wavelength
- In the curve (Fig. 12. 1) half the wavelength is
  - A B
  - B D
  - D E
  - A E

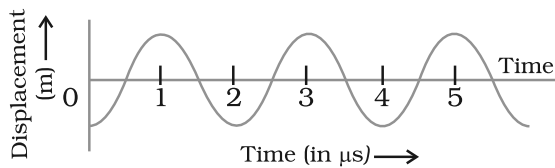


**Fig. 12.1**

7. Earthquake produces which kind of sound before the main shock wave begins
- ultrasound
  - infrasound
  - audible sound
  - none of the above
8. Infrasound can be heard by
- dog
  - bat
  - rhinoceros
  - human beings
9. Before playing the orchestra in a musical concert, a sitarist tries to adjust the tension and pluck the string suitably. By doing so, he is adjusting
- intensity of sound only
  - amplitude of sound only
  - frequency of the sitar string with the frequency of other musical instruments
  - loudness of sound

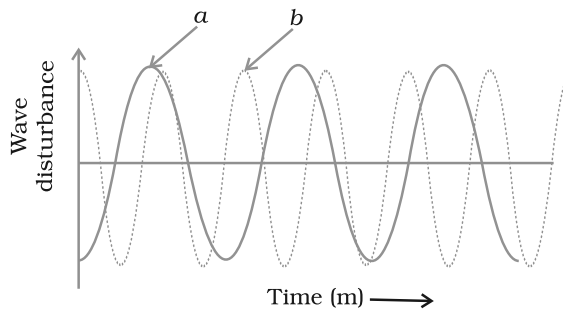
### Short Answer Question

10. The given graph (Fig. 12.2) shows the displacement versus time relation for a disturbance travelling with velocity of  $1500 \text{ m s}^{-1}$ . Calculate the wavelength of the disturbance.



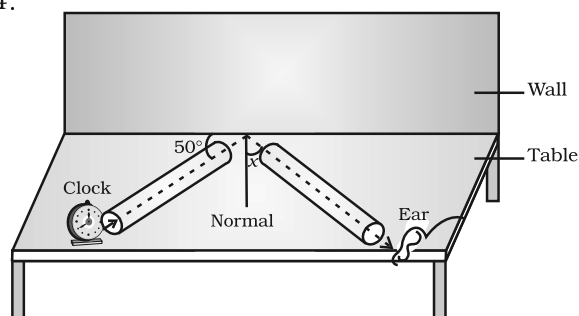
**Fig. 12.2**

11. Which of the above two graphs (a) and (b) (Fig. 12.3) representing the human voice is likely to be the male voice? Give reason for your answer.



**Fig. 12.3**

12. A girl is sitting in the middle of a park of dimension  $12\text{ m} \times 12\text{ m}$ . On the left side of it there is a building adjoining the park and on right side of the park, there is a road adjoining the park. A sound is produced on the road by a cracker. Is it possible for the girl to hear the echo of this sound? Explain your answer.
13. Why do we hear the sound produced by the humming bees while the sound of vibrations of pendulum is not heard?
14. If any explosion takes place at the bottom of a lake, what type of shock waves in water will take place?
15. Sound produced by a thunderstorm is heard 10 s after the lightning is seen. Calculate the approximate distance of the thunder cloud. (Given speed of sound =  $340\text{ m s}^{-1}$ .)
16. For hearing the loudest ticking sound heard by the ear, find the angle  $x$  in the Fig. 12.4.



**Fig. 12.4**

17. Why is the ceiling and wall behind the stage of good conference halls or concert halls made curved?

## Long Answer Questions

18. Represent graphically by two separate diagrams in each case
- Two sound waves having the same amplitude but different frequencies?
  - Two sound waves having the same frequency but different amplitudes.
  - Two sound waves having different amplitudes and also different wavelengths.
19. Establish the relationship between speed of sound, its wavelength and frequency. If velocity of sound in air is  $340\text{ m s}^{-1}$ , calculate
- wavelength when frequency is 256 Hz.
  - frequency when wavelength is 0.85 m.
20. Draw a curve showing density or pressure variations with respect to distance for a disturbance produced by sound. Mark the position of compression and rarefaction on this curve. Also define wavelengths and time period using this curve.

# Chapter 13

## WHY DO WE FALL ILL

### Multiple Choice Questions

1. Which one of the following is not a viral disease?
  - (a) Dengue
  - (b) AIDS
  - (c) Typhoid
  - (d) Influenza
2. Which one of the following is not a bacterial disease?
  - (a) Cholera
  - (b) Tuberculosis
  - (c) Anthrax
  - (d) Influenza
3. Which one of the following disease is not transmitted by mosquito?
  - (a) Brain fever
  - (b) Malaria
  - (c) Typhoid
  - (d) Dengue
4. Which one of the following disease is caused by bacteria?
  - (a) Typhoid
  - (b) Anthrax
  - (c) Tuberculosis
  - (d) Malaria
5. Which one of the following diseases is caused by protozoans?
  - (a) Malaria
  - (b) Influenza
  - (c) AIDS
  - (d) Cholera
6. Which one of the following has a long term effect on the health of an individual?
  - (a) Common cold
  - (b) Chicken pox
  - (c) Chewing tobacco
  - (d) Stress

7. Which of the following can make you ill if you come in contact with an infected person?
- (a) High blood pressure
  - (b) Genetic abnormalities
  - (c) Sneezing
  - (d) Blood cancer
8. AIDS cannot be transmitted by
- (a) sexual contact
  - (b) hugs
  - (c) breast feeding
  - (d) blood transfusion
9. Making anti-viral drugs is more difficult than making anti-bacterial medicines because
- (a) viruses make use of host machinery
  - (b) viruses are on the border line of living and non-living
  - (c) viruses have very few biochemical mechanisms of their own
  - (d) viruses have a protein coat
10. Which one of the following causes kala-azar?
- (a) *Ascaris*
  - (b) *Trypanosoma*
  - (c) *Leishmania*
  - (d) Bacteria
11. If you live in a overcrowded and poorly ventilated house, it is possible that you may suffer from which of the following diseases
- (a) Cancer
  - (b) AIDS
  - (c) Air borne diseases
  - (d) Cholera
12. Which disease is not transmitted by mosquitoes?
- (a) Dengue
  - (b) Malaria
  - (c) Brain fever or encephalitis
  - (d) Pneumonia
13. Which one of the following is not important for individual health?
- (a) Living in clean space
  - (b) Good economic condition
  - (c) Social equality and harmony
  - (d) Living in a large and well furnished house

14. Choose the wrong statement
- (a) High blood pressure is caused by excessive weight and lack of exercise.
  - (b) Cancers can be caused by genetic abnormalities
  - (c) Peptic ulcers are caused by eating acidic food
  - (d) Acne is not caused by staphylococci
15. We should not allow mosquitoes to breed in our surroundings because they
- (a) multiply very fast and cause pollution
  - (b) are vectors for many diseases
  - (c) bite and cause skin diseases
  - (d) are not important insects
16. You are aware of Polio Eradication Programme in your city. Children are vaccinated because
- (a) vaccination kills the polio causing microorganisms
  - (b) prevents the entry of polio causing organism
  - (c) it creates immunity in the body
  - (d) all the above
17. Viruses, which cause hepatitis, are transmitted through
- (a) air
  - (b) water
  - (c) food
  - (d) personal contact
18. Vectors can be defined as
- (a) animals carry the infecting agents from sick person to another healthy person
  - (b) microorganisms which cause many diseases
  - (c) infected person
  - (d) diseased plants

### Short Answer Questions

19. Give two examples for each of the following
- (a) Acute diseases
  - (b) Chronic diseases
  - (c) Infectious diseases
  - (d) Non-infectious diseases
20. Name two diseases caused by Protozoans  
What are their causal organisms?
21. Which bacterium causes peptic ulcers?  
Who discovered the above pathogen for the first time?

- 22.** What is an antibiotic? Give two examples
- 23.** Fill in the blanks
- (a) Pneumonia is an example of \_\_\_\_\_ disease.
  - (b) Many skin diseases are caused by\_\_\_\_\_.
  - (c) Antibiotics commonly block biochemical pathways important for the growth of \_\_\_\_\_.
  - (d) Living organisms carrying the infecting agents from one person to another are called \_\_\_\_\_.
- 24.** Name the target organs for the following diseases
- (a) Hepatitis targets\_\_\_\_\_.
  - (b) Fits or unconsciousness targets \_\_\_\_\_.
  - (c) Pneumonia targets \_\_\_\_\_.
  - (d) Fungal disease targets \_\_\_\_\_.
- 25.** Who discovered 'vaccine' for the first time?  
Name two diseases which can be prevented by using vaccines.
- 26.** Fill in the blanks
- (a) \_\_\_\_\_ disease continues for many days and causes \_\_\_\_\_ on body.
  - (b) \_\_\_\_\_disease continues for a few days and causes no longer term effect on body.
  - (c) \_\_\_\_\_ is defined as physical, mental and social well-being and comfort.
  - (d) Common cold is \_\_\_\_\_ disease.
  - (e) Many skin diseases are caused by\_\_\_\_\_.
- 27.** Classify the following diseases as infectious or non-infectious.
- (a) AIDS
  - (b) Tuberculosis
  - (c) Cholera
  - (d) High blood pressure
  - (e) Heart disease
  - (f) Pneumonia
  - (g) Cancer
- 28.** Name any two groups of micro-organisms from which antibiotics could be extracted.
- 29.** Name any three diseases transmitted through vectors.

## Long Answer Questions

- 30.** Explain giving reasons
  - (a) Balanced diet is necessary for maintaining healthy body.
  - (b) Health of an organism depends upon the surrounding environmental conditions.
  - (c) Our surrounding area should be free of stagnant water.
  - (d) Social harmony and good economic conditions are necessary for good health.
- 31.** What is a disease? How many types of diseases have you studied? Give examples.
- 32.** What do you mean by disease symptoms? Explain giving two examples?
- 33.** Why is immune system essential for our health?
- 34.** What precautions will you take to justify "prevention is better than cure".
- 35.** Why do some children fall ill more frequently than others living in the same locality?
- 36.** Why are antibiotics not effective for viral disease?
- 37.** Becoming exposed to or infected with an infectious microbe does not necessarily mean developing noticeable disease. Explain.
- 38.** Give any four factors necessary for a healthy person.
- 39.** Why is AIDS considered to be a 'Syndrome' and not a disease?



# Chapter 14

## NATURAL RESOURCES

### Multiple Choice Questions

1. The atmosphere of the earth is heated by radiations which are mainly
  - (a) radiated by the sun
  - (b) re-radiated by land
  - (c) re-radiated by water
  - (d) re-radiated by land and water
2. If there were no atmosphere around the earth, the temperature of the earth will
  - (a) increase
  - (b) go on decreasing
  - (c) increase during day and decrease during night
  - (d) be unaffected
3. What would happen, if all the oxygen present in the environment is converted to ozone?
  - (a) We will be protected more
  - (b) It will become poisonous and kill living forms
  - (c) Ozone is not stable, hence it will be toxic
  - (d) It will help harmful sun radiations to reach earth and damage many life forms.
4. One of the following factors does not lead to soil formation in nature
  - (a) the sun
  - (b) water
  - (c) wind
  - (d) polythene bags
5. The two forms of oxygen found in the atmosphere are
  - (a) water and ozone
  - (b) water and oxygen
  - (c) ozone and oxygen
  - (d) water and carbon-dioxide

6. The process of nitrogen-fixation by bacteria does not take place in the presence of
- (a) molecular form of hydrogen
  - (b) elemental form of oxygen
  - (c) water
  - (d) elemental form of nitrogen
7. Rainfall patterns depend on
- (a) the underground water table
  - (b) the number of water bodies in an area
  - (c) the density pattern of human population in an area
  - (d) the prevailing season in an area
8. Among the given options, which one is not correct for the use of large amount of fertilisers and pesticides?
- (a) They are eco-friendly
  - (b) They turn the fields barren after some time
  - (c) They adversely affect the useful component from the soil
  - (d) They destroy the soil fertility
9. The nitrogen molecules present in air can be converted into nitrates and nitrites by
- (a) a biological process of nitrogen fixing bacteria present in soil
  - (b) a biological process of carbon fixing factor present in soil
  - (c) any of the industries manufacturing nitrogenous compounds
  - (d) the plants used as cereal crops in field
10. One of the following processes is not a step involved in the water-cycle operating in nature
- (a) evaporation
  - (b) transpiration
  - (c) precipitation
  - (d) photosynthesis
11. The term “water-pollution” can be defined in several ways. Which of the following statements does not give the correct definition?
- (a) The addition of undesirable substances to water-bodies
  - (b) The removal of desirable substances from water-bodies
  - (c) A change in pressure of the water bodies
  - (d) A change in temperature of the water bodies
12. Which of the following is not a green house gas?
- (a) Methane
  - (b) Carbon dioxide
  - (c) Carbon monoxide
  - (d) Ammonia

13. Which step is not involved in the carbon-cycle?  
(a) Photosynthesis  
(b) Transpiration  
(c) Respiration  
(d) Burning of fossil fuels
14. 'Ozone-hole' means  
(a) a large sized hole in the ozone layer  
(b) thinning of the ozone layer  
(c) small holes scattered in the ozone layer  
(d) thickening of ozone in the ozone layer
15. Ozone-layer is getting depleted because of  
(a) excessive use of automobiles  
(b) excessive formation of industrial units  
(c) excessive use of man-made compounds containing both fluorine and chlorine  
(d) excessive deforestation.
16. Which of the following is a recently originated problem of environment?  
(a) Ozone layer depletion  
(b) Green house effect  
(c) Global warming  
(d) All of the above
17. When we breathe in air, nitrogen also goes inside along with oxygen. What is the fate of this nitrogen?  
(a) It moves along with oxygen into the cells  
(b) It comes out with the  $\text{CO}_2$  during exhalation  
(c) It is absorbed only by the nasal cells  
(d) Nitrogen concentration is already more in the cells so it is not at all absorbed.
18. Top-soil contains the following  
(a) Humus and living organisms only  
(b) Humus and soil particles only  
(c) Humus, living organisms and plants  
(d) Humus, living organisms and soil particles.
19. Choose the correct sequences  
(a)  $\text{CO}_2$  in atmosphere  $\rightarrow$  decomposers  $\rightarrow$  organic carbon in animals  $\rightarrow$  organic carbon in plants  
(b)  $\text{CO}_2$  in atmosphere  $\rightarrow$  organic carbon in plants  $\rightarrow$  organic carbon in animals  $\rightarrow$  inorganic carbon in soil  
(c) Inorganic carbonates in water  $\rightarrow$  organic carbon in plants  $\rightarrow$  organic carbon in animals  $\rightarrow$  scavengers  
(d) Organic carbon in animals  $\rightarrow$  decomposers  $\rightarrow$   $\text{CO}_2$  in atmosphere  $\rightarrow$  organic carbon in plants

20. Major source of mineral in soil is the  
(a) parent rock from which soil is formed  
(b) plants  
(c) animals  
(d) bacteria
21. Total earth's surface covered by water is  
(a) 75%  
(b) 60%  
(c) 85%  
(d) 50%
22. Biotic component of biosphere is not constituted by  
(a) producers  
(b) consumers  
(c) decomposer  
(d) air
23. An increase in carbon dioxide content in the atmosphere would not cause  
(a) more heat to be retained by the environment  
(b) increase in photosynthesis in plants  
(c) global warming  
(d) abundance of desert plants
24. Oxygen is returned to the atmosphere mainly by  
(a) burning of fossil fuel  
(b) respiration  
(c) photosynthesis  
(d) fungi
25. Low visibility during cold weather is due to  
(a) formation of fossil fuel  
(b) unburnt carbon particles or hydrocarbons suspended in air  
(c) lack of adequate power supply  
(d) none of these
26. Growth of Lichens on barren rocks is followed by the growth of  
(a) moss  
(b) ferns  
(c) gymnosperms  
(d) algae
27. Marked temperature changes in aquatic environment can affect  
(a) breeding of animals  
(b) more growth of aquatic plants  
(c) process of digestion in animals  
(d) availability of nutrients.

28. Soil erosion can be prevented by
- (a) raising forests
  - (b) deforestation
  - (c) excessive use of fertilizer
  - (d) overgrazing by animals
29. What happens when rain falls on soil without vegetational cover?
- (a) Rain water percolates in soil efficiently
  - (b) Rain water causes loss of surface soil
  - (c) Rain water leads to fertility of the soil
  - (d) Rain water does not cause any change in soil
30. Oxygen is harmful for
- (a) ferns
  - (b) nitrogen fixing bacteria
  - (c) chara
  - (d) mango tree

### Short Answer Questions

31. Rivers from land, add minerals to sea water. Discuss how?
32. How can we prevent the loss of top soil?
33. How is the life of organisms living in water affected when water gets polluted?
34. During summer, if you go near the lake, you feel relief from the heat, why?
35. In coastal area, wind current moves from the sea towards the land during day; but during night it moves from land to the sea. Discuss the reason.
36. Following are a few organisms  
(a) lichen (b) mosses (c) mango tree (d) cactus  
Which among the above can grow on stones; and also help in formation of soil? Write the mode of their action for making soil.
37. Soil formation is done by both abiotic and biotic factors. List the names of these factors by classifying them as abiotic and biotic?
38. All the living organisms are basically made up of C, N, S, P, H and O. How do they enter the living forms? Discuss.
39. Why does the percentage of gases like oxygen, nitrogen and carbon dioxide remain almost the same in the atmosphere?
40. Why does moon have very cold and very hot temperature variations eg, from  $-190^{\circ}\text{C}$  to  $110^{\circ}\text{C}$  even though it is at the same distance from the sun as the earth is?

41. Why do people love to fly kites near the seashore ?
42. Why does Mathura refinery pose problems to the Taj Mahal?
43. Why do not lichens occur in Delhi whereas they commonly grow in Manali or Darjeeling?
44. Why does water need conservation even though large oceans surround the land masses?
45. There is mass mortality of fishes in a pond. What may be the reasons ?
46. Lichens are called pioneer colonisers of bare rock. How can they help in formation of soil?
47. "Soil is formed by water." If you agree to this statement then give reasons
48. Fertile soil has lots of humus. Why?
49. Why step farming is common in hills?
50. Why are root nodules useful for the plants?

### Long Answer Questions

51. How do fossil fuels cause air pollution?
52. What are the causes of water pollution? Discuss how you can contribute in reducing water pollution.
53. A motor car, with its glass totally closed, is parked directly under the sun. The inside temperature of the car rises very high. Explain why?
54. Justify "Dust is a pollutant" ?
55. Explain the role of the Sun in the formation of soil.
56. Carbon dioxide is necessary for plants. Why do we consider it as a pollutant?

# Chapter 15

## IMPROVEMENT IN FOOD RESOURCES

### Multiple Choice Questions

1. Which one is an oil yielding plant among the following?
  - (a) Lentil
  - (b) Sunflower
  - (c) Cauliflower
  - (d) Hibiscus
2. Which one is not a source of carbohydrate?
  - (a) Rice
  - (b) Millets
  - (c) Sorghum
  - (d) Gram
3. Find out the wrong statement from the following
  - (a) White revolution is meant for increase in milk production
  - (b) Blue revolution is meant for increase in fish production
  - (c) Increasing food production without compromising with environmental quality is called as sustainable agriculture
  - (d) None of the above
4. To solve the food problem of the country, which among the following is necessary?
  - (a) Increased production and storage of food grains
  - (b) Easy access of people to the food grain
  - (c) People should have money to purchase the grains
  - (d) All of the above

5. Find out the correct sentence
- (i) Hybridisation means crossing between genetically dissimilar plants
  - (ii) Cross between two varieties is called as inter specific hybridisation
  - (iii) Introducing genes of desired character into a plant gives genetically modified crop
  - (iv) Cross between plants of two species is called as inter varietal hybridisation
- (a) (i) and (iii)
  - (b) (ii) and (iv)
  - (c) (ii) and (iii)
  - (d) (iii) and (iv)
6. Weeds affect the crop plants by
- (a) killing of plants in field before they grow
  - (b) dominating the plants to grow
  - (c) competing for various resources of crops (plants) causing low availability of nutrients
  - (d) all of the above.
7. Which one of the following species of honey bee is an Italian species?
- (a) *Apis dorsata*
  - (b) *Apis florae*
  - (c) *Apis cerana indica*
  - (d) *Apis mellifera*
8. Find out the correct sentence about manure
- (i) Manure contains large quantities of organic matter and small quantities of nutrients.
  - (ii) It increases the water holding capacity of sandy soil.
  - (iii) It helps in draining out of excess of water from clayey soil.
  - (iv) Its excessive use pollutes environment because it is made of animal excretory waste.
- (a) (i) and (iii)
  - (b) (i) and (ii)
  - (c) (ii) and (iii)
  - (d) (iii) and (iv)



9. Cattle husbandry is done for the following purposes
- (i) Milk Production
  - (ii) Agricultural work
  - (iii) Meat production
  - (iv) Egg production
- (a) (i), (ii) and (iii)
- (b) (ii), (iii) and (iv)
- (c) (iii) and (iv)
- (d) (i) and (iv)
10. Which of the following are Indian cattle?
- (i) *Bos indicus*
  - (ii) *Bos domestica*
  - (iii) *Bos bubalis*
  - (iv) *Bos vulgaris*
- (a) (i) and (iii)
- (b) (i) and (ii)
- (c) (ii) and (iii)
- (d) (iii) and (iv)
11. Which of the following are exotic breeds?
- (i) Brawn
  - (ii) Jersey
  - (iii) Brown Swiss
  - (iv) Jersey Swiss
- (a) (i) and (iii)
- (b) (ii) and (iii)
- (c) (i) and (iv)
- (d) (ii) and (iv)
12. Poultry farming is undertaken to raise following
- (i) Egg production
  - (ii) Feather production
  - (iii) Chicken meat
  - (iv) Milk production

- (a) (i) and (iii)  
(b) (i) and (ii)  
(c) (ii) and (iii)  
(d) (iii) and (iv)
- 13.** Poultry fowl are susceptible to the following pathogens  
(a) Viruses  
(b) Bacteria  
(c) Fungi  
(d) All of the above
- 14.** Which one of the following fishes is a surface feeder?  
(a) Rohus  
(b) Mrigals  
(c) Common carps  
(d) Catlas
- 15.** Animal husbandry is the scientific management of  
(i) animal breeding  
(ii) culture of animals  
(iii) animal livestock  
(iv) rearing of animals  
(a) (i), (ii) and (iii)  
(b) (ii), (iii) and (iv)  
(c) (i), (ii) and (iv)  
(d) (i), (iii) and (iv)
- 16.** Which one of the following nutrients is not available in fertilizers?  
(a) Nitrogen  
(b) Phosphorus  
(c) Iron  
(d) Potassium
- 17.** Preventive and control measures adopted for the storage of grains include  
(a) strict cleaning  
(b) proper disjoining  
(c) fumigation  
(d) all of the above

## Short Answer Questions

18. Match the column **A** with the column **B**

**(A)**

**(B)**

- |                  |                           |
|------------------|---------------------------|
| (a) Catla        | (i) Bottom feeders        |
| (b) Rohu         | (ii) Surface feeders      |
| (c) Mrigal       | (iii) Middle-zone feeders |
| (d) Fish farming | (iv) Culture fishery      |

19. Fill in the blanks

- Pigeon pea is a good source of \_\_\_\_\_.
- Berseem is an important \_\_\_\_\_ crop.
- The crops which are grown in rainy season are called \_\_\_\_\_ crops.
- \_\_\_\_\_ are rich in vitamins.
- \_\_\_\_\_ crop grows in winter season.

20. What is a GM crop? Name any one such crop which is grown in India.

21. List out some useful traits in improved crop?

22. Why is organic matter important for crop production?

23. Why is excess use of fertilizers detrimental for environment?

24. Give one word for the following

- Farming without the use of chemicals as fertilizers, herbicides and pesticides is known as \_\_\_\_\_.
- Growing of wheat and groundnut on the same field is called as \_\_\_\_\_.
- Planting soyabean and maize in alternate rows in the same field is called as \_\_\_\_\_.
- Growing different crops on a piece of land in pre-planned succession is known as \_\_\_\_\_.
- Xanthium* and *Parthenium* are commonly known as \_\_\_\_\_.
- Causal organism of any disease is called as \_\_\_\_\_.

25. Match the following **A** and **B**

**(A)**

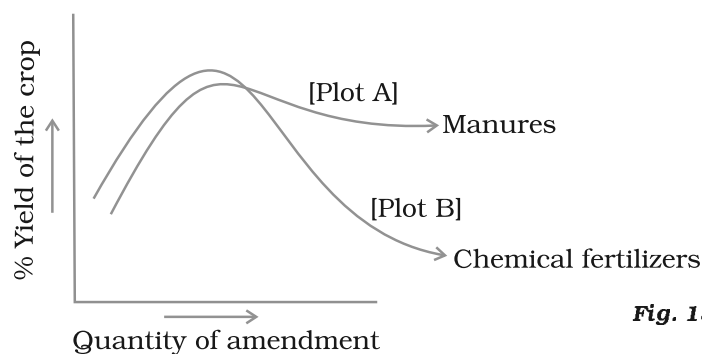
**(B)**

- |   |                            |
|---|----------------------------|
| (a) Cattle used for tilling and carting   | (i) Milk producing female  |
| (b) Indian breed of chicken               | (ii) Broiler               |
| (c) Sahiwal, Red Sindhi                   | (iii) Drought animals      |
| (d) Milch                                 | (iv) Local breed of cattle |
| (e) Chicken better fed for obtaining meat | (v) Aseel                  |

26. If there is low rainfall in a village throughout the year, what measures will you suggest to the farmers for better cropping?
27. Group the following and tabulate them as energy yielding, protein yielding, oil yielding and fodder crop.  
Wheat, rice, berseem, maize, gram, oat, pigeon gram, sudan grass, lentil, soyabean, groundnut, castor and mustard.
28. Define the term hybridization and photoperiod.
29. Fill in the blanks
- Photoperiod affect the\_\_\_\_\_.
  - Kharif crops are cultivated from\_\_\_\_\_to\_\_\_\_\_.
  - Rabi crops are cultivated from\_\_\_\_\_to\_\_\_\_\_.
  - Paddy, maize, green gram and black gram are\_\_\_\_\_crops.
  - Wheat, gram, pea, mustard are\_\_\_\_\_crops.
30. Cultivation practices and crop yield are related to environmental condition. Explain.
31. Fill in the blanks
- A total of\_\_\_\_\_nutrients are essential to plants.
  - \_\_\_\_\_and\_\_\_\_\_are supplied by air to plants.
  - \_\_\_\_\_is supplied by water to plants.
  - Soil supply\_\_\_\_\_nutrients to plants.
  - \_\_\_\_\_nutrients are required in large quantity and called as\_\_\_\_\_.
  - \_\_\_\_\_ nutrients are needed in small quantity for plants and are called\_\_\_\_\_.
32. Differentiate between compost and vermicompost?
33. Arrange these statements in correct sequence of preparation of green manure.
- Green plants are decomposed in soil.
  - Green plants are cultivated for preparing manure or crop plant parts are used.
  - Plants are ploughed and mixed into the soil.
  - After decomposition it becomes green manure.
34. An Italian bee variety *A. mellifera* has been introduced in India for honey production. Write about its merits over other varieties.
35. In agricultural practices, higher input gives higher yield. Discuss how?

## Long Answer Questions

- 36.** Discuss the role of hybridisation in crop improvement.
- 37.** Define (i) Vermicompost  
(ii) Green manure  
(iii) Bio fertilizer
- 38.** Discuss various methods for weed control.
- 39.** Differentiate between the following  
(i) Capture fishery and Culture fishery  
(ii) Mixed cropping and Inter cropping  
(iii) Bee keeping and Poultry farming
- 40.** Give the merits and demerits of fish culture?
- 41.** What do you understand by composite fish culture?
- 42.** Why bee keeping should be done in good pasturage?
- 43.** Write the modes by which insects affect the crop yield.
- 44.** Discuss why pesticides are used in very accurate concentration and in very appropriate manner?
- 45.** Name two types of animal feed and write their functions.
- 46.** What would happen if poultry birds are larger in size and have no summer adaptation capacity? In order to get small sized poultry birds, having summer adaptability, what method will be employed?
- 47.** Suggest some preventive measures for the diseases of poultry birds.
- 48.** Figure 15.1 shows the two crop fields [Plots A and B] have been treated by manures and chemical fertilizers respectively, keeping other environmental factors same. Observe the graph and answer the following questions.  
(i) Why does plot B show sudden increase and then gradual decrease in yield?  
(ii) Why is the highest peak in plot A graph slightly delayed?  
(iii) What is the reason for the different pattern of the two graphs?



**Fig. 15.1**

49. Complete the crossword puzzle (Fig.15.2)

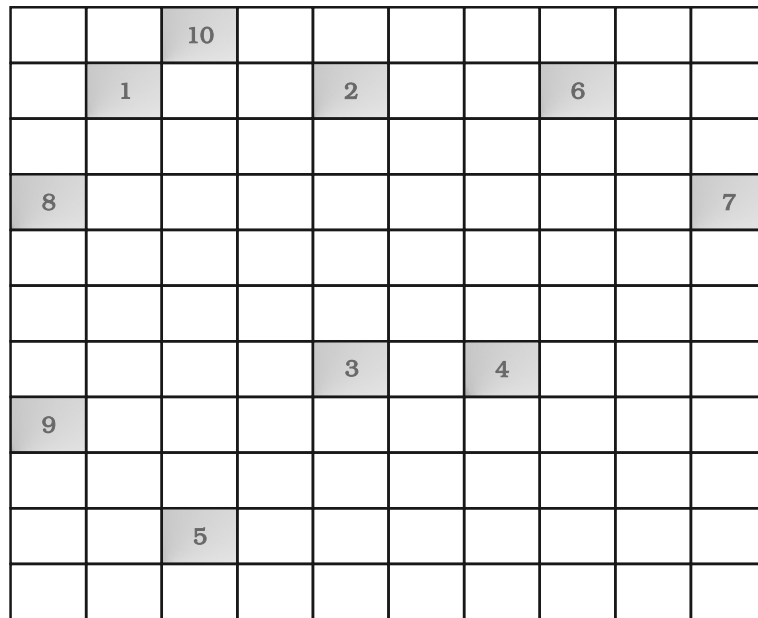


Fig. 15.2

**Across**

1. Oil yielding plant (9)
3. Crop grown in winter season (4)
5. Fixed by *Rhizobium* (8)
9. Common honey bee (4)

**Downward**

2. Animal feed (6)
4. A micronutrient (5)
6. Unwanted plant in crop fields (4)
7. An exotic breed of chicken(7)
8. Bottom feeders in fish pond(7)
10. A marine fish (4)

**SCIENCE**  
**CLASS IX (THEORY)**  
**SAMPLE QUESTION PAPER-I**

**Time:** 3 Hours

**Maximum Marks :** 75

**Multiple Choice Questions**

1. On converting 25 °C, 38 °C and 66 °C to kelvin scale, the correct answer will be
  - (a) 298 K, 311 K and 339 K
  - (b) 298 K, 300 K and 338 K
  - (c) 273 K, 278 K and 543 K
  - (d) 298 K, 310 K and 338 K(1)
  
2. Choose the correct statement of the following
  - (a) conversion of solid into vapours without passing through the liquid state is called vapourisation.
  - (b) conversion of vapours into solid without passing through the liquid state is called sublimation.
  - (c) conversion of vapours into solid without passing through the liquid state is called freezing.
  - (d) conversion of solid into liquid is called sublimation.(1)
  
3. Rusting of an article made up of iron is called
  - (a) corrosion and it is a physical as well as chemical change
  - (b) dissolution and it is a physical change
  - (c) corrosion and it is a chemical change
  - (d) dissolution and it is a chemical change(1)
  
4. Which of the following are homogeneous in nature?

(i) ice    (ii) wood    (iii) soil    (iv) air

  - (a) (i) and (iii)
  - (b) (ii) and (iv)
  - (c) (i) and (iv)
  - (d) (iii) and (iv)(1)
  
5. Following are a few definitions of osmosis  
Read carefully and select the correct definition
  - (a) Movement of water molecules from a region of higher concentration to a region of lower concentration through a semipermeable membrane
  - (b) Movement of solvent molecules from its higher concentration to lower concentration

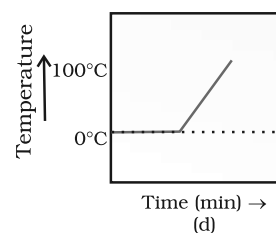
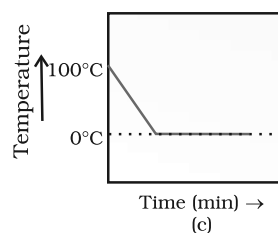
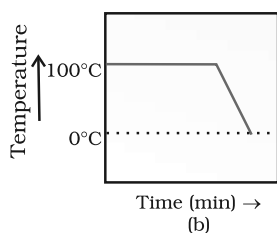
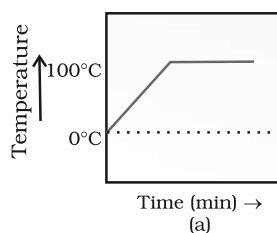
- (c) Movement of solvent molecules from higher concentration to lower concentration of solution through a permeable membrane
- (d) Movement of solute molecules from lower concentration to higher concentration of solution through semipermeable membrane.
- 6.** Which among the following has specialised tissue for conduction of water?  
(a) Thallophyta  
(b) Bryophyta  
(c) Pteridophyta  
(d) Fungi (1)
- 7.** Which of the following is not a criterion for classification of living organisms?  
(a) Body design of the organism  
(b) Ability to produce one's own food  
(c) Membrane bound nucleus and cell organelles  
(d) Height of the plant (1)
- 8.** Which of the following is not important for individual's health?  
(a) Living in clean space  
(b) Good economic condition  
(c) Social equality and harmony  
(d) Living in a large and well furnished house (1)
- 9.** Chromosomes are made up of  
(a) DNA only  
(b) protein only  
(c) DNA and protein  
(d) RNA only (1)
- 10.** A particle is moving in a circular path of radius (r). The displacement after half a circle would be  
(a) Zero  
(b)  $\pi r$   
(c)  $2 r$   
(d)  $2\pi r$  (1)
- 11.** In case of negative work the angle between the force and displacement is  
(a)  $0^\circ$   
(b)  $45^\circ$   
(c)  $90^\circ$   
(d)  $180^\circ$  (1)
- 12.** An object moving at a speed greater than that of sound is said to be moving at  
(a) infrasonic speed  
(b) sonic speed  
(c) ultrasonic speed  
(d) supersonic speed (1)



13. Before playing the orchestra in a musical concert, a sitarist tries to adjust the tension and pluck the string suitably. By doing so, he is adjusting
- intensity of sound only
  - amplitude of sound only
  - frequency of the sitar string with the frequency of other musical instruments
  - loudness of sound
- (1)
14. Ozone - layer is getting depleted because of
- excessive use of automobiles
  - excessive formation of industrial units
  - excessive use of man-made compounds containing both fluorine and chlorine
  - excessive deforestation.
- (1)
15. To solve the food problem of the country, which among the following is necessary?
- Increased production and storage of food grains.
  - Easy access of people to the food grain.
  - People should have money to purchase the grains.
  - All of the above.
- (1)
16. Which one of the following nutrients is not available in fertilizers?
- Nitrogen
  - Phosphorus
  - Iron
  - Potassium
- (1)

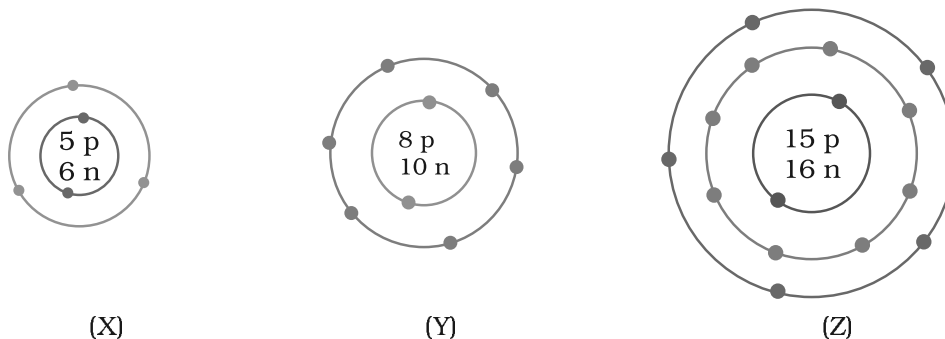
### Short Answer Questions

17. A student heats a beaker containing ice and water. He measures the temperature of the contents of the beaker as a function of time. Which of the following would correctly represent the result? Give justification for your choice. (1+1= 2)



18. An element is sonorous and highly ductile. Under which category would you classify this element? What other characteristics do you expect the element to possess?  $(\frac{1}{2} + 1\frac{1}{2} = 2)$

19. What information do you get from the following figures about the valency, atomic number and mass number of atoms X, Y and Z? Give your answer in a tabular form.  $(1 + \frac{1}{2} + \frac{1}{2} = 2)$



20. One electron is present in the outer most shell of the atom of an element X. What would be the nature and value of the charge on the ion formed if this electron is removed from the outer most shell?  $(1+1 = 2)$

21. Cells of onion peel and RBC are separately kept in hypotonic solution, what among the following will take place? Explain the reason for your answer.

- (a) Both the cells will swell.
- (b) RBC will burst easily while cells of onion peel will resist the bursting to some extent.
- (c) a and b both are correct
- (d) RBC and onion peel cells will behave similarly.  $(\frac{1}{2}+1\frac{1}{2} = 2)$

22. Name the different components of xylem and draw a living component of it.  $(1 + 1 = 2)$

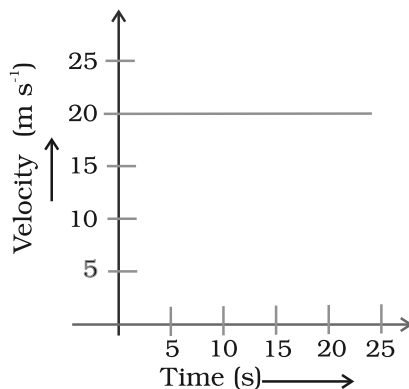
23. Classify the following organisms based on the absence/presence of true coelom (i.e. acoelomate, pseudocoelomate and coelomate)

<i>Spongilla</i> ,	Sea anemone	
Planaria,	Liver fluke	
<i>Wuchereria</i> ,	<i>Ascaris</i>	
<i>Nereis</i> ,	Scorpion	
Earthworm,	Birds	
Fishes,	Horse	(2)

24. Which cell organelle controls most of the activities of the cell? (2)

25. Draw well labelled diagrams of various types of muscles found in human body (2)

26. The following velocity-time graph shows the motion of a cyclist. Find (i) its acceleration, (ii) its velocity and (iii) the distance covered by the cyclist in 15 seconds.



( $\frac{1}{2} + \frac{1}{2} + 1 = 2$ )

27. A ball is dropped from a height of 10 m. If the energy of the ball reduces by 40% after striking the ground, how much high can the ball bounce back? (2)

28. Draw a graph for a wave representing wave disturbance and time for a sound changing from low pitch to high pitch, keeping the amplitude of the sound same. (2)

29. Why lichens do not occur in Delhi whereas they commonly grow in Manali or Darjeeling? (2)

30. Lichens are called pioneer colonisers of bare rock. How can they help in formation of soil? (2)

31. What is a GM crop? Name any one such crop which is grown in India. (1+1= 2)

32. If there is low rainfall in a village throughout the year what measures will you suggest to the farmers for better cropping? (2)

33. In agricultural practices, higher input gives higher yield. Discuss how? (2)

### Long Answer Questions

34. The mass of one steel screw is 4.11 g. Find the mass of one mole of these steel screws. Compare this value with the mass of the Earth ( $5.98 \times 10^{24}$  kg). Which one of the two is heavier and by how many times?

( $1\frac{1}{2} + 2\frac{1}{2} + 1 = 5$ )

Or

In photosynthesis, 6 molecules of carbon dioxide combine with an equal number of water molecules through a complex series of reactions to give a molecule of glucose having a molecular formula  $C_6H_{12}O_6$ . How many grams

of water would be required to produce 18 g of glucose? Compute the volume of water so consumed assuming the density of water to be  $1 \text{ g cm}^{-3}$ .

$$(4 + 1 = 5)$$

**35.** Explain giving reasons

- (a) Balanced diet is necessary for maintaining healthy body.
- (b) Health of an organism depends upon the surrounding environmental conditions.
- (c) Our surrounding area should be free of stagnant water.
- (d) Social harmony and good economic conditions are necessary for good health.

$$(1 + 1 + 1 + 2 = 5)$$

**Or**

Why is AIDS considered to be a 'Syndrome' and not a disease? (5)

- 36.** (a) Explain the meaning of inertia with the help of an example.
- (b) Two balls of same size but of different materials, rubber and iron are kept on the smooth floor of a moving train. The brakes are applied suddenly to stop the train. Will the balls start rolling? If so, in which direction? Will they move with the same speed? Give reasons for your answer.

$$(2 + \frac{1}{2} + \frac{1}{2} + 1 + 1 = 5)$$

**Or**

- (a) A ball of mass  $m$  is thrown vertically upward from the ground with an initial speed  $v$ , its speed decreases continuously till it becomes zero. Thereafter, the ball begins to fall downward and attains the speed  $v$  again before striking the ground. It implies that the magnitude of initial and final momentum of the ball are same. Yet, it is not an example of conservation of momentum. Explain why?
- (b) A bullet of mass 20 g is horizontally fired with a velocity  $150 \text{ m s}^{-1}$  from a pistol of mass 2 kg. What is the recoil velocity of the pistol?

$$(3 + 2 = 5)$$

- 37.** (a) With the help of Second Law of Motion and the Universal Law of Gravitation derive an expression for acceleration due to gravity ' $g$ '.
- (b) The weight of any person on the moon is about  $1/6$  times that on the earth. He can lift a mass of 15 kg on the earth. What will be the maximum, mass, which can be lifted by the same force applied by the person on the moon?

$$(1+1+1+2=5)$$

**Or**

(a) Identical packets are dropped from two aeroplanes, one above the equator and the other above the north pole, both at height ' $h$ '. Assuming all conditions are identical, will these packets take same time to reach the surface of the earth? Justify your answer.

(b) It is seen that a falling apple is attracted towards the earth. Does the apple also attract the earth? If so, we do not see the earth moving towards the apple. Why?  $(2 + 1 + 1 + 1 = 5)$

**38.** A motor car, with its glass totally closed, is parked directly under the sun. The inside temperature of the car rises very high. Explain why?  $(5)$

**Or**

What are the causes of water pollution? Discuss how can you contribute in reducing the water pollution.  $(2\frac{1}{2} + 2\frac{1}{2} = 5)$

## ANSWERS

### Multiple Choice Questions

1. (a)
2. (b)
3. (c)
4. (c)
5. (a)
6. (c)
7. (d)
8. (d)
9. (c)
10. (c)
11. (d)
12. (d)
13. (c)
14. (c)
15. (d)
16. (c)

### Short Answer Questions

17. The correct option is (d). Since ice and water are in equilibrium, the temperature would be zero. When we heat the mixture, energy supplied is utilised in melting the ice and the temperature does not change till all the ice melts because of latent heat of fusion. On further heating the temperature of the water would increase.
18. This element is a metal. Other characteristics that the element may possess are—lustre, malleability, heat and electrical conductivity.

19.

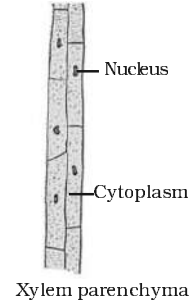
	Valency	Atomic No.	Mass No.
X	3	5	11
Y	2	8	18
Z	3,5	15	31

20. + 1

21. (b), Onion peel has cell wall and RBC does not have cell wall

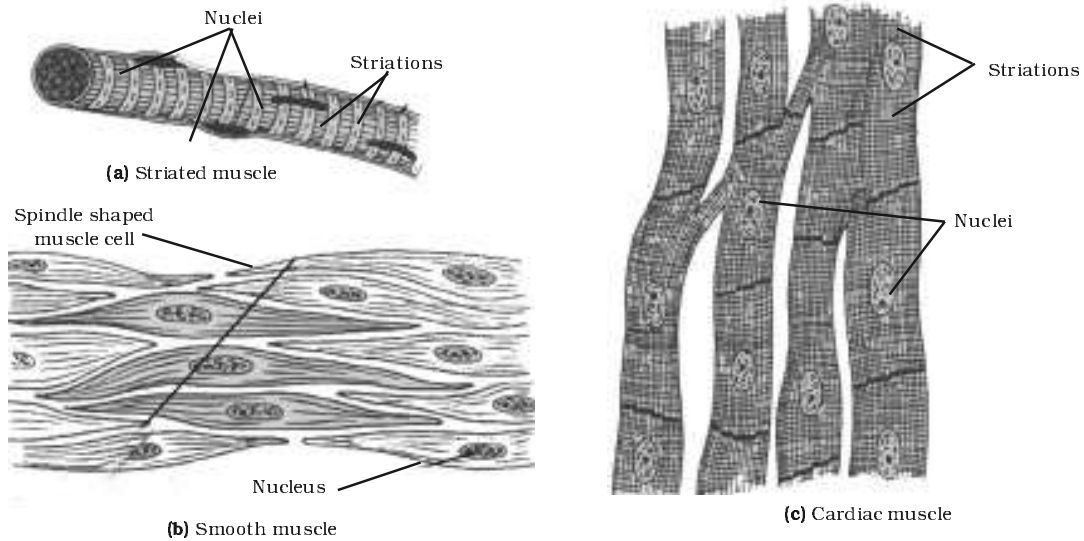
22. **Hint**—Xylem consists of tracheids, vessels, xylem parenchyma and xylem fibres.

23. *Spongilla*—Acoelomate  
Sea anemone—Acoelomate  
*Planaria*—Acoelomate  
Liver fluke—Acoelomate  
*Wuchereria*—Pseudocoelomate  
*Ascaris*—Pseudocoelomate  
*Nereis*—Coelomate  
Scorpion—Coelomate  
Earthworm—Coelomate  
Birds, Fishes and Horse—Coelomate



24. **Hint**—Nucleus

25.



26. (a) Since velocity is not changing, acceleration is equal to zero.

(b) Reading the graph, velocity =  $20 \text{ m s}^{-1}$

(c)  $s =$  area of the figure enclosed under  $v-t$  graph

Distance covered in 15 s,  $s = u \times t$

$$= 20 \times 15 = 300 \text{ m}$$

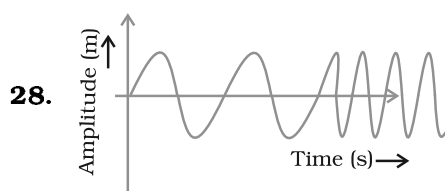
27. Total energy of the ball =  $m \times g \times h$   
 $= m \times 10 \times 10 = 100 m$   
 $= 100 m \text{ kg} \times \text{m}^2 \text{ s}^{-2}$

Energy with which it struck the ground = 60% of the total energy

$$E = \frac{60}{100} \times 100 m \text{ kg m}^2 \text{ s}^{-2}$$

$\therefore$  Height to which the ball will bounce back

$$h = \frac{E}{m \times g} = 6 \text{ m}$$



29. **Hint**— It is a bio-indicator and sensitive to  $\text{SO}_2$  pollution from automobiles. Delhi has maximum number of automobiles, hence has a highly polluted environment.
30. Lichens release chemical substances to break the rocks into smaller particles and hence make soil.
31. Crop which has been developed by introducing new gene from any other source, to obtain the desired character, is called as genetically modified (GM) crop. Bt Cotton is an example of GM crop which is made insect-resistant by introducing a new gene from a bacteria.
32. Farmers of low rainfall area will be suggested to  
 (a) practice farming with drought resistant and early maturing varieties of crops.  
 (b) to enrich the soil with more humus content as it increases the water-holding capacity and retains the water for longer duration.
33. In agricultural practices, higher input gives higher yield, means higher money input raise the yield. Financial conditions of the farmers allows them to take up different farming practices and technologies. The farmer's purchasing capacity for input decides cropping system and production practices.



## Long Answer Questions

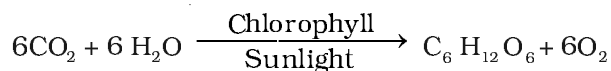
34. One mole of screws weigh  $2.475 \times 10^{24}$ g  
 $= 2.475 \times 10^{21}$  kg

$$\frac{\text{Mass of the earth}}{\text{Mass of 1 mole of screws}} = \frac{5.98 \times 10^{24} \text{ kg}}{2.475 \times 10^{21} \text{ kg}} = 2.4 \times 10^3$$

Mass of earth is  $2.4 \times 10^3$  times the mass of screw

The earth is 2400 times heavier than a mole of screw.

**Or**



1 mole of glucose needs 6 moles of water

180 g of glucose needs (6×18) g of water

1 g of glucose will need  $\frac{108}{180}$  g of water.

$$\begin{aligned} 18 \text{ g of glucose would need } & \frac{108}{180} \times 18 \text{ g of water} \\ & = 10.8 \text{ g} \end{aligned}$$

$$\text{Volume of water used} = \frac{\text{Mass}}{\text{Density}} = \frac{10.8 \text{ g}}{1 \text{ g cm}^{-3}} = 10.8 \text{ cm}^3.$$

35. (a) Food is necessary for the growth and development of the body. Balanced diet provides raw materials and energy in appropriate amount needed for the substances like proteins, carbohydrates, fats, minerals etc which in turn are essential for the proper growth and functioning of the healthy body.
- (b) Health is a state of being well enough to function well physically, mentally and socially and these conditions depend upon the surrounding environmental conditions. For example, if there is unhygienic conditions in surrounding area, it is likely we might get infected or diseased.
- (c) This is so because many water borne diseases and insect vectors flourish in stagnant water which cause diseases in human beings.
- (d) Human beings live in societies and different localities like villages or cities, which determines the social and physical environment and hence both are to be kept in harmony. Public cleanliness is important for individual health. For better living conditions lot of money is required. We need good food for healthy body and for this we have to earn more. For the treatment of diseases also, one has to be in good economic condition.

Or

AIDS causing virus— HIV that comes into the body via, the sexual organs or any other means like blood transfusion will spread to lymph nodes all over the body. The virus damages the immune system of the body adversely. Due to this the body can no longer fight off many minor infections. Instead, every small cold can become pneumonia, or minor gut infection can become severe diarrhoea with blood loss. The effect of disease becomes very severe and complex, at times killing the person suffering from AIDS. Hence there is no specific disease symptoms for AIDS but it results in complex diseases and symptoms. Therefore, it is known as syndrome.

36. (a) **Hint**— Explain inertia with certain examples  
(b) Yes, the balls will start rolling in the direction of the displacement of the train.  
No, they will not move with the same speed, because their masses (inertia) are different. The lighter ball will move faster than the heavier ball.

Or

- (a) Yes, it is not an example of conservation of momentum because momentum remains conserved when no external force is acting on the object. In this case, force of gravity is acting on the ball.

(b)  $m_1 = 20 \text{ g} = \frac{20}{1000} = \frac{1}{50} \text{ kg}$

$$v_1 = 150 \text{ ms}^{-1}$$

$$m_2 = 2 \text{ kg}$$

$$v_2 = \quad \therefore m_1 v_1 = m_2 v_2$$

$$\therefore \frac{1}{50} \times 150 = 2 \times v_2$$

$$v_2 = \frac{150}{50 \times 2} = 1.5 \text{ m s}^{-1}$$

37. (a) Newton's Second Law of Motion  $F = m \times a$  ;  $F = mg$

Universal Law of Gravitation  $F = \frac{GmM}{R^2}$

$$\therefore mg = \frac{GmM}{R^2}, g = \frac{GM}{R^2}$$

(b)  $g_e = g$  and  $g_m = g/6$

Force applied to lift a mass of 15 kg, at the earth  $F = m g_e = 15 g_e \text{ N}$   
Therefore, the mass lifted by the same force on the moon,

$$m = F / g_m = \frac{15g}{g/6} = 90 \text{ kg}$$

**Or**

- (a) We know that the value of 'g' at the equator of the earth is less than that at poles. Therefore, the packet falls slowly at the equator in comparison to the poles. Thus, the packet will remain in air for longer time interval, when it is dropped at the equator.
- (b) The apple also attracts the earth with equal and opposite force (Newton's Third Law).

$$\therefore m_a g_a = m_e g_e$$

As the mass of the apple is negligible when compared to the mass of earth, the acceleration produced in the apple will be much greater than that produced in the earth.

- 38.** Infra-red radiations in sunlight pass through the glass and heat the interior of the car. The radiation emitted by upholstery and other inner parts of the car cannot pass out of the glass, so the heat trapped inside raises the temperature of the interior. This is because glass is transparent to infra-red radiation from the sun having smaller wavelength than that emitted by the interior of the car which are of longer wavelength to which the glass is opaque.

**Or**

Water pollution can be caused by addition of

- (i) undesirable substances like fertilisers and pesticides or any poisonous substances.
- (ii) sewage directly entering a water body.
- (iii) hot water from the power plant that increases the temperature and reduces the dissolved oxygen in water thus killing the aquatic organisms.
- (iv) industrial effluents or radioactive substances in water body.

We can take following measures to check water pollution

- (i) The sewer lines should not be directly connected to the water body.
- (ii) We should not throw our garbages or domestic wastes into the water body.
- (iii) Prevent dumping of toxic compounds in the water bodies.
- (iv) Washing of clothes should be avoided near water bodies as it adds a lot of detergents to it.
- (v) Plant trees near the banks of the river to check soil erosion otherwise erosion leads to siltation of water body.

**SCIENCE**  
**CLASS IX (THEORY)**  
**SAMPLE QUESTION PAPER - II**

**Time:** 3 Hours

**Maximum Marks :** 75

**Multiple Choice Questions**

1. Seema visited a Natural Gas Compressing Unit and found that the gas can be liquefied under specific conditions of temperature and pressure. While sharing her experience with friends she got confused. Help her to identify the correct set of conditions.
- (a) Low temperature, low pressure
  - (b) High temperature, low pressure
  - (c) Low temperature, high pressure
  - (d) High temperature, high pressure (1)
2. Which of the following are physical changes?
- (i) Melting of iron metal
  - (ii) Rusting of iron
  - (iii) Bending of an iron rod
  - (iv) Drawing a wire of iron metal
- (a) (i), (ii) and (iii)
  - (b) (i), (ii) and (iv)
  - (c) (i), (iii) and (iv)
  - (d) (ii), (iii) and (iv) (1)
3. Which one of the following has maximum number of atoms?
- (a) 18 g of H<sub>2</sub>O
  - (b) 18 g of O<sub>2</sub>
  - (c) 18 g of CO<sub>2</sub>
  - (d) 18 g of CH<sub>4</sub> (1)
4. In a sample of ethyl ethanoate (CH<sub>3</sub>COOC<sub>2</sub>H<sub>5</sub>) the two oxygen atoms have the same number of electrons but different number of neutrons. Which of the following is the correct reason for it?
- (a) One of the oxygen atoms has gained electrons
  - (b) One of the oxygen atoms has gained two neutrons
  - (c) The two oxygen atoms are isotopes
  - (d) The two oxygen atoms are isobars. (1)

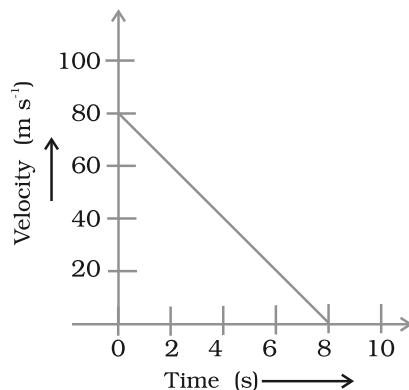
5. A cell will swell up if
- (a) the concentration of water molecules in the cell is higher than the concentration of water molecules in surrounding medium
  - (b) the concentration of water molecules in surrounding medium is higher than water molecules concentration in the cell.
  - (c) the concentration of water molecules is same in the cell and in the surrounding medium
  - (d) concentration of water molecules does not matter (1)
6. Survival of plants in terrestrial environment has been made possible by the presence of
- (a) intercalary meristem
  - (b) conducting tissue
  - (c) apical meristem
  - (d) parenchymatous tissue (1)
7. In which group of animals coelom is filled with blood?
- (a) Arthropoda
  - (b) Annelida
  - (c) Nematoda
  - (d) Echinodermata (1)
8. Organisms without nucleus and cell organelles belong to
- (a) fungi
  - (b) protista
  - (c) algae
  - (d) bacteria (1)
9. Which cells do not have perforated cell walls?
- (a) Tracheids
  - (b) Companion cells
  - (c) Sieve tubes
  - (d) Vessels (1)
10. The numerical ratio of displacement to distance covered by a moving object is
- (a) always less than 1
  - (b) always equal to 1
  - (c) always more than 1
  - (d) equal or less than 1 (1)
11. According to the third law of motion, action and reaction
- (a) always act on the same body
  - (b) always act on different bodies in opposite directions
  - (c) have same magnitude and direction
  - (d) act on either body at normal to each other (1)

- 12.** The value of acceleration due to gravity  
(a) is least on equator  
(b) is least on poles  
(c) is same on equator and poles  
(d) increases from pole to equator (1)
- 13.** The gravitational force between two objects is  $F$ . If the masses of both objects are halved without changing distance between them, then the gravitational force would become  
(a)  $\frac{F}{4}$  (b)  $\frac{F}{2}$  (c)  $F$  (d)  $2F$  (1)
- 14.** Among the given options, which one is not correct for the use of large amount of fertilisers and pesticides?  
(a) They are eco-friendly  
(b) They turn the fields barren after some time  
(c) They remove the useful component from the soil  
(d) They destroy the soil fertility (1)
- 15.** Find out the correct sentence  
(i) Hybridisation means crossing between genetically dissimilar plants.  
(ii) Cross between two varieties is called as inter specific hybridisation.  
(iii) Introducing genes of desired character into a plant gives genetically modified crop.  
(iv) Cross between plants of two species is called as inter varietal.  
(a) (i) and (iii)  
(b) (ii) and (iv)  
(c) (ii) and (iii)  
(d) (iii) and (iv) (1)
- 16.** Find out the correct sentence about manure  
(i) Manure contains large quantities of organic matter and small quantities of nutrients.  
(ii) It increases the water holding capacity of sandy soil.  
(iii) It helps in draining out of excess of water from clayey soil.  
(iv) Its excessive use pollutes environment because it is made of animal excretory waste.  
(a) (i) and (iii)  
(b) (i) and (ii)  
(c) (ii) and (iii)  
(d) (iii) and (iv) (1)

## Short Answer Questions

17. 'Osmosis is a special kind of diffusion'. Comment. (2)
18. Give the chemical formulae for the following compounds and compute the ratio by mass of the combining elements in each one of them.  
(a) Ammonia  
(b) Carbon monoxide  
(c) Hydrogen chloride  
(d) Aluminium fluoride (1 + 1 = 2)
19. Write the molecular formulae for the following compounds  
(a) Aluminium (III) nitrate  
(b) Calcium (II) phosphate  
(c) Mercury (II) chloride  
(d) Magnesium (II) acetate ( $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 2$ )
20. Helium atom has 2 electrons in its valence shell but its valency is not 2, Explain. (2)
21. If a person takes concentrated solution of salt. After sometime, he starts vomiting. What is the phenomenon responsible for such situation? Explain. (2)
22. Differentiate the following activities on the basis of voluntary or involuntary muscles.  
(a) Jumping of frog  
(b) Pumping of the heart  
(c) Writing with hand  
(d) Movement of chocolate in your intestine ( $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 2$ )
23. Water hyacinth float on water surface. Explain. (2)
24. Which bacterium causes peptic ulcers?  
Who discovered the above pathogen for the first time? (1 + 1 = 2)
25. Give reasons for  
(a) Meristematic cells have a prominent nucleus and dense cytoplasm but they lack vacuole.  
(b) Intercellular spaces are absent in sclerenchymatous tissues.  
(c) We get a crunchy and granular feeling, when we chew pear fruit.  
(d) Branches of a tree move and bend freely in high wind velocity. ( $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 2$ )
26. A motorcyclist drives from point A to point B with a uniform speed of 30 km h<sup>-1</sup> and returns back to point A with a uniform speed of 20 km h<sup>-1</sup>. Find the average speed of the motorcyclist. (2)

27. Velocity versus time graph of a ball of mass 50 g rolling on a concrete floor is shown below. Calculate the acceleration and the frictional force of the floor on the ball? (1 + 1 = 2)



28. The volume of a 500 g sealed packet is 350 cm<sup>3</sup>. Will the packet float or sink in a saturated salt solution, if the density of the solution is 1.2 g cm<sup>-3</sup>? What will be the mass of the solution displaced by this packet?

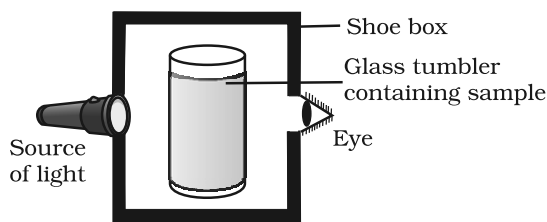
(1 + 1 = 2)

29. Why step farming is common in hills? (2)
30. Fertile soil has lots of humus. Why? (2)
31. List out some useful traits in improved crop. (2)
32. Arrange these statements in correct sequence of preparation of green manure.
- (a) Green plants are decomposed in soil.
  - (b) Green plants are cultivated for preparing manure or crop plant parts are used.
  - (c) Plants are ploughed and mixed into the soil.
  - (d) After decomposition it becomes green manure. ( $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 2$ )
33. An Italian bee variety *Apis mellifera* has been introduced in India for honey production. Write about its merits on other varieties. (2)



## Long Answer Questions

34. A group of students took an old shoe box and covered it with a black paper from all sides. They fixed a source of light (a torch) at one end of the box by making a hole in it and made another hole on the other side to view the sample taken in a beaker/glass tumbler as shown in the figure. They were amazed to see that milk taken in the glass was illuminated. They tried the same activity by taking a salt solution but found that light simply passed through it



- (a) Explain why the milk sample was illuminated. Name the phenomenon involved.
- (b) Same results were not observed with a salt solution. Explain.
- (c) Can you suggest two more solutions which would show the same effect as shown by the milk solution? (2 + 2 + 1 = 5)

**Or**

During an experiment the students were asked to prepare a 10% solution of sugar in water. Ramesh dissolved 10g of sugar in 100g of water while Sarika prepared it by dissolving 10g of sugar in water to make 100g of the solution.

- (a) Are the two solutions of the same concentration?
- (b) Compare the mass % of the two solutions. (1 + 4 = 5)

35. Why do some children fall ill more frequently than others living in the same locality? (5)

**Or**

Give any four factors necessary for a healthy person. (5)

36. Define power. How will you differentiate between kW and kWh? If the velocity of a ball is tripled, what will be the ratio of
- (a) its initial kinetic energy and final kinetic energy
- (b) initial momentum and final momentum. (1 + 1 + 1½ + 1½ = 5)

**Or**

Four men lift a 250 kg box to a height of 1 m and hold it without raising or lowering it.

- (a) How much work the men do in lifting the box?
- (b) How much work do they do in just holding it?
- (c) Why do they get tired while holding it? ( $g = 10 \text{ m s}^{-2}$ ) ( $2 + 1\frac{1}{2} + 1\frac{1}{2} = 5$ )

- 37.** (a) Explain how 'echo' is produced.
- (b) What should be the minimum distance between the listener and the reflector to hear an echo of sound propagating with a speed  $v \text{ m s}^{-1}$ ?
- (c) Does the speed of sound increase or decrease on a hotter day? Justify.  
( $1\frac{1}{2} + \frac{1}{2} + 1 + 2 = 5$ )

**Or**

Establish the relationship between speed of sound, its wavelength and frequency. If speed of sound in air is  $340 \text{ m s}^{-1}$ , calculate.

- (a) wavelength when frequency is 256 Hz.
- (b) frequency when wavelength is 0.85 m. ( $2 + 1\frac{1}{2} + 1\frac{1}{2} = 5$ )

- 38.** How do fossil fuels cause air pollution? (5)

**Or**

Explain the role of the Sun in the formation of soil. (5)

## ANSWERS

### Multiple Choice Questions

1. (c)
2. (c)
3. (d)

Number of atoms =  $\frac{\text{Mass of substance}}{\text{Molar mass}} \times N_A \times \text{Number of atoms in the molecule}$

$$\therefore \text{(a) 18 g of water} = \frac{18}{18} \times N_A \times 3 = 3 N_A$$

$$\text{(b) 18 g of oxygen} = \frac{18}{32} \times N_A \times 2 = 1.12 N_A$$

$$\text{(c) 18 g of CO}_2 = \frac{18}{44} \times N_A \times 3 = 1.23 N_A$$

$$\text{(d) 18 g of CH}_4 = \frac{18}{16} \times N_A \times 5 = 5.60 N_A$$

4. (c)
5. (b)
6. (b)
7. (a)
8. (d)
9. (b)
10. (d)
11. (b)
12. (a)
13. (a)
14. (a)
15. (a)
16. (b)

## Short Answer Questions

17. Yes, it is true. In both the phenomena, there is movement of particles from region of higher concentration to that of lower concentration. However, in case of osmosis the movement of solvent is through a semi permeable membrane which is permeable only to water molecules.
18. (a)  $\text{NH}_3$                       (b)  $\text{CO}$                       (c)  $\text{HCl}$                       (d)  $\text{AlF}_3$   
           N:  $\text{H} \times 3$                       C:O                      H: Cl                      Al:  $\text{F} \times 3$   
           14:  $1 \times 3$                       12: 16                      1: 35.5                      27:  $19 \times 3$   
           14: 3                      3: 4                      2:71                      9: 19
19. (a)  $\text{Al}(\text{NO}_3)_3$   
       (b)  $\text{Ca}_3(\text{PO}_4)_2$   
       (c)  $\text{HgCl}_2$   
       (d)  $\text{Mg}(\text{CH}_3\text{COO})_2$
20. Helium atom has 2 electrons in its outermost shell and its duplet is complete. Hence the valency is zero.
21. **Hint**— Exosmosis in intestine causes dehydration
22. On the basis of voluntary muscles – a, c  
       On the basis of involuntary muscles– b, d
23. **Hint**— Due to aerenchyma present in the swollen petiole.
24. (i) *Helicobacter pylori*  
       (ii) Marshall and Warren.
25. **Hint**—  
       (a) No need of storage.  
       (b) Because they are lignified.  
       (c) Presence of stone cells (sclerenchyma)  
       (d) Presence of Collenchyma.
26. Let  $AB = x$

$$\text{So } t_1 = \frac{x}{30} \text{ and } t_2 = \frac{x}{20}$$

$$\text{Total Time} = t_1 + t_2 = \frac{5}{60}x$$

$$\text{Average speed} = \frac{\text{Total distance}}{\text{Total time}}$$

$$= \frac{2x}{\frac{5x}{60}} = 24 \text{ kmh}^{-1}$$

27. Acceleration =  $\frac{v - u}{t} = \frac{80 - 0}{8} = 10 \text{ m s}^{-2}$

Force =  $m \times a = \frac{50}{1000} \times 10 = 0.5 \text{ N}$

28. Density of the sealed packet =  $\frac{m}{V} = \frac{500}{350} = 1.4 \text{ g cm}^{-3}$

As the density of the packet is greater than that of the saturated salt solution, the packet will sink.

Mass of the solution displaced = Volume of the packet  $\times$  Density of the solution.  
 $= 350 \times 1.2 = 420 \text{ g.}$

29. **Hint**— This is practiced to check soil erosion through water currents on the slopes.

30. Fertile soils are rich in organisms that decompose dead organic matter forming humus. Humus gives minerals, absorbs water and makes soil porous.

31. Useful traits of improved crops are  
(a) higher yield  
(b) improved nutritional quality  
(c) resistance to biotic and abiotic stresses  
(d) change in maturity  
(e) wide range of adaptability  
(f) desired agronomic characteristics.

32. (b)  $\rightarrow$  (c)  $\rightarrow$  (a)  $\rightarrow$  (d)

33. Merits of Italian bee variety *Apis mellifera* are—

- (a) It stings less.
- (b) It has high honey collection capacity.
- (c) It stays in given beehive for long periods and breeds very well.

### Long Answer Questions

34. **Hint**— (a) Dilute milk solution is a colloid and would show Tyndall effect.  
(b) Salt solution is a true solution and would not scatter light.  
(c) Detergent solution, sulphur solution.

**Or**

(a) No.

$$(b) \text{ Mass\%} = \frac{\text{Mass of solute}}{\text{Mass of solute} + \text{Mass of solvent}} \times 100$$

Solution made by Ramesh

$$\text{Mass\%} = \left( \frac{10}{10+100} \right) 100 = \frac{10}{110} \times 100 = 9.09\%$$

Solution made by Sarika

$$\text{Mass\%} = \frac{10}{100} \times 100 = 10\%$$

- 35. Hint**— Due to poor immune system, some children fall ill frequently. Balanced diet and proper nutrition for healthy body is required to have a strong immune system.

**Or**

For a healthy person it is necessary that

- (a) The surrounding environment should be clean. Air and water borne diseases will not spread.
  - (b) Personal hygiene prevents infectious diseases.
  - (c) Proper, sufficient nourishment and food is necessary for good immune system of our body.
  - (d) Immunisation against severe diseases.
- 36.** Definition of power  
kW is the unit of power and kWh is the unit of energy.

(a)  $\therefore v_1 = v; v_2 = 3v$

$$KE_1 = \frac{1}{2} mv^2$$

$$KE_2 = \frac{1}{2} m (3v)^2 = \frac{9}{2} mv^2$$

$$KE_1 : KE_2 = \frac{1}{2} mv^2 : \frac{9}{2} mv^2 = 1:9$$

(b)  $p_1 = mv; p_2 = m \times 3v = 3mv$

$$p_1 : p_2 = mv : 3mv \\ = 1 : 3$$

**Or**

(a)  $F = 250 \text{ kg} \times g = 250 \times 10 = 2500 \text{ N}$

$s = 1 \text{ m}$

$W = F \cdot s = 2500 \text{ N m} = 2500 \text{ J}$

(b) Zero, as the box does not move at all while holding it.

(c) In order to hold the box men are applying a force which is opposite and equal to the gravitational force acting on the box. While applying the force men make muscular effort. So they get tired.

**37.** (a) Echo

(b)  $\text{Time} = \frac{\text{Distance}}{\text{Speed}}$  that is,  $t = \frac{2d}{V}$

or  $d = \frac{V \times t}{2} = \frac{V \times 1}{2 \times 10} = \frac{V}{20} \text{ m} \therefore \text{time} = 0.1 \text{ s}$

(c) The speed of sound increases with temperature. So on a hotter day speed of sound is more.

**Or**

$v = v \lambda$  (Derivation)

(a)  $340 = 256 \lambda$

$\lambda = 1.33 \text{ m}$

(b)  $340 = v (0.85)$

$v = 400 \text{ Hz}$

**38.** The fossil fuels like coal and petroleum contain small amounts of nitrogen and sulphur. When fossil fuels are burnt, it produces oxides of nitrogen and sulphur. These gases cause inhalation problems and in presence of rain forms acid rain. Burning of fossil fuels also increases the amount of suspended particles in air that reduce the visibility.

**Or**

**Hint**—The rocks are heated by the sun; they contract during night but not at same rate—resulting in cracks in rocks and ultimately to smaller particles.

**Appendix—1****DESIGN OF THE SAMPLE QUESTION PAPER****SCIENCE—CLASS—IX (THEORY)****Time: 3 Hours****Maximum Marks: 75****(1) Weightage to content/subject units**

<b>Number of questions from each theme</b>					
<b>S.No.</b>	<b>Theme</b>	<b>Marks</b>	<b>MCQ</b>	<b>SAQ</b>	<b>LAQ</b>
1.	Food	8	2	3	–
2.	Materials	17	4	4	1
3.	The world of the living	20	5	5	1
4.	Moving things people and Ideas	20	4	3	2
5.	Natural resources	10	1	2	1
	<b>Total</b>	<b>75</b>	<b>16</b>	<b>17</b>	<b>5</b>

**(2) Weightage to forms of questions**

<b>Form of question</b>	<b>Marks for each question</b>	<b>Number of questions</b>	<b>Total marks</b>
Multiple Choice Question (MCQ)	1	16	16
Short Answer Question (SAQ)	2	17	34
Long Answer Question (LAQ)	5	5	25
	<b>Total</b>	<b>38</b>	<b>75</b>

**(3) The Expected time for different types of questions would be as follows**

<b>S.No.</b>	<b>Form of questions</b>	<b>Approx. time for each question (minutes)</b>
1.	Multiple Choice Question (MCQ)	2
2.	Short Answer Question (MCQ)	5
3.	Long Answer Question (LAQ)	10

**(4) Weightage to difficulty level of questions**

<b>S.No.</b>	<b>Estimated difficulty level of questions</b>	<b>Percentage</b>
1.	Easy	20
2.	Average	60
3.	Difficult	20



## Definitions and symbols of the seven base units of the International System of Units (SI)

Base Quantity	Unit	Symbol	Definition
Length	metre	m	The metre is the length of path travelled by light in vacuum during a time interval of $1/299\,792\,458^*$ of a second (17 <sup>th</sup> CGPM, 1983).
Mass	kilogram	kg	The kilogram is the unit of mass; it is equal to the mass of the international prototype of the kilogram (3 <sup>rd</sup> CGPM, 1901).
Time	second	s	The second is the duration of 9192631770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium-133 atom (13 <sup>th</sup> CGPM, 1967).
Electric current	ampere	A	The ampere is that constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circular cross-section, and placed 1 metre apart in vacuum, would produce between these conductors a force equal to $2 \times 10^{-7}$ Newton per metre of length (9 <sup>th</sup> CGPM, 1948).
Thermodynamic temperature	kelvin	K	The kelvin, unit of thermodynamic temperature, is the fraction $1/273.16$ of the thermodynamic temperature of the triple point of water (13 <sup>th</sup> CGPM, 1967).
Amount of substance	mole	mol	The mole is the amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilogram of carbon-12. When the mole is used, the elementary entities must be specified and may be atoms, molecules, ions, electrons, other particles, or specified groups of such particles (14 <sup>th</sup> CGPM, 1971).
Luminous intensity	candela	cd	The candela is the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency $540 \times 10^{12}$ hertz and that has a radiant intensity in that direction of $(1/683)$ watt per steradian (16 <sup>th</sup> CGPM, 1979).

\*  $299\,792\,458$  m/s is the velocity of light vacuum

## Elements, their Symbol, Atomic Number and Molar Mass

Element	Symbol	Atomic Number	Molar mass/ (g mol <sup>-1</sup> )	Element	Symbol	Atomic Number	Molar mass/ (g mol <sup>-1</sup> )
Actinium	Ac	89	227.03	Mercury	Hg	80	200.59
Aluminium	Al	13	26.98	Molybdenum	Mo	42	95.94
Americium	Am	95	(243)	Neodymium	Nd	60	144.24
Antimony	Sb	51	121.75	Neon	Ne	10	20.18
Argon	Ar	18	39.95	Neptunium	Np	93	(237.05)
Arsenic	As	33	74.92	Nickel	Ni	28	58.71
Astatine	At	85	210	Niobium	Nb	41	92.91
Barium	Ba	56	137.34	Nitrogen	N	7	14.0067
Berkelium	Bk	97	(247)	Nobelium	No	102	(259)
Beryllium	Be	4	9.01	Osmium	Os	76	190.2
Bismuth	Bi	83	208.98	Oxygen	O	8	16.00
Bohrium	Bh	107	(264)	Palladium	Pd	46	106.4
Boron	B	5	10.81	Phosphorus	P	15	30.97
Bromine	Br	35	79.91	Platinum	Pt	78	195.09
Cadmium	Cd	48	112.40	Plutonium	Pu	94	(244)
Caesium	Cs	55	132.91	Polonium	Po	84	210
Calcium	Ca	20	40.08	Potassium	K	19	39.10
Californium	Cf	98	251.08	Praseodymium	Pr	59	140.91
Carbon	C	6	12.01	Promethium	Pm	61	(145)
Cerium	Ce	58	140.12	Protactinium	Pa	91	231.04
Chlorine	Cl	17	35.45	Radium	Ra	88	(226)
Chromium	Cr	24	52.00	Radon	Rn	86	(222)
Cobalt	Co	27	58.93	Rhenium	Re	75	186.2
Copper	Cu	29	63.54	Rhodium	Rh	45	102.91
Curium	Cm	96	247.07	Rubidium	Rb	37	85.47
Dubnium	Db	105	(263)	Ruthenium	Ru	44	101.07
Dysprosium	Dy	66	162.50	Rutherfordium	Rf	104	(261)
Einsteinium	Es	99	(252)	Samarium	Sm	62	150.35
Erbium	Er	68	167.26	Scandium	Sc	21	44.96
Europium	Eu	63	151.96	Seaborgium	Sg	106	(266)
Fermium	Fm	100	(257.10)	Selenium	Se	34	78.96
Fluorine	F	9	19.00	Silicon	Si	14	28.08
Francium	Fr	87	(223)	Silver	Ag	47	107.87
Gadolinium	Gd	64	157.25	Sodium	Na	11	22.99
Gallium	Ga	31	69.72	Strontium	Sr	38	87.62
Germanium	Ge	32	72.61	Sulphur	S	16	32.06
Gold	Au	79	196.97	Tantalum	Ta	73	180.95
Hafnium	Hf	72	178.49	Technetium	Tc	43	(98.91)
Hassium	Hs	108	(269)	Tellurium	Te	52	127.60
Helium	He	2	4.00	Terbium	Tb	65	158.92
Holmium	Ho	67	164.93	Thallium	Tl	81	204.37
Hydrogen	H	1	1.0079	Thorium	Th	90	232.04
Indium	In	49	114.82	Thulium	Tm	69	168.93
Iodine	I	53	126.90	Tin	Sn	50	118.69
Iridium	Ir	77	192.2	Titanium	Ti	22	47.88
Iron	Fe	26	55.85	Tungsten	W	74	183.85
Krypton	Kr	36	83.80	Ununbium	Uub	112	(277)
Lanthanum	La	57	138.91	Ununnilium	Uun	110	(269)
Lawrencium	Lr	103	(262.1)	Unununium	Uuu	111	(272)
Lead	Pb	82	207.19	Uranium	U	92	238.03
Lithium	Li	3	6.94	Vanadium	V	23	50.94
Lutetium	Lu	71	174.96	Xenon	Xe	54	131.30
Magnesium	Mg	12	24.31	Ytterbium	Yb	70	173.04
Manganese	Mn	25	54.94	Yttrium	Y	39	88.91
Mendelevium	Md	101	258.10	Zinc	Zn	30	65.37
				Zirconium	Zr	40	91.22

The value given in parenthesis is the molar mass of the isotope of largest known half-life.

# Chapter 1

## ANSWERS

### Multiple Choice Questions

1. (c)      2. (c)      3. (c)      4. (d)  
5. (c)      6. (a)      7. (b)      8. (c)  
9. (a)      10. (c)

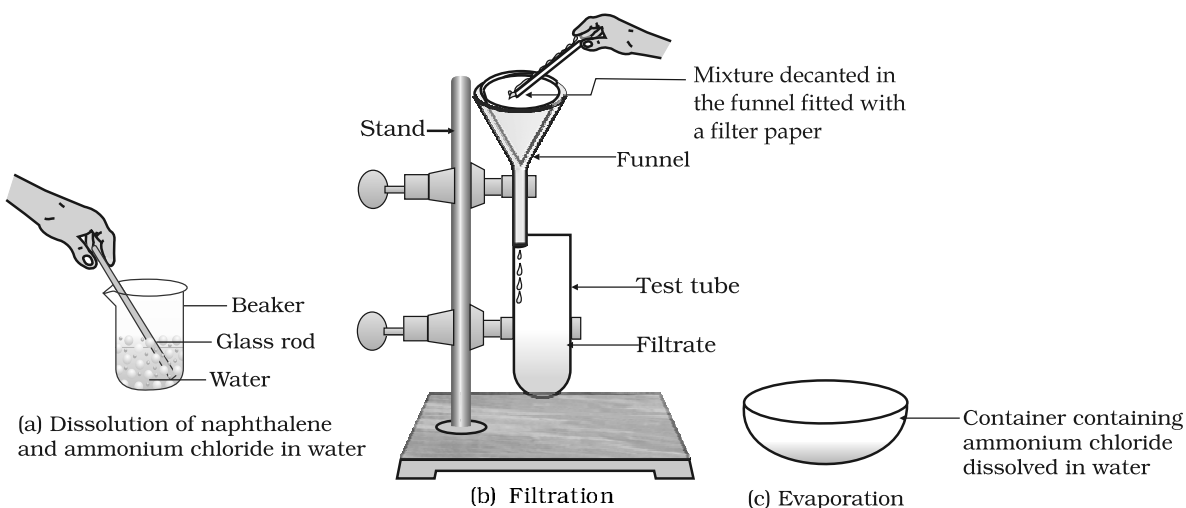
### Short Answer Questions

11. Its freezing point will be below  $0^{\circ}\text{C}$  due to the presence of a non-volatile impurity in it.
12. Since ice and water are in equilibrium, the temperature would be zero. When we heat the mixture, energy supplied is utilized in melting the ice and the temperature does not change till all the ice melts because of latent heat of fusion. On further heating, the temperature of the water would increase. Therefore the correct option is (d).
13. (a) cooling  
(b) stronger  
(c) liquid, gaseous  
(d) sublimation, liquid  
(e) evaporation
14. (a) — (iii)  
(b) — (iv)  
(c) — (v)  
(d) — (ii)  
(e) — (i)
15. (a) — (iv)  
(b) — (iii)  
(c) — (v)  
(d) — (ii)  
(e) — (i)
16. Yes, this is true. In both the phenomena, there is movement of particles from region of higher concentration to that of lower concentration. However, in the case of osmosis the movement of solvent is through a semi permeable membrane which is permeable only to water molecules.

17. (a) Osmosis  
(b) Diffusion  
(c) Osmosis  
(d) Osmosis  
(e) Osmosis  
(f) Diffusion  
(g) Diffusion
18. In case of ice the water molecules have low energy while in the case of steam the water molecules have high energy. The high energy of water molecules in steam is transformed as heat and may cause burns. On the other hand, in case of ice, the water molecules take energy from the body and thus give a cooling effect.
19. The temperature of both boiling water and steam is  $100^{\circ}\text{C}$ , but steam has more energy because of latent heat of vapourisation.
20. (a) The water will cool initially till it reaches  $0^{\circ}\text{C}$ , the freezing point. At this stage the temperature will remain constant till all the water will freeze. After this temperature would fall again.
21. (c) The rate of evaporation increases with an increase of surface area because evaporation is a surface phenomenon. Also, with the increase in air speed, the particles of water vapour will move away with the air, which will increase the rate of evaporation.
22. (a) Sublimation  
(b) The amount of heat required to convert 1 kg of solid into liquid at one atmosphere pressure at its melting point is known as its latent heat of fusion.

### Long Answer Questions

23. **Hint**— Naphthalene is insoluble in water but soluble in ether an organic solvent. It is volatile at room temperature. Ammonium chloride is soluble in water and volatile at higher temperature. It decomposes on heating to dryness.



24. Cotton being a better absorber of water than nylon helps in absorption of sweat followed by evaporation which leads to cooling. So Priyanshi is more comfortable, whereas Ali is not so comfortable.
25. Conditions that can increase the rate of evaporation of water are
- (a) an increase of surface area by spreading the shirt
  - (b) an increase in temperature by putting the shirt under the sun
  - (c) increase the wind speed by spreading it under the fan.
26. (a) Evaporation produces cooling as the particles at the surface of the liquid gain energy from the surroundings and change into vapour thereby producing a cooling effect.
- (b) Air around us cannot hold more than a definite amount of water vapour at a given temperature which is known as humidity. So, if the air is already rich in water vapour, it will not take up more water therefore, rate of evaporation of water will decrease.
- (c) A sponge has minute holes in which air is trapped. Also the material is not rigid. When we press it, the air is expelled out and we are able to compress it.
27. The temperature of a substance remains constant at its melting and boiling points until all the substance melts or boils because, the heat supplied is continuously used up in changing the state of the substance by overcoming the forces of attraction between the particles. This heat energy absorbed without showing any rise in temperature is given the name latent heat of fusion/latent heat of vapourisation.

# Chapter 2

## ANSWERS

### Multiple Choice Questions

1. (b)      2. (c)      3. (d)      4. (d)      5. (c)  
6. (c)      7. (a)      8. (c)      9. (d)

### Short Answer Questions

10. (a) Separation by using separating funnel  
(b) Sublimation  
(c) Filtration followed by evaporation  
**or**  
Centrifugation followed by evaporation/distillation  
(d) Separation by using separating funnel to separate kerosene oil followed by evaporation or distillation.
11. **Hint—** Look for the larger surface area. The presence of beads in tube (a) would provide a larger surface area for cooling.
12. Crystallization
13. Homogeneous— mixture of salts and water only  
Heterogeneous— contains salts, water, mud, decayed plant etc.
14. **Hint—** Distillation, since acetone is more volatile it will separate out first.
15. (a) Solid potassium chloride will separate out.  
(b) Initially the water will evaporate and then sugar will get charred.  
(c) Iron sulphide will be formed.
16. Particle size in a suspension is larger than those in a colloidal solution. Also molecular interaction in a suspension is not strong enough to keep the particles suspended and hence they settle down.
17. Both fog and smoke have gas as the dispersion medium. The only difference is that the dispersed phase in fog is liquid and in smoke it is a solid
18. Physical properties – (a) and (c)  
Chemical properties – (b) and (d)

19. 'C' has made the desired solution

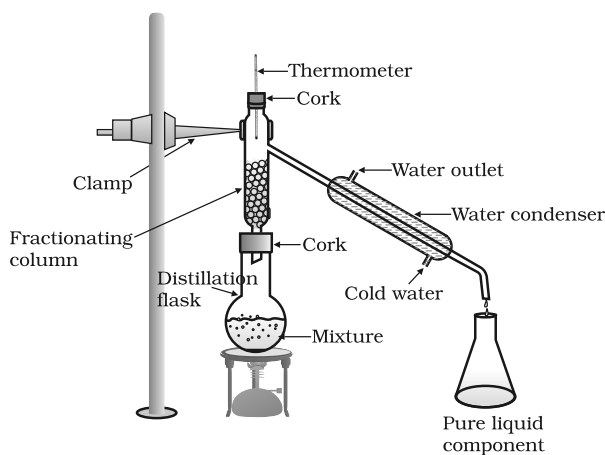
$$\begin{aligned}\text{Mass by volume \%} &= \frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100 \\ &= \frac{50}{100} \times 100 \\ &= 50 \% \text{ mass by volume}\end{aligned}$$

20. (a) Sublimation (f) Sedimentation  
(b) Diffusion (g) Scattering of light (Tyndall effect)  
(c) Dissolution/diffusion  
(d) Evaporation, diffusion  
(e) Centrifugation
21. Sample 'B' will not freeze at 0°C because it is not pure water. At 1 atm, the boiling point of pure water is 100°C and the freezing point of pure water is 0°C.
22. Pure gold is very soft as compared to gold alloyed with silver or copper. Thus for providing strength to gold, it is alloyed.
23. This element is a metal. Other characteristics expected to be possessed by the element are—lustre, malleability, heat and electrical conductivity.
24. (a) Evaporation or distillation  
(b) Distillation  
(c) Separation by using separating funnel  
(d) Sublimation  
(e) Chromatography
25. (a) heterogenous, centrifugation  
(b) physical, chemically  
(c) water, chloroform (hint— density of water is less than that of chloroform)  
(d) fractional distillation  
(e) scattering, Tyndall effect, colloidal
26. It is a pure substance because chemical composition of sugar crystals is same irrespective of its source.
27. **Hint**—Tyndall effect can be seen when light passes through a heterogeneous mixture. Example, when sunlight passes through the canopy of a dense forest.
28. **Hint**— Water and alcohol are miscible.

29. (a) Chemical change  
 (b) Acidic and basic solutions can be prepared by dissolving the products of the above process in water  
 $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2$  (basic solution)  
 $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$  (acidic solution)
30. (a) Iodine  
 (b) Bromine  
 (c) Graphite  
 (d) Carbon  
 (e) Sulphur, phosphorus  
 (f) Oxygen
31. **Elements** **Compounds**  
 Cu  $\text{CaCO}_3$   
 Zn  $\text{H}_2\text{O}$   
 $\text{F}_2$   
 $\text{O}_2$   
 Diamond (carbon)  
 Hg
32. Chlorine gas, Iron, Aluminium, Iodine, Carbon, Sulphur powder.

### Long Answer Questions

33. The fractionating column packed with glass beads provides a surface for the vapours to collide and lose energy so that they can be quickly condensed and distilled. Also length of the column would increase the efficiency.

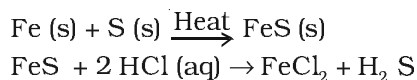


**Figure:** Fractional distillation



- 34. Hint-** (a) Homogenous mixture, because they have a uniform composition throughout  
 (b) No, solid solutions and gaseous solutions are also possible. Examples brass and air  
 (c) No, solution is a homogenous mixture of two or more substances

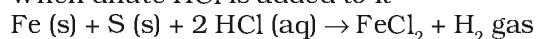
**35. Part A**



**Part B**

Fe (s) + S (s) → Mixture of iron filings and sulphur

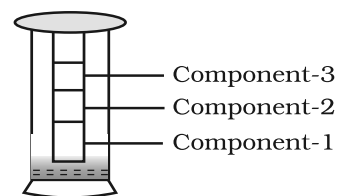
When dilute HCl is added to it



Sulphur remains unreacted

H<sub>2</sub>S gas formed has a foul smell and on passing through lead acetate solution, it turns the solution black. Hydrogen gas burns with a pop sound.

- 36. Hint-** (i) Three different bands will be observed.  
 (ii) Chromatography  
 (iii) To separate the pigments present in Chlorophyll.



- 37.** (a) Milk is a colloid and would show Tyndall effect.  
 (b) Salt solution is a true solution and would not scatter light.  
 (c) Detergent solution, sulphur solution.

- 38. Hint**—Physical changes —(a), (b), (e)  
 Chemical changes— (c), (d)

- 39.** (a) No.

$$\text{Mass \%} = \frac{\text{Mass of solute}}{\text{Mass of solute} + \text{Mass of solvent}} \times 100$$

(b) Solution made by Ramesh

$$\text{Mass \%} = \left( \frac{10}{10 + 100} \right) 100 = \frac{10}{110} \times 100 = 9.09\%$$

Solution made by Sarika

$$\text{Mass \%} = \frac{10}{100} \times 100 = 10\%$$

The solution prepared by Sarika has a higher mass % than that prepared by Ramesh.

**40. Hint-**

- Step-1 Separate iron filings with the help of a magnet  
Step-2 Sublimation of the remaining mixture separates ammonium chloride  
Step-3 Add water to the remaining mixture, stir and filter  
Step-4 The filtrate can be evaporated to get back sodium chloride.

**41. (c)**

$$\begin{aligned}\text{Mass \%} &= \frac{\text{Mass of solute}}{\text{Mass of solute} + \text{Mass of solvent}} \times 100 \\ &= \frac{0.01}{0.01 + 99.99} \times 100 \\ &= \frac{0.01}{100} \times 100 \\ &= 0.01 \text{ g}\end{aligned}$$

**42.** Let the mass of sodium sulphate required be =  $x$  g

The mass of solution would be =  $(x + 100)$  g

$x$  g of solute in  $(x + 100)$  g of solution

$$20\% = \frac{x}{x + 100} \times 100$$

$$20x + 2000 = 100x$$

$$80x = 2000$$

$$\begin{aligned}x &= \frac{2000}{80} \\ &= 25 \text{ g}\end{aligned}$$

# Chapter 3

## ANSWERS

### Multiple Choice Questions

1. (d)

(ii) 20 moles of water =  $20 \times 18 \text{ g} = 360 \text{ g}$  of water, because mass of 1 mole of water is the same as its molar mass, i.e., 18 g.

(iv)  $1.2044 \times 10^{25}$  molecules of water contains

$$\frac{1.2044 \times 10^{25}}{N_A} \text{ number of moles, } N_A = 6.023 \times 10^{23}$$

$$\therefore \frac{1.2044 \times 10^{25}}{6.022 \times 10^{23}} = 20 \text{ moles}$$

$$\begin{aligned} 20 \text{ moles of water} &= 20 \times 18 \text{ g} \\ &= 360 \text{ g of water.} \end{aligned}$$

2. (a) Inert gases exist in monoatomic form.

3. (b)

4. (d)

5. (c)

Weight of a sample in gram = number of moles  $\times$  molar mass

(a) 0.2 moles of  $\text{C}_{12}\text{H}_{22}\text{O}_{11} = 0.2 \times 342 = 68.4 \text{ g}$

(b) 2 moles of  $\text{CO}_2 = 2 \times 44 = 88 \text{ g}$

(c) 2 moles of  $\text{CaCO}_3 = 2 \times 100 = 200 \text{ g}$

(d) 10 moles of  $\text{H}_2\text{O} = 10 \times 18 = 180 \text{ g}$

6. (d)

$$\text{Number of atoms} = \frac{\text{Mass of substance} \times \text{Number of atoms in the molecule}}{\text{Molar mass}} \times N_A$$

$$\therefore \text{(a) } 18 \text{ g of water} = \frac{18 \times 3}{18} \times N_A = 3 N_A$$

$$\text{(b) } 18 \text{ g of oxygen} = \frac{18 \times 2}{32} \times N_A = 1.12 N_A$$

$$\text{(c) } 18 \text{ g of } \text{CO}_2 = \frac{18 \times 3}{44} \times N_A = 1.23 N_A$$

$$\text{(d) } 18 \text{ g of } \text{CH}_4 = \frac{18 \times 5}{16} \times N_A = 5.63 N_A$$

7. (c)

$$\begin{aligned} 1 \text{ g of H}_2 &= \frac{1}{2} \times N_A = 0.5 N_A \\ &= 0.5 \times 6.022 \times 10^{23} \\ &= 3.011 \times 10^{23} \end{aligned}$$

8. (a)

$$\begin{aligned} \text{Mass of one atom of oxygen} &= \text{Atomic mass} / N_A \\ &= \frac{16}{6.022 \times 10^{23}} \text{ g} \end{aligned}$$

9. (a)

$$\begin{aligned} \text{Number of moles of sucrose} &= \frac{\text{Mass of substance}}{\text{Molar mass}} \\ &= \frac{3.42 \text{ g}}{342 \text{ g mol}^{-1}} = 0.01 \text{ mol} \end{aligned}$$

$$\begin{aligned} 1 \text{ mol of sucrose (C}_{12}\text{H}_{22}\text{O}_{11}\text{)} &\text{ contains } = 11 \times N_A \text{ atoms of oxygen} \\ 0.01 \text{ mol of sucrose (C}_{12}\text{H}_{22}\text{O}_{11}\text{)} &\text{ contains } = 0.01 \times 11 \times N_A \text{ atoms of oxygen} \\ &= 0.11 \times N_A \text{ atoms of oxygen} \end{aligned}$$

$$\text{Number of moles of water} = \frac{18 \text{ g}}{18 \text{ g mol}^{-1}} = 1 \text{ mol}$$

$$\begin{aligned} 1 \text{ mol of water (H}_2\text{O)} &\text{ contains } 1 \times N_A \text{ atom of oxygen} \\ \text{Total number of oxygen atoms} &= \text{Number of oxygen atoms from sucrose} + \\ &\quad \text{Number of oxygen atoms from water} \\ &= 0.11 N_A + 1.0 N_A = 1.11 N_A \end{aligned}$$

$$\begin{aligned} \text{Number of oxygen atoms in solution} &= 1.11 \times \text{Avogadro's number} \\ &= 1.11 \times 6.022 \times 10^{23} \\ &= 6.68 \times 10^{23} \end{aligned}$$

10. (c)

## Short Answer Questions

11. (b)  $\text{BiPO}_4$  — Both ions are trivalent  
Bismuth phosphate

12. (a)  $\text{CuBr}_2$   
(b)  $\text{Al}(\text{NO}_3)_3$   
(c)  $\text{Ca}_3(\text{PO}_4)_2$   
(d)  $\text{Fe}_2\text{S}_3$   
(e)  $\text{HgCl}_2$   
(f)  $\text{Mg}(\text{CH}_3\text{COO})_2$

13.  $\text{CuCl}_2 / \text{CuSO}_4 / \text{Cu}_3(\text{PO}_4)_2$   
 $\text{NaCl} / \text{Na}_2\text{SO}_4 / \text{Na}_3\text{PO}_4$   
 $\text{FeCl}_3 / \text{Fe}_2(\text{SO}_4)_3 / \text{FePO}_4$
14. Anions Cations  
 (a)  $\text{CH}_3\text{COO}^-$   $\text{Na}^+$   
 (b)  $\text{Cl}^-$   $\text{Na}^+$   
 (c) It is a covalent compound  
 (d)  $\text{NO}_3^-$   $\text{NH}_4^+$
15. (a)  $\text{CaF}_2$  (e)  $\text{Na}_2\text{O}$   
 (b)  $\text{H}_2\text{S}$  (f)  $\text{CO}, \text{CO}_2$   
 (c)  $\text{NH}_3$   
 (d)  $\text{CCl}_4$
16. (a) Incorrect, the correct symbol of cobalt is Co  
 (b) Incorrect, the correct symbol of carbon is C  
 (c) Incorrect, the correct symbol of aluminium is Al  
 (d) Correct (He)  
 (e) Incorrect, the correct symbol of sodium is Na
17. (a)  $\text{NH}_3$  (b) CO (c) HCl (d)  $\text{AlF}_3$  (e) Mg S  
 N : H  $\times$  3 C : O H : Cl Al : F  $\times$  3 Mg : S  
 14 : 1  $\times$  3 12 : 16 1 : 35.5 27 : 19  $\times$  3 24 : 32  
 14 : 3 3 : 4 2 : 71 9 : 19 3 : 4
18. (a) 4 (b) 5  
 (c) 7 (d) 2

19.  $\sim 8/18$   
 Mass of one mole (Avogadro Number) of neutrons  $\sim 1$  g  
 Mass of one neutron =  $\frac{1}{\text{Avogadro Number } (N_A)}$  g  
 Mass of one molecule of water =  $\frac{\text{Molar mass}}{N_A} = \frac{18}{N_A}$  g  
 There are 8 neutrons in one atom of oxygen  
 Mass of 8 neutrons =  $\frac{8}{N_A}$   
 Fraction of mass of water due to neutrons  $\sim \frac{8}{18}$

- 20.** Yes, it is a temperature dependent property. The solubility generally, increases with increase in temperature. For example, you can dissolve more sugar in hot water than in cold water.
- 21.** (a) 2 (b) 3 (c) 3 (d) 8 (e) 4 (f) 4 (g) 14 (h) 3 (i) 2 (j) 5  
 (k) 1 (Noble gases do not combine and exist as monoatomic gases)  
 (l) Polyatomic. It is difficult to talk about the atomicity of metals as any measurable quantity will contain millions of atoms bound by metallic bond (about which you would learn later).
- 22.** On heating the powder, it will char if it is a sugar.  
 Alternatively, the powder may be dissolved in water and checked for its conduction of electricity. If it conducts, it is a salt.
- 23.** Number of moles =  $\frac{12}{24} = 0.5$  mol

### Long Answer Questions

- 24.** (a)  $\text{CO}_2$  has molar mass =  $44 \text{ g mol}^{-1}$   
 5 moles of  $\text{CO}_2$  have molar mass =  $44 \times 5$   
 =  $220 \text{ g}$   
 $\text{H}_2\text{O}$  has molar mass =  $18 \text{ g mol}^{-1}$   
 5 moles of  $\text{H}_2\text{O}$  have mass =  $18 \times 5 \text{ g}$   
 =  $90 \text{ g}$
- (b) Number of moles in 240g Ca metal =  $\frac{240}{40} = 6$   
 Number of moles in 240g of Mg metal =  $\frac{240}{24} = 10$   
 Ratio 6:10  
 3: 5
- 25.** (a)  $\text{Ca CO}_3$  (b)  $\text{MgCl}_2$  (c)  $\text{H}_2\text{SO}_4$   
 Ca : C : O  $\times 3$  Mg : Cl  $\times 2$  H  $\times 2$  : S : O  $\times 4$   
 40 : 12 : 16 $\times 3$  24 : 35.5  $\times 2$  1  $\times 2$  : 32 : 16  $\times 4$   
 40 : 12 : 48 24 : 71 2 : 32 : 64  
 10 : 3 : 12 1 : 16 : 32
- (d)  $\text{C}_2\text{H}_5\text{OH}$  (e)  $\text{NH}_3$  (f)  $\text{Ca(OH)}_2$   
 C  $\times 2$  : H  $\times 6$  : O N : H  $\times 3$  Ca : O  $\times 2$  : H  $\times 2$   
 12  $\times 2$  : 1  $\times 6$  : 16 14 : 1  $\times 3$  40 : 16  $\times 2$  : 1  $\times 2$   
 24 : 6 : 16 14 : 3 40 : 32 : 2  
 12 : 3 : 8 20 : 16 : 1

- 26.** 1 mole of calcium chloride = 111 g  
 $\therefore$  222 g of  $\text{CaCl}_2$  is equivalent to 2 moles of  $\text{CaCl}_2$   
 Since 1 formula unit  $\text{CaCl}_2$  gives 3 ions, therefore, 1 mol of  $\text{CaCl}_2$  will give 3 moles of ions  
 2 moles of  $\text{CaCl}_2$  would give  $3 \times 2 = 6$  moles of ions.  
 No. of ions = No. of moles of ions  $\times$  Avogadro number  
 $= 6 \times 6.022 \times 10^{23}$   
 $= 36.132 \times 10^{23}$   
 $= 3.6132 \times 10^{24}$  ions
- 27.** A sodium atom and ion, differ by one electron. For 100 moles each of sodium atoms and ions there would be a difference of 100 moles of electrons.  
 Mass of 100 moles of electrons = 5.48002 g  
 Mass of 1 mole of electron =  $\frac{5.48002}{100}$  g  
 Mass of one electron =  $\frac{5.48002}{100 \times 6.022 \times 10^{23}}$  =  $9.1 \times 10^{-28}$  g  
 $= 9.1 \times 10^{-31}$  kg
- 28.** Molar mass of  $\text{HgS} = 200.6 + 32 = 232.6 \text{ g mol}^{-1}$   
 Mass of Hg in 232.6 g of  $\text{HgS} = 200.6 \text{ g}$   
 Mass of Hg in 225 g of  $\text{HgS} = \frac{200.6}{232.6} \times 225 = 194.04 \text{ g}$
- 29.** One mole of screws weigh =  $2.475 \times 10^{24} \text{ g} = 2.475 \times 10^{21} \text{ kg}$   
 $\frac{\text{Mass of the Earth}}{\text{Mass of 1 mole of screws}} = \frac{5.98 \times 10^{24} \text{ kg}}{2.475 \times 10^{21} \text{ kg}} = 2.4 \times 10^3$   
 Mass of earth is  $2.4 \times 10^3$  times the mass of screws  
 The earth is 2400 times heavier than one mole of screws.
- 30.** 1 mole of oxygen atoms =  $6.023 \times 10^{23}$  atoms  
 $\therefore$  Number of moles of oxygen atoms =  $\frac{2.58 \times 10^{24}}{6.022 \times 10^{23}}$   
 $= 4.28 \text{ mol}$   
 4.28 moles of oxygen atoms.
- 31.** (a) Mass of sodium atoms carried by Krish =  $(5 \times 23) \text{ g} = 115 \text{ g}$   
 While mass of carbon atom carried by Raunak =  $(5 \times 12) \text{ g} = 60 \text{ g}$   
 Thus, Krish's container is heavy  
 (b) Both the bags have same number of atoms as they have same number of moles of atoms

32.

Species	H <sub>2</sub> O	CO <sub>2</sub>	Na atom	MgCl <sub>2</sub>
<b>Property</b>				
No. of moles	2	0.5	5	0.5
No of particles	$1.2044 \times 10^{24}$	$3.011 \times 10^{23}$	$3.011 \times 10^{24}$	$3.011 \times 10^{23}$
Mass	36g	22g	115g	47.5g

33. Number of moles of stars =  $\frac{10^{22}}{6.023 \times 10^{23}}$   
 = 0.0166 mols

34. (a) kilo (b) deci (c) centi (d) micro (e) nano (f) pico

35. (a)  $5.84 \times 10^{-9}$  kg  
 (b)  $5.834 \times 10^{-2}$  kg  
 (c)  $5.84 \times 10^{-4}$  kg  
 (d)  $5.873 \times 10^{-24}$  kg

36. A Mg<sup>2+</sup> ion and Mg atom differ by two electrons.  
 10<sup>3</sup> moles of Mg<sup>2+</sup> and Mg atoms would differ by  
 10<sup>3</sup> × 2 moles of electrons  
 Mass of 2 × 10<sup>3</sup> moles of electrons =  $2 \times 10^3 \times 6.023 \times 10^{23} \times 9.1 \times 10^{-31}$  kg  
 ⇒  $2 \times 6.022 \times 9.1 \times 10^{-5}$  kg  
 ⇒  $109.6004 \times 10^{-5}$  kg  
 ⇒  $1.096 \times 10^{-3}$  kg

37. (i) 100 g of N<sub>2</sub> =  $\frac{100}{28}$  moles

$$\text{Number of molecules} = \frac{100}{28} \times 6.022 \times 10^{23}$$

$$\text{Number of atoms} = \frac{2 \times 100}{28} \times 6.022 \times 10^{23} = 43.01 \times 10^{23}$$

(ii) 100 g of NH<sub>3</sub> =  $\frac{100}{17}$  moles =  $\frac{100}{17} \times 6.022 \times 10^{23}$  molecules

$$= \frac{100}{17} \times 6.022 \times 10^{23} \times 4 \text{ atoms}$$

$$= 141.69 \times 10^{23}$$

NH<sub>3</sub> would have more atoms



**38.**  $5.85 \text{ g of NaCl} = \frac{5.85}{58.5} = 0.1 \text{ moles}$

or 0.1 moles of NaCl particle

Each NaCl particle is equivalent to one  $\text{Na}^+$  one  $\text{Cl}^-$

$\Rightarrow 2$  ions

$\Rightarrow \text{Total moles of ions} = 0.1 \times 2$

$\Rightarrow 0.2 \text{ moles}$

No. of ions =  $0.2 \times 6.022 \times 10^{23}$

$\Rightarrow 1.2042 \times 10^{23}$  ions

**39.** One gram of gold sample will contain  $\frac{90}{100} = 0.9 \text{ g of gold}$

$$\text{Number of moles of gold} = \frac{\text{Mass of gold}}{\text{Atomic mass of gold}}$$

$$= \frac{0.9}{197} = 0.0046$$

One mole of gold contains  $N_A$  atoms =  $6.022 \times 10^{23}$

$\therefore 0.0046$  mole of gold will contain =  $0.0046 \times 6.022 \times 10^{23}$   
 $= 2.77 \times 10^{21}$

**40.** Atoms of different elements join together in definite proportions to form molecules of compounds. Examples— water, ammonia, carbon dioxide. Compounds composed of metals and non-metals contain charged species. The charged species are known as ions. An ion is a charged particle and can be negatively or positively charged. A negatively charged ion is called an anion and the positively charged ion is called cation. Examples— sodium chloride, calcium oxide.

**41.** Mass of 1 mole of aluminium atom = the molar mass of aluminium  
 $= 27 \text{ g mol}^{-1}$

An aluminium atom needs to lose three electrons to become an ion,  $\text{Al}^{3+}$

For one mole of  $\text{Al}^{3+}$  ion, three moles of electrons are to be lost.

The mass of three moles of electrons =  $3 \times (9.1 \times 10^{-28}) \times 6.022 \times 10^{23} \text{ g}$

$$= 27.3 \times 6.022 \times 10^{-5} \text{ g}$$

$$= 164.400 \times 10^{-5} \text{ g}$$

$$= 0.00164 \text{ g}$$

$$\text{Molar mass of } \text{Al}^{3+} = (27 - 0.00164) \text{ g mol}^{-1}$$

$$= 26.9984 \text{ g mol}^{-1}$$

$$\text{Difference} = 27 - 26.9984$$

$$= 0.0016 \text{ g}$$

42. Mass of silver = m g

$$\text{Mass of gold} = \frac{m}{100} \text{ g}$$

$$\begin{aligned}\text{Number of atoms of silver} &= \frac{\text{Mass}}{\text{Atomic mass}} \times N_A \\ &= \frac{m}{108} \times N_A\end{aligned}$$

$$\text{Number of atoms of gold} = \frac{m}{100 \times 197} \times N_A$$

Ratio of number of atoms of gold to silver = Au : Ag

$$\begin{aligned}&= \frac{m}{100 \times 197} \times N_A : \frac{m}{108} \times N_A \\ &= 108 : 100 \times 197 \\ &= 108 : 19700 \\ &= 1 : 182.41\end{aligned}$$

43. Mass of 1 molecule of  $\text{CH}_4 = \frac{16 \text{ g}}{N_A}$

$$\text{Mass of } 1.5 \times 10^{20} \text{ molecules of methane} = \frac{1.5 \times 10^{20} \times 16}{N_A} \text{ g}$$

$$\text{Mass of 1 molecule of } \text{C}_2\text{H}_6 = \frac{30}{N_A} \text{ g}$$

$$\text{Mass of molecules of } \text{C}_2\text{H}_6 \text{ is} = \frac{1.5 \times 10^{20} \times 16}{N_A} \text{ g}$$

$$\therefore \text{Number of molecules of ethane} = \frac{1.5 \times 10^{20} \times 16}{N_A} \times \frac{N_A}{30} = 0.8 \times 10^{20}$$

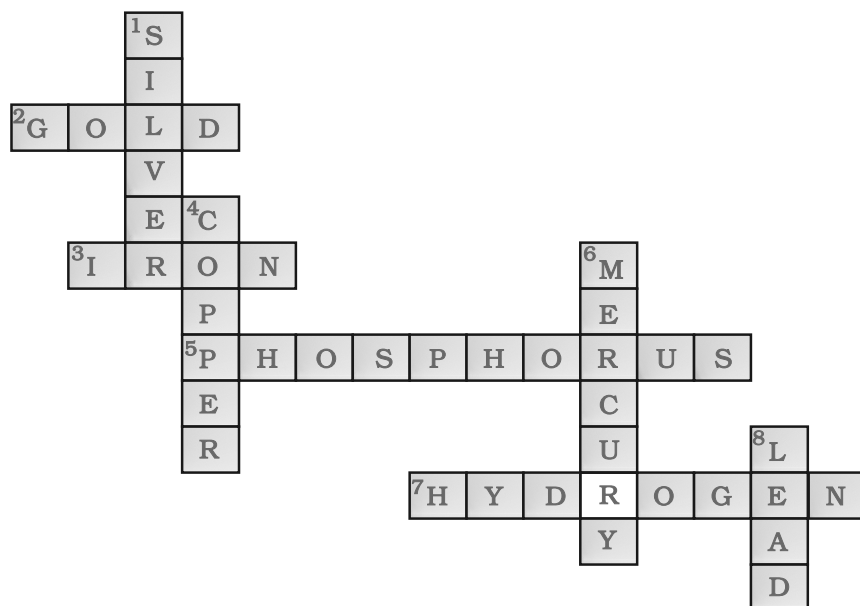
44. (a) Law of conservation of mass

(b) Polyatomic ion

(c)  $(3 \times \text{atomic mass of Ca}) + (2 \times \text{atomic mass of phosphorus}) + (8 \times \text{atomic mass of oxygen}) = 310$

(d)  $\text{Na}_2\text{CO}_3 \cdot (\text{NH}_4)_2\text{SO}_4$

45.



46 (a)



(b) Six: Helium (He); Neon (Ne); Argon (Ar); Krypton (Kr); Xenon (Xe); Radon (Rn).

47. (a) KOH

$$(39 + 16 + 1) = 56 \text{ g mol}^{-1}$$

(b) NaHCO<sub>3</sub>

$$23 + 1 + 12 + (3 \times 16) = 84 \text{ g mol}^{-1}$$

(c) CaCO<sub>3</sub>

$$40 + 12 + (3 \times 16) = 100 \text{ g mol}^{-1}$$

(d) NaOH

$$23 + 16 + 1 = 40 \text{ g mol}^{-1}$$

(e)  $C_2H_5OH = C_2H_6O$   
 $2 \times 12 + (6 \times 1) + 16 = 46 \text{ g mol}^{-1}$

(f) NaCl  
 $23 + 35.5 = 58.5 \text{ g mol}^{-1}$



1 mole of glucose needs 6 moles of water

180 g of glucose needs (6×18) g of water

1 g of glucose will need  $\frac{108}{180}$  g of water.

18 g of glucose would need  $\frac{108}{180} \times 18 \text{ g of water} = 10.8 \text{ g}$

Volume of water used =  $\frac{\text{Mass}}{\text{Density}} = \frac{10.8 \text{ g}}{1 \text{ g cm}^{-3}} = 10.8 \text{ cm}^3$ .

# Chapter 4

## ANSWERS

### Multiple Choice Questions

1. (b)      2. (c)      3. (a)      4. (d)  
5. (a)      6. (d)      7. (a)      8. (b)  
9. (b)      10. (d)      11. (c)      12. (c)  
13. (d)      14. (c)      15. (a)      16. (c)  
17. (a)      18. (c)

### Short Answer Questions

19. Yes, it is true for hydrogen atom which is represented as  ${}^1_1\text{H}$   
20. **Hint**— Discovery of electrons and protons  
21. **Hint**— No,  ${}^{35}\text{Cl}$  and  ${}^{37}\text{Cl}$  are isotopes of an element.  
22. **Hint**— gold has high malleability  
23. (a) 0  
(b) 1  
24. + 1  
25. 2, 8, 7. The L shell has eight electrons  
26. -2

27.

	Atomic No.	Mass No.	Valency
X	5	11	3
Y	8	18	2
Z	15	31	3,5

28. **Hint**— No, the statement is incorrect. In an atom the number of protons and electrons is always equal.  
29. Mass number = No. of protons + No. of neutrons = 31  
 $\therefore$  Number of neutrons = 31 - number of protons  
= 31 - 15  
= 16

30. (a) (iii)    (b) (iv)    (c) (i)    (d) (ii)  
 (e) (vi)    (f) (vii)    (g) (v)

31. Isobars

32.

Element	$n_p$	$n_n$
Cl	17	18
C	6	6
Br	35	46

33. Helium atom has 2 electrons in its outermost shell and its duplet is complete. Hence the valency is zero.
34. (a) atomic nucleus  
 (b) atomic number, mass number  
 (c) 0 and 1.  
 (d) Silicon—2, 8, 4  
 Sulphur— 2, 8, 6
35. Valency is zero as K shell is completely filled.

### Long Answer Questions

36. Helium has two electrons in its only energy shell, while Argon and Neon have 8 electrons in their valence shells. As these have maximum number of electrons in their valence shells, they do not have any tendency to combine with other elements. Hence, they have a valency equal to zero.
37. (i) Volume of the sphere =  $\frac{4}{3} \pi r^3$

Let R be the radius of the atom and r be that of the nucleus.  
 $\Rightarrow R = 10^5 r$

$$\begin{aligned} \text{Volume of the atom} &= \frac{4}{3} \pi R^3 = \frac{4}{3} \pi (10^5 r)^3 \quad (\because R = 10^5 r) \\ &= \frac{4}{3} \pi r^3 \times 10^{15} \end{aligned}$$

$$\text{Volume of the nucleus} = \frac{4}{3} \pi r^3$$

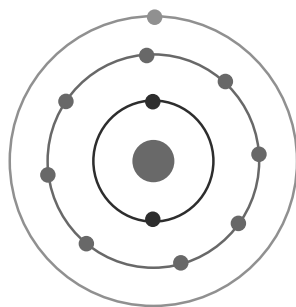
$$\text{Ratio of the size of atom to that of nucleus} = \frac{\frac{4}{3} \times 10^{15} \times \pi r^3}{\frac{4}{3} \pi r^3} = 10^{15}$$

- (ii) If the atom is represented by the planet earth ( $R_e = 6.4 \times 10^6 \text{ m}$ ) then the radius of the nucleus would be  $r_n = \frac{R_e}{10^5}$

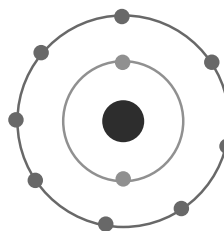
$$\begin{aligned} r_n &= \frac{6.4 \times 10^6 \text{ m}}{10^5} \\ &= 6.4 \times 10 \text{ m} \\ &= 64 \text{ m.} \end{aligned}$$

- 38.** Rutherford concluded from the  $\alpha$ -particle scattering experiment that—
- Most of the space inside the atom is empty because most of the  $\alpha$ -particles passed through the gold foil without getting deflected.
  - Very few particles were deflected from their path, indicating that the positive charge of the atom occupies very little space.
  - A very small fraction of  $\alpha$ -particles were deflected by  $180^\circ$ , indicating that all the positive charges and mass of the gold atom were concentrated in a very small volume within the atom.
- From the data he also calculated that the radius of the nucleus is about  $10^5$  times less than the radius of the atom.
- 39.** Rutherford proposed a model in which electrons revolve around the nucleus in well-defined orbits. There is a positively charged centre in an atom called the nucleus. He also proposed that the size of the nucleus is very small as compared to the size of the atom and nearly all the mass of an atom is centred in the nucleus. Whereas, Thomson proposed the model of an atom to be similar to a christmas pudding. The electrons are studded like currants in a positively charged sphere like christmas pudding and the mass of the atom was supposed to be uniformly distributed.
- 40.** The orbital revolution of the electron is not expected to be stable. Any particle in a circular orbit would undergo a acceleration and the charged particles would radiate energy. Thus, the revolving electron would lose energy and finally fall into the nucleus. If this were so, the atom should be highly unstable and hence matter would not exist in the form that we know.
- 41.** The postulates put forth by Neils Bohr's about the model of an atom:
- Only certain special orbits known as discrete orbits of electrons, are allowed inside the atom.
  - While revolving in discrete orbits the electrons do not radiate energy.
- These orbits are called energy levels. Energy levels in an atom are shown by circles.
- These orbits are represented by the letters K, L, M, N, ... or the numbers,  $n=1, 2, 3, 4, \dots$

42.



Sodium atom



Sodium ion

Since the atomic number of sodium atom is 11, it has 11 electrons. A positively charged sodium ion ( $\text{Na}^+$ ) is formed by the removal of one electron from a sodium atom. So, a sodium ion has  $11-1 = 10$  electrons in it. Thus, electronic distribution of sodium ion will be 2, 8. The atomic number of an element is equal to the number of protons in its atom. Since, sodium atom and sodium ion contain the same number of protons, therefore, the atomic number of both is 11.

43. % of  $\alpha$ -particles deflected more than  $50^\circ = 1\%$  of  $\alpha$ -particles.

% of  $\alpha$ -particles deflected less than  $50^\circ = 100-1 = 99\%$

Number of  $\alpha$ -particles bombarded = 1 mole =  $6.022 \times 10^{23}$  particles

Number of particles that deflected at an angle less than  $50^\circ$

$$= \frac{99}{100} \times 6.022 \times 10^{23}$$

$$= \frac{596.178}{100} \times 10^{23}$$

$$= 5.96 \times 10^{23}$$



# Chapter 5

## ANSWERS

### Multiple Choice Questions

- |         |         |         |         |
|---------|---------|---------|---------|
| 1. (c)  | 2. (b)  | 3. (c)  | 4. (c)  |
| 5. (c)  | 6. (a)  | 7. (b)  | 8. (b)  |
| 9. (a)  | 10. (a) | 11. (c) | 12. (a) |
| 13. (d) | 14. (d) | 15. (d) | 16. (b) |
| 17. (a) | 18. (b) | 19. (c) | 20. (c) |
| 21. (a) | 22. (b) | 23. (a) | 24. (b) |
| 25. (a) | 26. (a) | 27. (b) | 28. (c) |
| 29. (d) |         |         |         |

### Short Answer Questions

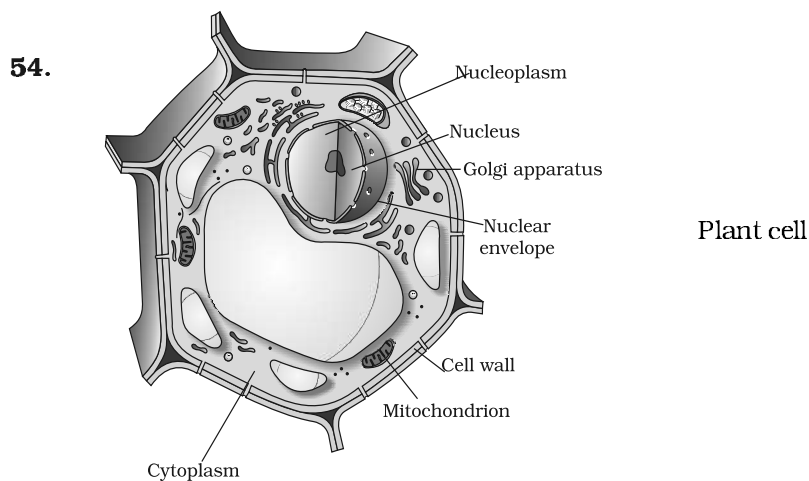
30. Lysosomes are known as 'suicide-bags' because when cell gets damaged during the disturbance in cellular metabolism, lysosomes may burst and the digestive enzymes thus released digest their own cell.
31. **Hint**— Cell → tissue → organ → organ system → organism
32. Soap solution is very concentrated - Hypertonic solution, so water moves out of your finger cells by osmosis.
33. **Hint**— Cell wall is absent in animals
34. Exosmosis in intestine causes dehydration
35. Ribosomes
36. Diffusion and osmosis respectively
37. Exosmosis
38. **Hint**— (b) Onion peel has cell wall and RBC does not have cell wall
39. **Hint**— Small vesicles associated with plasma membrane
40. a—iv; b—v; c—iii; d—i; e—ii

41. Flower and Fruit— Chromoplast  
Leaves of the plant— Chloroplast  
Root of the plant— Leucoplast
42. (a) Endoplasmic reticulum (b) Mitochondria  
(c) Golgi body (d) Lysosome  
(e) Vacuole (f) Chloroplast  
(g) Nucleus
43. **Hint**— Bacterial cell is a prokaryote  
Onion peel cell is a plant cell— an eukaryote
44. **Hint**—Diffusion and osmosis
45. **Hint**—Endocytosis
46. **Hint**—Mitochondria and plastids
47. **Hint**—Remove debris of the cell
48. **Hint**—Nucleus
49. **Hint**—(a) Leucoplast (b) Chloroplast (c) Chromoplast
50. **Hint**—Vacuoles not only store many important substances, they also contain cell sap that give turgidity to cell.
51. **Hint**—Chromosomes are made up of chromatids and chromatids are made up of chromatin
52. (a) Exosmosis (b) Endosmosis (c) No effect

### Long Answer Type Questions

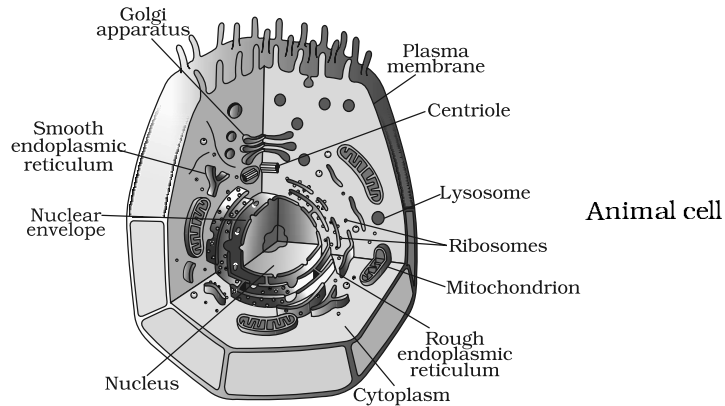
53. **Hint**— (a) Nucleus  
(b) Golgi apparatus  
(c) Cell wall  
(d) Cytoplasm  
(e) Nucleoplasm.

Diagram of the plant cell can be drawn and label it with parts mentioned above



Plant Cell	Animal Cell
1. Cell wall present	1. Cell wall absent
2. Plastids are present	2. Plastids are absent
3. It has a large vacuole	3. It has a small vacuole
4. Centriole absent	4. Centriole present

55.



56. Any electron microscopic diagram of Nucleus can be drawn. It is a membrane bound organelle.

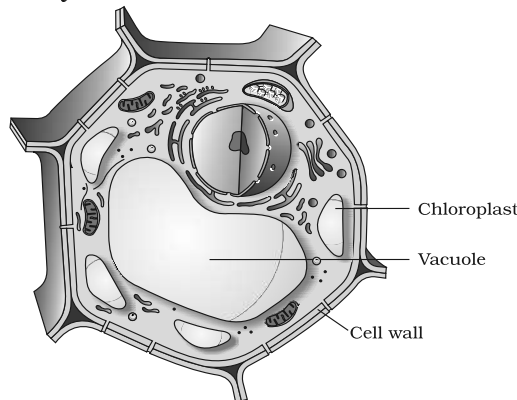
57. The ribosomes, which are present in all active cells, are the sites of protein synthesis. Endoplasmic reticulum helps in transporting these proteins to various places. The smooth endoplasmic reticulum help in manufacture of fat and lipids which alongwith proteins help in building the cell membrane.

Smooth Endoplasmic Reticulum (SER)	Rough Endoplasmic Reticulum (RER)
SER has no ribosomal particles on the surface, hence look smooth SER helps in the manufacture of lipids and fat molecules	RER has particles of ribosome on the surface. Ribosomes are the sites of protein synthesis.

58. **Hints**—(a) First it swells due to endosmosis and then exosmosis occurs and it shrinks. (b) It will lose water and shrink. (c) The cell will die. (d) The cell gets killed on boiling so no plasmolysis (d) All sorts of vesicle formation stops.

59.

Plant cell



# Chapter 6

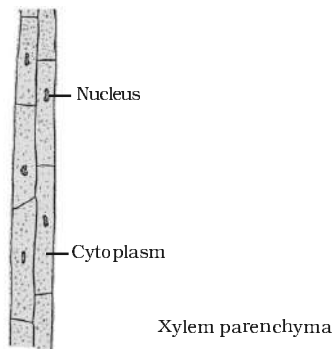
## ANSWERS

### Multiple Choice Questions

- |         |         |         |         |
|---------|---------|---------|---------|
| 1. (b)  | 2. (c)  | 3. (b)  | 4. (b)  |
| 5. (b)  | 6. (c)  | 7. (d)  | 8. (b)  |
| 9. (c)  | 10. (c) | 11. (c) | 12. (c) |
| 13. (b) | 14. (b) | 15. (c) | 16. (b) |
| 17. (c) | 18. (c) | 19. (c) | 20. (b) |
| 21. (d) | 22. (b) | 23. (a) | 24. (a) |
| 25. (d) | 26. (d) | 27. (c) | 28. (a) |
| 29. (a) | 30. (c) | 31. (b) | 32. (c) |
| 33. (c) |         |         |         |

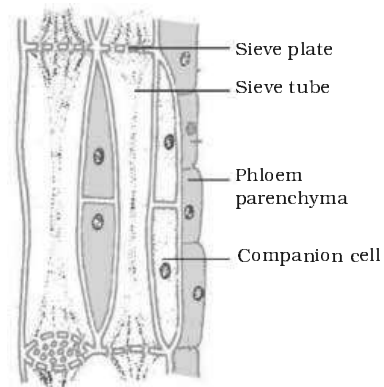
### Short Answer Questions

34. **Hint**— Fat acts as subcutaneous insulation of body for thermoregulation
35. a—v;                    b—iv;                    c—iii;                    d—i;                    e—ii;                    f—vi;
36. a—i;                    b—ii                    c—iv;                    d—iii;                    e—v;
37. **Hint**— Because of transpiration
38. **Hint**— Xylem consists of tracheids, vessels, xylem parenchyma and xylem fibres.



39. **Hint**—Sieve tubes, companion cells, phloem fibres and phloem parenchyma.

Section of phloem

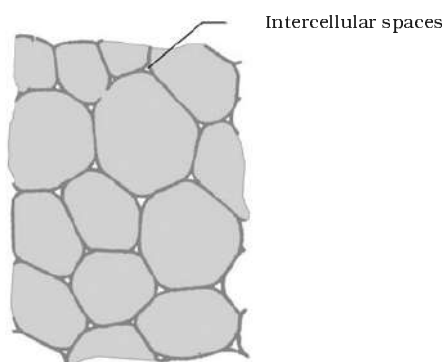


40. (a)—T, (b)—T, (c)—F, (d)—T, (e)—F
41. Voluntary muscles can be moved by conscious will when we want them to move. For example, muscles of limbs or skeletal muscles. Involuntary muscles function on their own. We cannot start or stop them from working by our desire. examples are cardiac muscles and smooth muscles.
42. (a)—V, (b)—I V, (c)—V, (d)—I V
43. (a) squamous epithelium  
(b) columnar epithelium  
(c) cuboidal epithelium  
(d) respiratory tract
44. **Hint**— Due to aerenchyma present in the swollen petiole.
45. **Hint**- Epidermis having thick cuticle and waxy substances to prevent the invasion of parasites.
46. (a) suberin (b) sieve tubes (c) calcium and phosphorus
47. **Hint**—Epidermis is important for plants due to the following reasons  
(i) it gives protection  
(ii) helps in gaseous exchange  
(iii) checks water loss  
(iv) root hairs arising from epidermis helps in absorption of water and minerals.
48. (a) Xylem and phloem  
(b) Stomata  
(c) Suberin  
(d) Sclerenchyma  
(e) Collenchyma  
(f) Xylem; phloem  
(g) Water; minerals  
(h) food; leaf

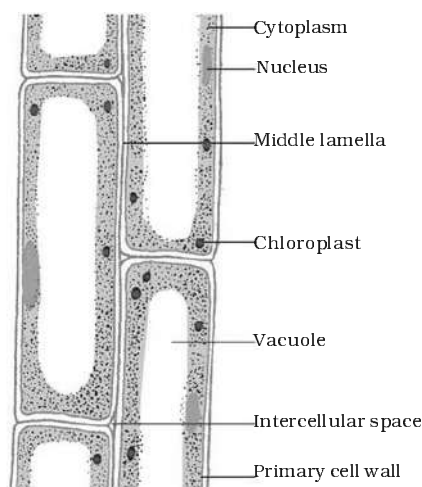
## Long Answer Questions

49. Differences between parenchyma and sclerenchyma.

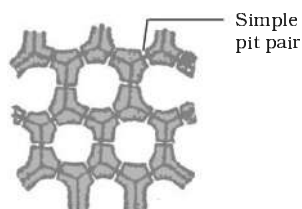
Parenchyma	Sclerenchyma
(1) Cells are thin walled and un specialised	(1) Cells are thick walled and lignified
(2) These are living cells	(2) Tissues are made up of dead cells
(3) Cells are usually loosely packed with large intercellular space	(3) No intercellular spaces between the cells are found
(4) Stores nutrient and water in stem and roots	(4) Provides strength to the plant parts
(5) Some cells contain chlorophyll called chlorenchyma and perform photosynthesis. Other cells have large air cavities called aerenchyma which provide buoyancy to the hydrophytic plants	(5) The cells are long and narrow, make the plant hard and stiff. The tissue is present in the stem around vascular bundles, in veins of leaves and hard covering of seeds and nuts.



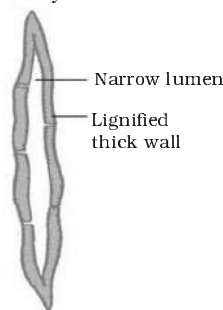
T.S. Parenchyma



L.S. Parenchyma



T.S. Sclerenchyma



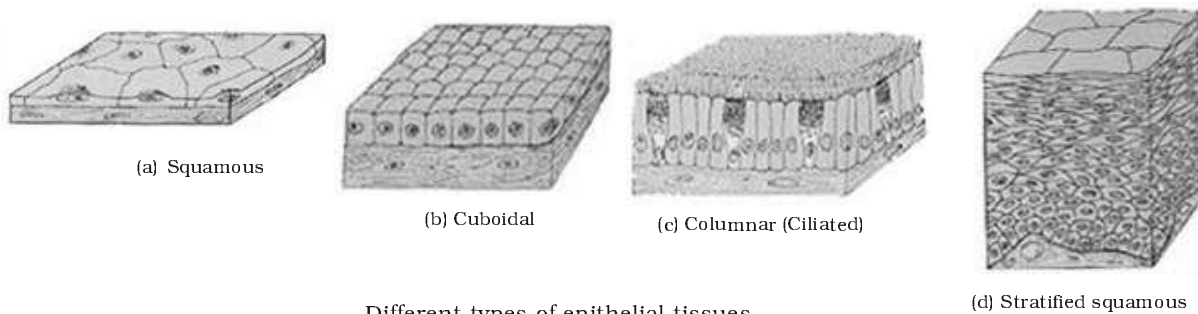
L.S. Sclerenchyma

- 50.** Epithelial tissues are the covering or protective tissues in the animal body. Epithelium covers most organs and cavities within the body and keep different body systems separate. The skin, the lining of the mouth, the lining of blood vessels, lung alveoli and kidney tubules are all made of epithelial tissue. Epithelial tissue cells are tightly packed and form a continuous sheet. They have only a small amount of cementing material between them and almost no intercellular spaces. The permeability of the cells of various epithelia play an important role in regulating the exchange of materials between the body and the external environment and also between different parts of the body. Regardless of the type, all epithelia are usually separated from the underlying tissue by an extracellular fibrous basement membrane.

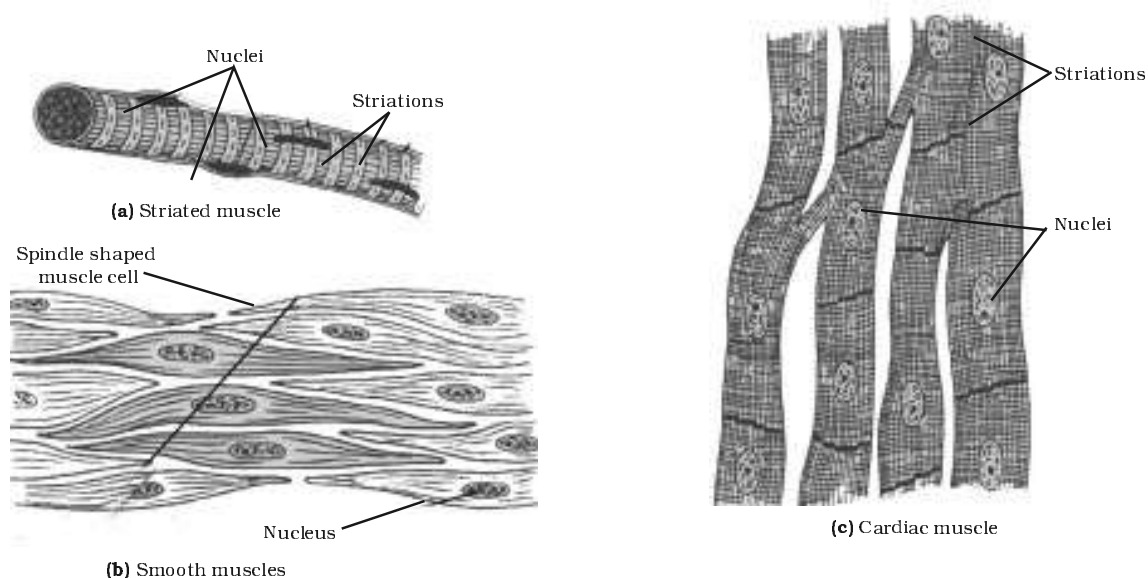
Epithelial tissues are of following types— (1) Simple squamous epithelium (2) Stratified squamous epithelium (3) Columnar epithelium, and (4) Cuboidal epithelium. These tissues differ in structure that correlate with their unique functions. For example, in cells lining blood vessels or lung alveoli, where transportation of substances occurs through a selectively permeable surface, there is a simple flat kind of epithelium. This is called the simple squamous epithelium. Simple squamous epithelial cells are extremely thin and flat and form a delicate lining. The skin, oesophagus and the lining of the mouth are also covered with squamous epithelium. Skin epithelial cells are arranged in many layers to prevent wear and tear. Since, they are arranged in a pattern of layers, the epithelium is called stratified squamous epithelium.

Where absorption and secretion occur, as in the inner lining of the intestine, tall epithelial cells are present. This columnar epithelium facilitates movement across the epithelial barrier. In the respiratory tract, the columnar epithelial tissue also has cilia, which are hair-like projections on the outer surfaces of epithelial cells. These cilia can move, and their movement pushes the mucus forward to clear it. This type of epithelium is thus ciliated columnar epithelium.

Cuboidal epithelium forms the lining of kidney tubules and ducts of salivary glands, where it provides mechanical support. Epithelial cells often acquire additional specialisation as gland cells, which can secrete substances at the epithelial surface. Sometimes a portion of the epithelial tissue folds inward, and a multicellular gland is formed. This is glandular epithelium.



51.



52. **Hint—**

- (a) No need of storage.
- (b) Because they are lignified.
- (c) Presence of stone cells (sclerenchyma)
- (d) Presence of Collenchyma.
- (e) Sclerenchyma.

53. **Characteristics**

- a)
  - Cells of cork are dead at maturity
  - These cells are compactly arranged
  - Cells do not possess intercellular spaces.
  - Cells possess a chemical substances suberin in their walls
  - They are several layers thick.
- b) As plants grow older, a strip of secondary meristem replaces the epidermis of the stem. Cells cut on the outer side by this meristem are called cork.
- c) They are protective in function for older stem/twigs/branches.  
They are impervious to gases and water.



54. Both xylem and phloem consist of more than one type of cells, which coordinate to perform a common function.

Xylem	Phloem
<p>Consists of tracheids, vessels, xylem, parenchyma and xylem fibres</p> <p>They transport water and minerals vertically from soil to aerial parts of the plant.</p> <p>Most of the cells except xylem parenchyma are dead cells</p>	<p>Consist of sieve tubes, companion cell, phloem parenchyma and phloem fibres.</p> <p>They transport food from leaves to other parts of the plant.</p> <p>Most of the cells except phloem fibres are living cells.</p>

55.

Meristematic	Permanent
<p>Cells of this tissue divide throughout their life.</p> <p>They are located at specific regions of the plant viz: apical lateral, intercalary</p> <p>Cells of this tissue are very active, have dense cytoplasm, thin walls and prominent nuclei. They lack vacuoles</p> <p>Cell wall is cellulosic.</p>	<p>They lose the ability to divide to take up specific function.</p> <p>They are distributed throughout the plant body.</p> <p>They are vacuolated, vary in shape and size. Their cell wall may be thick.</p> <p>Cell wall is made up of cellulose/ lignin/ suberin.</p>

- (b) The loss of ability to divide by taking up a permanent shape, size and function is called differentiation.
- (c) Simple: Parenchyma/collenchyma/sclerenchyma  
Complex: Phloem/xylem

# Chapter 7

## ANSWERS

### Multiple Choice Questions

- |         |         |         |         |
|---------|---------|---------|---------|
| 1. (d)  | 2. (c)  | 3. (d)  | 4. (c)  |
| 5. (b)  | 6. (a)  | 7. (a)  | 8. (a)  |
| 9. (a)  | 10. (c) | 11. (d) | 12. (c) |
| 13. (a) | 14. (d) | 15. (c) | 16. (b) |
| 17. (d) | 18. (c) | 19. (a) | 20. (d) |
| 21. (b) | 22. (b) | 23. (a) | 24. (d) |
| 25. (a) | 26. (b) | 27. (b) | 28. (a) |
| 29. (a) | 30. (b) | 31. (b) | 32. (a) |
| 33. (b) | 34. (b) |         |         |

### Short Answer Questions

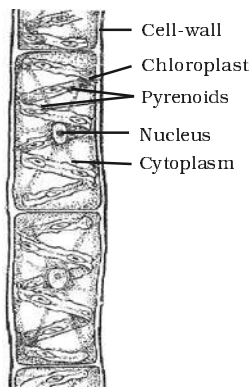
35. (a) T (b) T (c) F (d) T (e) F (f) T
36. (a) saprophytic (b) chitin (c) lichens (d) carbohydrate  
(e) species (f) thallophyta (g) bryophytes
37. Gram—dicot Wheat—monocot Rice—monocot,  
Pumpkin—dicot Maize—monocot Pea—dicot
38. (a)—B; (b)—A; (c)—D; (d)—C; (e)—F; (f)—E, (g)—G.
39. (a)—C; (b)—B; (c)—F; (d)—A; (e)—E; (f)—D
40. *Spongilla* —Acoelomate  
Sea anemone—Acoelomate  
*Planaria*—Acoelomate  
Liver fluke—Acoelomate  
*Wuchereria*—Pseudocoelomate  
*Ascaris*—Pseudocoelomate  
*Nereis*—Coelomate  
Scorpion—Coelomate  
Earthworm—Coelomate  
Birds, Fishes and Horse—Coelomate

41. Torpedo—Cartilagenous, Sting ray—Cartilagenous, Dog fish—  
Cartilagenous, Rohu—Bony, Angler fish— Cartilagenous  
Exocoetus—bony.
42. Rohu, *Scoliodon*— 2 chambered. Frog, Salamander, Flying lizard, King  
Cobra—3 chambered. Crocodile, Ostrich, Pigeon, Bat, Whale—4 chambered.
43. Cold blooded—Rohu, *Scoliodon*, Frog, Salamander, Flying Lizard, King  
Cobra, Crocodile, Warm blooded— Ostrich, Pigeon, Bat, Whale.
44. (i) *Platypus*                      (ii) *Echidna*
45. (a) Robert Whittaker  
(b) Species  
(c) Monera  
(d) Eukaryotic unicellular organisms  
(e) Chlorophyll  
(f) Mushroom  
(g) Yeast  
(h) Lichens
46. (a) F      (b) T                      (c) F                      (d) T                      (e) T      (f) T
47. (a) Liver fluke  
(b) Filarial worm  
(c) Arthropods  
(d) Nematodes
48. (a) Dorsal fin  
(b) Caudal fin  
(c) Pelvic fin  
(d) Pectoral fin  
Function of Caudal fin—Caudal fin helps in streamlined movement in  
water.

### Long Answer Questions

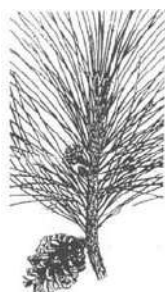
49. (a) Thallophyta  
(b) Without specialized vascular tissue  
(c) Pteridophyta  
(d) Phanerogams  
(e) Bear naked seeds  
(f) Angiosperms  
(g) Have seeds with two cotyledons  
(h) Monocots

50. *Ulothrix, Spirogyra, Cladophara, Ulva* and *Chara*,



*Spirogyra*

51. The Thallophyta, bryophyta and pteridophyta are called as 'Cryptogams' because the reproductive organs of these groups are inconspicuous or hidden. Seeds are absent. On the other hand 'Phanerogams' include gymnosperms and angiosperms which have well differentiated reproductive tissue and the embryo with stored food. Embryo develops into seed.

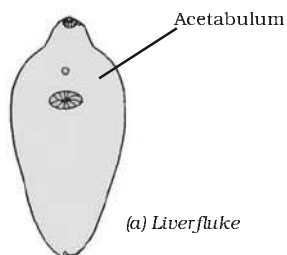


*Pinus*



*Cycas*

52. (a) The left and right halves of the body have the same design, eg, liver fluke  
 (b) Coelom is the internal body cavity between visceral organs and body wall in which well developed organs can be accommodated, eg. butterfly  
 (c) Animals having three layers of cells from which differentiated tissue can be made are called triploblastic, eg. star fish



(a) *Liver fluke*

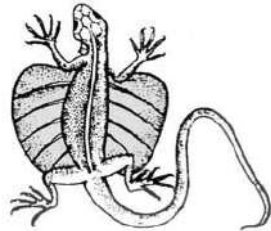


(b) *Butterfly*



(c) *Asterias (star fish)*

53. All organisms given in the question do not belong to same group. Leech and *Nereis* belong to phylum annelida because they have metamericly segmented body i.e., body is divided into many segments internally by septa. Body segments are lined up one after the other from head to tail. But *Scolopendra*, prawn and scorpion belong to phylum arthropoda as these have jointed legs and open circulating system.
54. **Hint**— Mango tree is more complex and evolved because, it is eukaryotic, autotrophic, terrestrial sporophyte with covered seed. The bacteria is unicellular prokaryote and fungi are the heterotrophic, simple thallophyte with no tissue systems.
55. *Flying lizard* belongs to group reptiles and characterised as cold blooded, body covered with scales and having three chambered heart, while *birds* belong to group aves and have characteristics of being warm blooded, having feather covered body, forelimbs modified as wings and having four chambered heart.



*Flying lizard (Draco)*



*Pigeon*

56. Bat, rat and cat belong to class mammalia and have following common features
- All have notochord at some stage of life cycle.
  - All are warm blooded.
  - All have four chambered heart.
  - All have skin covered with hair and with sweat and oil glands.
57. **Hint**— Because both are (1) cold blooded (2) have scales (3) breathe through lungs (4) have three chambered heart, and (5) they lay eggs with tough covering.

# Chapter 8

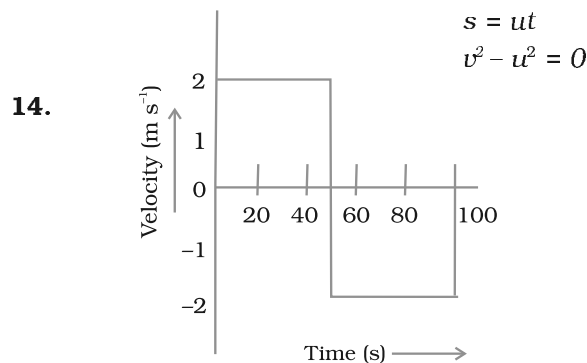
## ANSWERS

### Multiple Choice Questions

1. (c)      2. (b)      3. (d)      4. (b)  
 5. (a)      6. (c)      7. (b)      8. (b)  
 9. (a)      10. (c)      11. (a)

### Short Answer Questions

12. No. Though the moving object comes back to its initial position the distance travelled is not zero.  
 13. Acceleration  $a = 0$ ,  $v = u$

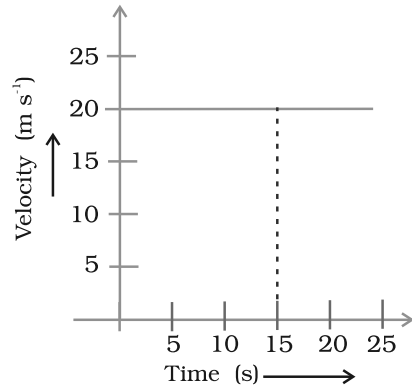


15. The distance travelled in first 8 s,  $x_1 = 0 + \frac{1}{2} (5) (8)^2 = 160$  m.  
 At this point the velocity  $v = u + at = 0 + (5 \times 8) = 40$  m s<sup>-1</sup>  
 Therefore, the distance covered in last four seconds,  $x_2 = (40 \times 4)$  m = 160 m  
 Thus, the total distance  $x = x_1 + x_2 = (160 + 160)$  m = 320 m
16. Let AB =  $x$ . So  $t_1 = \frac{x}{30}$  and  $t_2 = \frac{x}{20}$

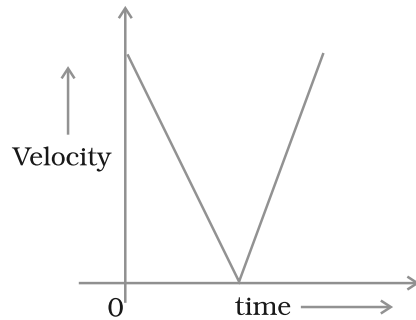
$$\text{Total time} = t_1 + t_2 = \frac{5x}{60} \text{ h.}$$

$$\text{Average speed for entire journey} = \frac{\text{Total distance}}{\text{Total Time}} = \frac{2x}{\frac{5x}{60}} = 24 \text{ km h}^{-1}$$

17. (i) Since velocity is not changing, acceleration is equal to zero.  
 (ii) Reading the graph, velocity =  $20 \text{ m s}^{-1}$   
 (iii) Distance covered in 15 seconds,  $s = u \times t = 20 \times 15 = 300 \text{ m}$



18.



### Long Answer Questions

19. Initial difference in height =  $(150 - 100) \text{ m} = 50 \text{ m}$

$$\text{Distance travelled by first body in } 2 \text{ s} = h_1 = 0 + \frac{1}{2} g (2)^2 = 2g$$

$$\text{Distance travelled by another body in } 2 \text{ s} = h_2 = 0 + \frac{1}{2} g (2)^2 = 2g$$

$$\text{After } 2 \text{ s, height at which the first body will be} = h_1' = 150 - 2g$$

$$\text{After } 2 \text{ s, height at which the second body will be} = h_2' = 100 - 2g$$

$$\begin{aligned} \text{Thus, after } 2 \text{ s, difference in height} &= 150 - 2g - (100 - 2g) \\ &= 50 \text{ m} = \text{initial difference in height} \end{aligned}$$

Thus, difference in height does not vary with time.

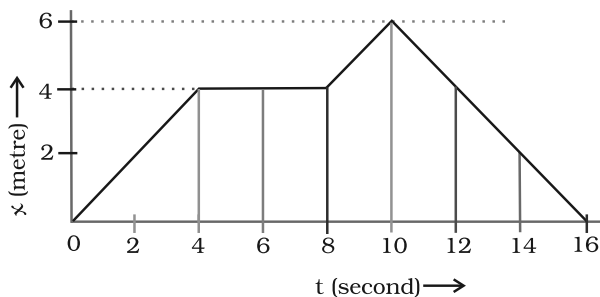
20.  $s_1 = ut + \frac{1}{2}at^2$  or  $20 = 0 + \frac{1}{2}a(2)^2$  or  $a = 10 \text{ m s}^{-2}$ ,

$$v = u + at = 0 + (10 \times 2) = 20 \text{ m s}^{-1}$$

$$s_2 = 160 = vt' + \frac{1}{2}a'(t')^2 = (20 \times 4) + \left(\frac{1}{2}a' \times 16\right) \Rightarrow a' = 10 \text{ m s}^{-2}$$

Since acceleration is the same, we have  $v' = 0 + (10 \times 7) = 70 \text{ m s}^{-1}$

21.



Average velocity for first 4 s.

$$\text{Average velocity} = \frac{\text{Change in displacement}}{\text{Total time taken}}$$

$$v = \frac{4 - 0}{4 - 0} = \frac{4}{4} = 1 \text{ m s}^{-1}$$

$$\text{For next 4 s, } v = \frac{4 - 4}{8 - 4} = \frac{0}{4} = 0 \text{ m s}^{-1}$$

(or as  $x$  remains the same from 4 to 8 seconds, velocity is zero)

$$\text{For last 6 s, } v = \frac{0 - 6}{16 - 10} = -1 \text{ m s}^{-1}$$

22. Given initial velocity,  $u = 5 \times 10^4 \text{ m s}^{-1}$   
and acceleration,  $a = 10^4 \text{ m s}^{-2}$

(i) final velocity  $= v = 2u = 2 \times 5 \times 10^4 \text{ m s}^{-1} = 10 \times 10^4 \text{ m s}^{-1}$

To find  $t$ , use  $v = u + at$

$$\text{or } t = \frac{v - u}{a}$$

$$\left( \frac{10 \times 10^4 - 5 \times 10^4}{10^4} \right) = \frac{5 \times 10^4}{10^4} = 5 \text{ s}$$

(ii) Using  $s = ut + \frac{1}{2}at^2$

$$= (5 \times 10^4) \times 5 + \frac{1}{2}(10^4) \times (5)^2 = 25 \times 10^4 + \frac{25}{2} \times 10^4 = 37.5 \times 10^4 \text{ m}$$



23. Using the equation of motion

$$s = ut + \frac{1}{2}at^2$$

Distance travelled in 5 s

$$s = u \times 5 + \frac{1}{2}a \times 5^2$$

$$\text{or } s = 5u + \frac{25}{2}a \text{ ---(i)}$$

Similarly, distance travelled in 4 s,  $s' = 4u + \frac{16}{2}a$  ---(ii)

Distance travelled in the interval between 4<sup>th</sup> and 5<sup>th</sup> second

$$= (s - s') = \left(u + \frac{9}{2}a\right) \text{ m}$$

24. We know for upward motion,  $v^2 = u^2 - 2gh$  or  $h = \frac{u^2 - v^2}{2g}$

But at highest point  $v = 0$

$$\text{Therefore, } h = \frac{u^2}{2g}$$

$$\text{For first ball, } h_1 = \frac{u_1^2}{2g}$$

$$\text{and for second ball, } h_2 = \frac{u_2^2}{2g}$$

$$\text{Thus } \frac{h_1}{h_2} = \frac{\frac{u_1^2}{2g}}{\frac{u_2^2}{2g}} = \frac{u_1^2}{u_2^2} \text{ or } h_1 : h_2 = u_1^2 : u_2^2$$

# Chapter 9

## ANSWERS

### Multiple Choice Questions

1. (c)            2. (b)            3. (b)            4. (c)  
5. (a)            6. (b)            7. (c)            8. (b)

### Short Answer Questions

9. **Steel.** As the mass is a measure of inertia, the ball of same shape and size, having more mass than other balls will have highest inertia. Since steel has greatest density and greatest mass, therefore, it has highest inertia.
10. Yes. the balls will start rolling in the direction in which the train was moving. Due to the application of the brakes, the train comes to rest but due to inertia the balls try to remain in motion, therefore, they begin to roll. Since the masses of the balls are not the same, therefore, the inertial forces are not same on both the balls. Thus, the balls will move with different speeds.
11. From the light rifle, according to law of conservation of momentum or explanation by Newton's laws of motion.
12. The force applied by the horse balances the force of friction.
13. Law of conservation of momentum is applicable to isolated system (no external force is applied). In this case, the change in velocity is due to the gravitational force of earth.
14. Acceleration =  $a = \frac{v - u}{t} = -\frac{80}{8} \text{ ms}^{-2} = -10 \text{ ms}^{-2}$   
Force =  $m a = \frac{50}{1000} \times 10 = 0.5 \text{ N}$
15. Calculate using  $F = m a$   
Acceleration becomes one-fourth of the original.
16. Separation between them will increase. Initially the momentum of both of them are zero as they are at rest. In order to conserve the momentum the one who throws the ball would move backward. The second will experience a net force after catching the ball and therefore will move backwards that is in the direction of the force.

17. The working of the rotation of sprinkler is based on third law of motion. As the water comes out of the nozzle of the sprinkler, an equal and opposite reaction force comes into play. So the sprinkler starts rotating.

### Long Answer Questions

18. (i)  $m = 10 \text{ g} = \frac{10}{1000} \text{ kg}$   
 $u = 10^3 \text{ m/s}$   
 $v = 0$   
 $s = \frac{5}{100} \text{ m}$   
 $v^2 - u^2 = 2 a s$   
 $0 - (10^3)^2 = 2 \cdot a \cdot \frac{5}{100}$   
 $a = \frac{-1000 \times 1000}{2 \cdot 5} \times 10 \cancel{\text{g}}$   
 $= -10^7 \text{ m s}^{-2}$   
 $F = m \cdot a = 10^5 \text{ N}$

(ii)  $v = u + a t$   
 $0 = 10^3 - 10^7 t$   
 $10^7 t = 10^3$   
 $t = \frac{10^3}{10^7}$   
 $= 10^{-4} \text{ s}$

19.  $F = m a = \text{kg m s}^{-2}$

This unit is also called newton. Its symbol is N.

$$m_1 = \frac{F}{a_1} = \frac{5}{8} \text{ kg},$$

$$m_2 = \frac{F}{a_2} = \frac{5}{24} \text{ kg},$$

$$M = \left( \frac{5}{8} + \frac{5}{24} \right) \text{ kg} = \left( \frac{5}{6} \right) \text{ kg}$$

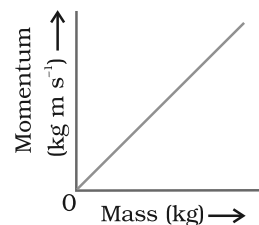
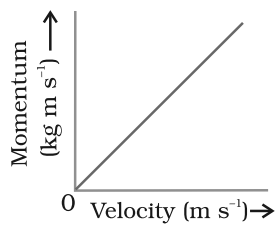
Acceleration produced in M,

$$a = \frac{F}{M} = \frac{5}{\frac{5}{6}} = 6 \text{ m s}^{-2}$$

20. Momentum = mass  $\times$  velocity

SI unit of momentum is  $\text{kg m s}^{-1}$

Force = Rate of change in momentum



# Chapter 10

## ANSWERS

### Multiple Choice Questions

1. (a)      2. (c)      3. (a)      4. (c)  
5. (d)      6. (d)      7. (c)      8. (d)  
9. (b)      10. (a)      11. (d)      12. (a)  
13. (a)      14. (b)      15. (d)

### Short Answer Questions

16. Gravitational force. This force depends on the product of the masses of the planet and sun and the distance between them.
17. Both stones will take the same time to reach the ground because the two stones fall from the same height.
18. The moon will begin to move in a straight line in the direction in which it was moving at that instant because the circular motion of moon is due to centripetal force provided by the gravitational force of earth.
19. The value of 'g' at the equator of the earth is less than that at poles. Therefore, the packet falls slowly at equator in comparison to the poles. Thus, the packet will remain in air for longer time interval, when it is dropped at the equator.

20.  $g_e = g$  and  $g_m = \frac{g}{6}$

Force applied to lift a mass of 15 kg at the earth,  $F = m g_e = 15 g_e$  N  
Therefore, the mass lifted by the same force on the moon,

$$m = \frac{F}{g_m} = \frac{15 g_e}{\frac{g_e}{6}} = 90 \text{ kg}$$

21.  $g = \frac{GM}{R^2}$  or  $M = \frac{g \times R^2}{G} \Rightarrow \text{Density } D = \frac{\text{mass}}{\text{volume}} = \frac{g \times R^2}{G \times V_e}$

(Where  $V_e$  is the volume of the earth)

or  $D = \frac{g \times R^2}{G \times \frac{4}{3} \pi R^3} = \frac{3g}{4 \pi GR}$

22. The gravitational force is responsible for providing the necessary centripetal force.

### Long Answer Questions

23. Weight of an object is directly proportional to the mass of the earth and inversely proportional to the square of the radius of the earth. i.e.,

$$\text{Weight of a body} \propto \frac{M}{R^2}$$

$$\text{Original weight } W_o = m g = m G \frac{M}{R^2}$$

When hypothetically  $M$  becomes  $4M$  and  $R$  becomes  $\frac{R}{2}$

$$\text{then weight becomes } W_n = m G \frac{4M}{\left(\frac{R}{2}\right)^2} = (16 m G) \frac{M}{R^2} = 16 \times W_o$$

The weight will become 16 times.

24.  $F \propto m_1 m_2$  and  $F \propto \frac{1}{d^2}$

This hypothesis is not correct. The two bricks, like a single body, fall with the same speed to reach the ground at the same time in case of free-fall. This is because acceleration due to gravity is independent of the mass of the falling body.

25.  $h_1 = \frac{1}{2} g t_1^2$        $h_2 = \frac{1}{2} g t_2^2$ , as  $x = 0$

$$\frac{t_1}{t_2} = \sqrt{\frac{h_1}{h_2}}$$

Ratio will not change in either case because acceleration remains the same. In case of free-fall acceleration does not depend upon mass and size.

26. a) (i) The cube will experience a greater buoyant force in the saturated salt solution because the density of the salt solution is greater than that of water.

(ii) The smaller cube will experience lesser buoyant force as its volume is lesser than the initial cube.

b) Buoyant force = weight of the liquid displaced  
 = density of water  $\times$  volume of water displaced  $\times g$   
 =  $1000 \times \frac{4}{4000} \times 10 = 10 \text{ N}$

# Chapter 11

## ANSWERS

### Multiple Choice Questions

1. (c)      2. (a)      3. (d)      4. (a)  
5. (d)      6. (c)      7. (d)      8. (d)  
9. (c)

### Short Answer Questions

10. Initial velocity =  $v$ , then  $v' = 3v$

$$\text{Initial kinetic energy} = \frac{1}{2} m v^2$$

$$\text{Final kinetic energy (K.E.)} = \frac{1}{2} m v'^2 = \frac{1}{2} m (3v)^2 = 9 \left( \frac{1}{2} m v^2 \right)$$

$$(\text{K.E.})_{\text{initial}} : (\text{K.E.})_{\text{final}} = 1:9$$

11. Power of Avinash  $P_A = F_A \cdot v_A = 10 \times 8 = 80 \text{ W}$   
The power of Kapil  $P_K = F_K \cdot v_K = 25 \times 3 = 75 \text{ W}$   
So, Avinash is more powerful than Kapil.

12.  $F = 5 \text{ N}$

$$W = F \cdot S$$

$$W = 5 \times [1500 + 200 + 2000] = 18500 \text{ J.}$$

13. Yes, mechanical energy comprises both potential energy and kinetic energy. Momentum is zero which means velocity is zero. Hence, there is no kinetic energy but the object may possess potential energy.
14. No. Since mechanical energy is zero, there is no potential energy and no kinetic energy. Kinetic energy being zero, velocity is zero. Hence, there will be no momentum.

15.  $P = \frac{W}{\Delta t} = \frac{mgh}{\Delta t} \Rightarrow \frac{m \times 10 \times 10}{60} = 2000 \text{ W}$

$$\text{or } m = \frac{12000}{10} = 1200 \text{ kg}$$

16. Since, weight of the person on planet A is half that on the earth, acceleration due to gravity there, will be 1/2 that on the earth. Hence he can jump double the height with the same muscular force.

**or**

The potential energy of the person will remain the same on the earth and on planet A.

$$\cancel{m} g_1 h_1 = \cancel{m} g_2 h_2$$

$$\text{if } g_1 = g \text{ then } g_2 = \frac{1}{2} g, h_1 = 0.4$$

$$\text{Then } h_2 = \frac{g_1 h_1}{g_2} = \frac{g \times 0.4}{g/2}$$

$$\text{or } h_2 = 0.4 \times 2 = 0.8\text{m}$$

17.  $v^2 - u^2 = 2 a.s$

$$\text{This gives } s = \frac{v^2 - u^2}{2 a}$$

$$F = m a$$

we can write work done (W) by this force  $F$  as

$$W = ma \left( \frac{v^2 - u^2}{2 a} \right) = \frac{1}{2} m v^2 - \frac{1}{2} m u^2 = (\text{K.E})_f - (\text{K.E})_i$$

18. Yes, it is possible, if an object is moving in a circular path. Because force is always acting perpendicular to the direction of displacement.

19.  $m g h = m \times 10 \times 10 = 100m \text{ J.}$

Energy is reduced by 40% then the remaining energy is  $60m \text{ J.}$

Therefore,  $60 \cancel{m} = \cancel{m} \times 10 \times h'$  or  $h' = 6 \text{ m}$

20.  $P = \frac{1200}{1000} = 1.2 \text{ kW}$

$$t = \frac{30}{60} = 0.5 \text{ h}$$

$$E = \text{Power} \times \text{time} \times \text{days}$$

$$= 1.2 \times 0.5 \times 30$$

$$= 18 \text{ kW h}$$



## Long Answer Questions

**21.**  $p_1 = m_1 v_1$      $p_2 = m_2 v_2$

But  $p_1 = p_2$  or  $m_1 v_1 = m_2 v_2$

If  $m_1 < m_2$  then  $v_1 > v_2$

$$(K.E)_1 = \frac{1}{2} m_1 v_1^2 \qquad (K.E)_2 = \frac{1}{2} m_2 v_2^2$$

$$(K.E)_1 = \frac{1}{2} (m_1 v_1) v_1 = \frac{1}{2} p_1 v_1 \qquad (K.E)_2 = \frac{1}{2} (m_2 v_2) v_2 = \frac{1}{2} p_2 v_2$$

$$\frac{(K.E)_1}{(K.E)_2} = \frac{\frac{1}{2} \cancel{p_2} v_1}{\frac{1}{2} \cancel{p_2} v_2} = \frac{v_1}{v_2}$$

But  $v_1 > v_2$

Therefore,  $(K.E)_1 > (K.E)_2$

**22.**  $m_{(A)} = m_{(B)} = 1000 \text{ kg}$ .     $v = 36 \text{ km/h} = 10 \text{ m/s}$

Frictional force = 100 N

Since, the car A moves with a uniform speed, it means that the engine of car applies a force equal to the frictional force

$$\text{Power} = \frac{\text{Force} \times \text{distance}}{\text{time}} = F.v$$

$$= 100 \text{ N} \times 10 \text{ m/s}$$

$$= 1000 \text{ W}$$

After collision

$$m_A u_A + m_B u_B = m_A v_A + m_B v_B$$

$$1000 \times 10 + 1000 \times 0 = 1000 \times 0 + 1000 \times v_B$$

$$v_B = 10 \text{ m s}^{-1}$$

**23.**  $u = 4 \text{ m s}^{-1}$     ,  $v = 0$ ,  $s = 16 \text{ m}$

$$a = \frac{v^2 - u^2}{2s} = -\frac{16}{2 \times 16} = -\frac{1}{2} \text{ m s}^{-2}$$

$$\text{Force} = m a = 40 \times \left(-\frac{1}{2}\right) = -20 \text{ N}$$

Work done on the trolley =  $20 \text{ N} \times 16 \text{ m} = 320 \text{ J}$

Work done by the girl = 0 J.

**24.** (a)  $F = 250 \text{ kg} \times g$     ( $g = 10 \text{ m s}^{-2}$ )  
 $= 2500 \text{ N}$

$$s = 1 \text{ m}$$

$$W = F.s = 2500 \text{ N m}$$

$$= 2500 \text{ J}$$

(b) zero; as the box does not move at all, while holding it.

(c) In order to hold the box, men are applying a force which is opposite and equal to the gravitational force acting on the box. While applying the force, muscular effort is involved. So they feel tired.

- 25.** Power is the rate of doing work. Kilowatt is the unit of power and kilowatt hour is the unit of energy.

$$h = 20 \text{ m, and mass} = 2000 \times 10^3 \text{ kg} = 2 \times 10^6 \text{ kg}$$

$$\begin{aligned} \text{Power} &= \frac{mgh}{t} = \frac{2 \times 10^6 \times 10 \times 20}{60} \text{ W} \\ &= \frac{4}{6} \times 10^7 \text{ W} = \frac{2}{3} \times 10^7 \text{ W} \end{aligned}$$

- 26.** Power =  $\frac{\text{work done or energy}}{\text{time}} = \frac{mgh}{t} = m \cdot g \cdot \left(\frac{h}{t}\right)$

$$\text{Here } \frac{h}{t} = \text{speed}$$

$$\text{Therefore, } m = \frac{\text{power}}{g \times \text{speed}} = \frac{100}{10 \times 1} = 10 \text{ kg}$$

- 27.** One watt is the power of an agent which does work at the rate of  $1 \text{ J s}^{-1}$

$$1 \text{ kilowatt} = 1000 \text{ J s}^{-1}$$

$$\text{Total Power} = 150 \times 500 = 7.5 \times 10^4 \text{ W}$$

$$\text{Force} = \frac{\text{Power}}{\text{velocity}} = \frac{7.5 \times 10^4}{20} = 3.75 \times 10^3 \text{ N}$$

$$\text{Force} = 3750 \text{ N.}$$

- 28.** (i) Power =  $mg \times \text{velocity}$ ,  $g = 10 \text{ m s}^{-2}$

$$= \frac{1}{1000} \times 10 \times 0.5 \text{ W}$$

$$= \frac{0.5}{100} \text{ W} = 5 \times 10^{-3} \text{ W}$$

(ii) Power =  $\frac{250}{1000} \times 10 \times 0.5 \text{ W}$

$$= \frac{1}{4} \times 10 \times 0.5 = 1.25 \text{ W}$$

Hence, the power with which the squirrel is climbing is much higher than that of a butterfly flying.

# Chapter 12

## ANSWERS

### Multiple Choice Questions

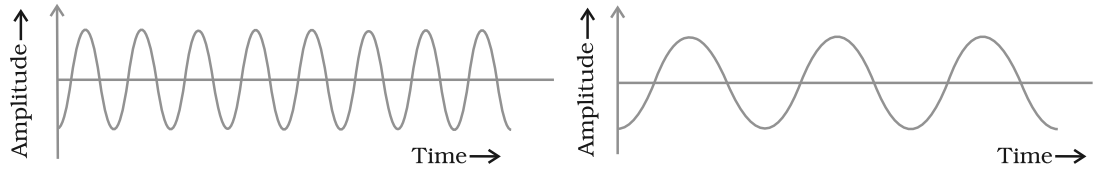
1. (c)      2. (a)      3. (a)      4. (c)  
5. (b)      6. (b)      7. (b)      8. (c)  
9. (c)

### Short Answer Questions

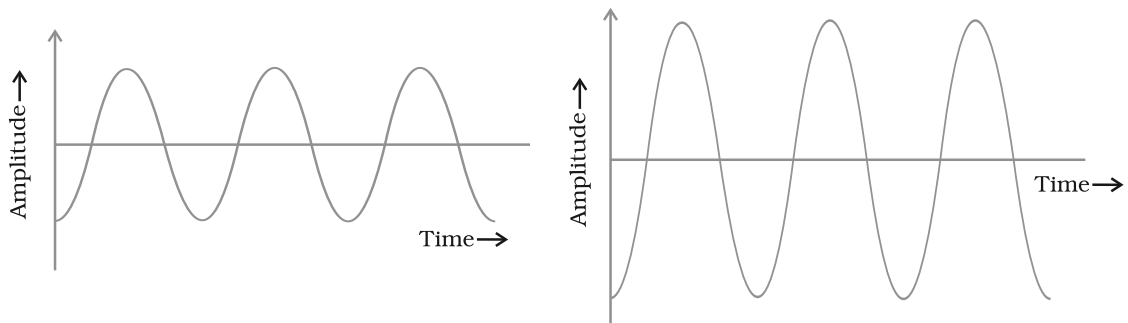
10. From the graph  
Time period,  $T = 2 \times 10^{-6}$  s.  
Frequency,  $\nu = 1/T = 5 \times 10^5$  Hz.  
Wavelength,  $\lambda = v/\nu = 5 \times 10^5$  m.
11. Graph (a) represents the male voice. Usually the male voice has less pitch (or frequency) as compared to female.
12. If the time gap between the original sound and reflected sound received by the listener is around 0.1 s, only then the echo can be heard.  
The minimum distance travelled by the reflected sound wave for the distinctly listening the echo  
= velocity of sound  $\times$  time interval  
 $\approx 344 \times 0.1$   
 $\approx 34.4$  m  
But in this case the distance travelled by the sound reflected from the building and then reaching to the girl will be  $(6 + 6) = 12$  m, which is much smaller than the required distance. Therefore, no echo can be heard.
13. Humming bees produce sound by vibrating their wings which is in the audible range. In case of pendulum the frequency is below 20 Hz which does not come in the audible range.
14. Longitudinal waves.
15.  $s \approx 340 \text{ m s}^{-1} \times 10 \text{ s} = 3400 \text{ m}$  or 3.4 km.
16.  $\angle i = \angle r$ , so  $x = 90^\circ - \angle r = 90^\circ - 50^\circ = 40^\circ$
17. Ceiling and walls are made curved so that sound after reflection reaches the target audience.

## Long Answer Questions

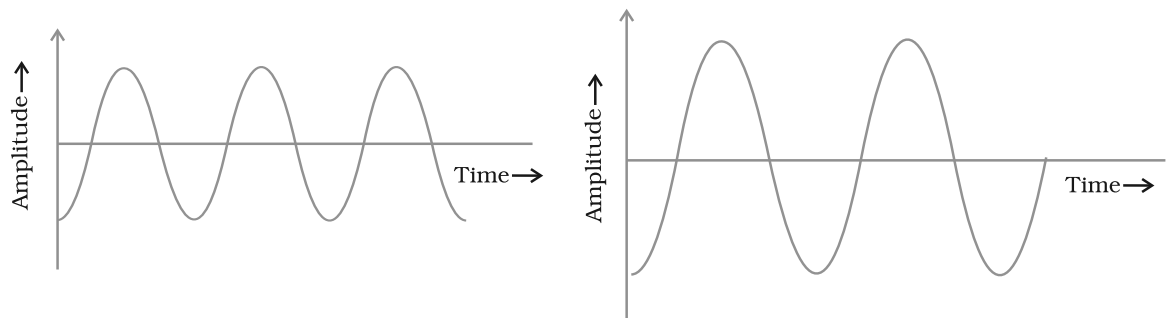
18



Same amplitude but different frequency



Same frequency but different amplitude



Different amplitudes and different wavelengths

19. Derivation of formula  $v = \nu \lambda$ .

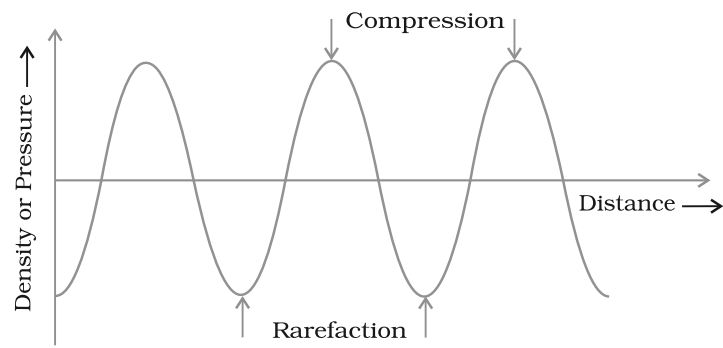
(i)  $340 = 256 \lambda$

$$\lambda = 1.33 \text{ m.}$$

(ii)  $340 = \nu (0.85)$

$$\nu = 400 \text{ Hz}$$

20.



Wavelength is the distance between two consecutive compressions or two consecutive rarefactions. Time period is the time taken to travel the distance between any two consecutive compressions or rarefactions from a fixed point.

# Chapter 13

## ANSWERS

### Multiple Choice Questions

- |         |         |         |         |
|---------|---------|---------|---------|
| 1. (c)  | 2. (d)  | 3. (c)  | 4. (d)  |
| 5. (a)  | 6. (c)  | 7. (c)  | 8. (b)  |
| 9. (c)  | 10. (c) | 11. (c) | 12. (d) |
| 13. (d) | 14. (c) | 15. (b) | 16. (c) |
| 17. (b) | 18. (a) |         |         |

### Short Answer Questions

19. (a) Viral fever, Flu  
(b) Elephantiasis, Tuberculosis (TB)  
(c) Small pox, Chicken pox  
(d) Diabetes, Goitre
20. (i) Sleeping sickness caused by *Trypanosoma* / Malaria by plasmodium  
(ii) Kala-azar caused by *Leishmania*
21. (i) *Helicobacter pylori*  
(ii) Marshall and Warren.
22. Antibiotic is a chemical substance that kill bacteria, secreted by micro-organisms which can kill the pathogens. Examples, Penicillin and Streptomycin.
23. (a) Communicable  
(b) Fungi  
(c) Bacteria  
(d) Vector
24. (a) Liver  
(b) Brain  
(c) Lungs  
(d) Skin

- 25.** Edward Jenner.  
Example— Small pox, Polio
- 26.** (a) Chronic, long term effect  
(b) Acute  
(c) Health  
(d) Infectious/ communicable  
(e) Fungi
- 27.** (a) infectious  
(b) infectious  
(c) infectious  
(d) non-infectious  
(e) non-infectious  
(f) infectious  
(g) non-infectious
- 28.** Bacteria and fungi
- 29.** Malaria, Dengue and Kala-azar

### Long Answer Questions

- 30.** (a) Food is necessary for the growth and development of the body. Balanced diet provides raw materials and energy in appropriate amount needed for the substances likes protein, carbohydrates, fats, minerals etc which in turn are essential for the proper growth and functioning of the healthy body.
- (b) Health is a state of being well enough to function well physically, mentally and socially and these conditions depend upon the surrounding environmental conditions. eg., If there is unhygienic conditions in surrounding area, it is likely we might get infected or diseased.
- (c) This is so because many water borne diseases and insect vectors flourish in stagnant water which cause diseases in human beings.
- (d) Human beings live in societies and different localities like villages or cities, which determines the social and physical environment and hence both are to be kept in harmony. Public cleanliness is important for individual health. For better living conditions lot of money is required. We need good food for healthy body and for this we have to earn more. For the treatment of diseases also, one has to be in good economic condition.
- 31. Hint—** When the functioning or the appearance of one or more systems of the body change for the worse the body is said to be diseased. The diseases can be — acute/chronic/ infectious/non infectious. Examples, influenza, tuberculosis, pneumonia, cancer respectively.

32. When the functioning or the appearance of one or more systems of the body will change for the worse, it gives certain abnormal signs of the disease. These visual changes in human beings are called symptoms. Symptoms give indication of the presence of a particular disease.  
Example (i) Lesions on the skin are the symptoms of chickenpox.  
Example (ii) Cough is the symptom of lung infection.
33. The immune system of our body is a kind of defense mechanism to fight against pathogenic microbes. It has cells that are specialized to kill infecting microbes and keep our body healthy.
34. Following precautions should be taken for prevention of disease.  
(1) Maintaining hygienic conditions.  
(2) Awareness about the disease and causal organism.  
(3) Balanced diet.  
(4) Regular medical check up.
35. **Hint—** Due to poor immune system, some children fall ill frequently. Balanced diet and proper nutrition for healthy body is required to have a strong immune system.
36. Antibiotics generally block the biosynthetic pathways and they block these pathways of the microbes/bacteria. However, viruses have very few biochemical mechanisms of their own and hence are unaffected by antibiotics.
37. Because of strong immune system our body is normally fighting off microbes. We have cells which are specialised to kill the pathogenic microbes. These cells are active when infecting microbes enter the body and if they are successful in removing the pathogen, we remain disease-free. So even if we are exposed to infectious microbes, it is not necessary that we suffer from diseases.
38. For a healthy person it is necessary that  
(i) The surrounding environment should be clean. Air and water borne diseases will not spread.  
(ii) Personal hygiene prevents infectious diseases.  
(iii) Proper, sufficient nourishment and food is necessary for good immune system of our body.  
(iv) Immunisation against severe diseases.
39. AIDS causing virus— HIV that comes into the body via, the sexual organs or any other means like blood transfusion will spread to lymph nodes all over the body. The virus damages the immune system of the body and due to this the body can no longer fight off many minor infections. Instead, every small cold can become pneumonia, or minor gut infection can become severe diarrhoea with blood loss. The effect of disease becomes very severe and complex, at times killing the person suffering from AIDS. Hence there is no specific disease symptoms for AIDS but it results in a complex diseases and symptoms. Therefore, it is known as a syndrome.



# Chapter 14

## ANSWERS

### Multiple Choice Questions

- |         |         |         |         |
|---------|---------|---------|---------|
| 1. (d)  | 2. (c)  | 3. (b)  | 4. (d)  |
| 5. (c)  | 6. (b)  | 7. (b)  | 8. (a)  |
| 9. (a)  | 10. (d) | 11. (c) | 12. (d) |
| 13. (b) | 14. (b) | 15. (c) | 16. (d) |
| 17. (b) | 18. (d) | 19. (b) | 20. (a) |
| 21. (a) | 22. (d) | 23. (d) | 24. (c) |
| 25. (b) | 26. (a) | 27. (a) | 28. (a) |
| 29. (b) | 30. (b) |         |         |

### Short Answer Questions

- 31.** Water is capable of dissolving a large number of substances. As water flows over the rocks containing soluble minerals, some of them get dissolved in the water. Thus, rivers carry many nutrients from land to the sea.
- 32.** Loss of top soil can be prevented by
- (i) increasing the vegetational cover
  - (ii) checking the falling of trees
  - (iii) by preventing excessive grazing by animals
- 33.** Addition of undesirable chemicals like pesticides, fertilizers, industrial waste and domestic wastes not only kill the organisms, they also cause diseases to the aquatic organisms. Besides, the requirement of oxygen by aquatic organisms is also increased. There is a reduction in the dissolved oxygen in water which adversely affects the aquatic organisms.
- 34. Hint—** Air near water bodies is cooled due to evaporation of water.
- 35. Hint—** Air above the land gets heated quickly during day and starts rising. This creates a region of low pressure as a result air over sea rushes into this area of low pressure. This movement of air from one region to the other creates winds. During night, as water cools down slowly, the air above water is warmer than the air on land. So air moves from land to sea creating winds.

36. **Hint**— Lichens and Mosses (a) and (b). Lichens and mosses release substances which break down the stones resulting in the formation of soil.
37. *Abiotic factors making soil*— sun, water, wind  
*Biotic factors*— lichens, mosses and trees
38. **Hint**— Through photosynthesis and absorption from soil
39. **Hint**— Cycling of these gases maintains consistency.
40. **Hint**— Absence of atmosphere on the moon.
41. **Hint**— Due to wind created during the day time
42. Mathura refinery releases toxic gases (like oxides of sulphur) which causes acid rain and hence corrosion of the marbles of Taj Mahal.
43. **Hint**—It is a bio-indicator and sensitive to SO<sub>2</sub> pollution from automobiles. Delhi has maximum number of automobiles, hence has a highly polluted environment.
44. **Hint**—Marine water is not useful for human and plant life directly. Uneven distribution of limited fresh water resources need conservation to cater to the demands.
45. **Hint**—(i) Thermal pollution (ii) Addition of poisonous (mercury) compounds in water (iii) Due to blockage of gills with any pollutant.
46. Lichens release chemical substances to break the rocks into smaller particles and hence make soil.
47. Water helps in formation of soil in following ways
- (i) Water causes 'wear off' of rocks over a long period of time.
  - (ii) It also causes the rocks to rub against other rocks creating small particles which are taken away downstream and deposited as soil.
  - (iii) Water expands on freezing in crevices of rocks and cracks rocks into smaller pieces.
48. Fertile soils are rich in organisms that decomposes dead organic matter forming humus. Humus gives minerals, absorbs water and makes soil porous.
49. **Hint**— This is practiced to check soil erosion through water currents on the slopes.
50. In root nodules nitrogen fixing *Rhizobium* bacteria are present which increases the soil fertility.

## Long Answer Questions

- 51.** The fossil fuels like coal and petroleum contain small amounts of nitrogen and sulphur. When fossil fuels are burnt, it produces oxides of nitrogen and sulphur. These gases cause inhalation problems and in presence of rain forms acid rain. Burning of fossil fuels also increase the amount of suspended particles in air that reduce the visibility.
- 52.** Water pollution can be caused by addition of
- undesirable substances like fertilizers and pesticides or any poisonous substances.
  - sewage directly entering a water body.
  - hot water from the power plant that increases the temperature and reduces the dissolved oxygen in water thus killing the aquatic organisms.
  - industrial effluents or radioactive substances in water body.
- We can take following measures to check water pollution
- The sewer lines should not be directly connected to the water body.
  - We should not throw our garbages or domestic waste in the water body.
  - Prevent dumping of toxic compounds in the water bodies.
  - Washing of clothes should be avoided near water bodies as it adds lot of detergents to it.
  - Plant trees near the banks of the river to check soil erosion otherwise erosion leads to siltation of water body.
- 53.** Infra-red radiations in sunlight pass through the glass and heat the interior of the car. The radiation emitted by upholstery and other inner parts of the car cannot pass out of the glass, so the heat trapped inside raises the temperature of the interior. This is because glass is transparent to infra-red radiation from the sun having smaller wavelength than that emitted by the interior of the car which are of longer wavelength to which the glass is opaque.
- 54.** Dust remains present in air as suspended particles can cause allergy and other respiratory diseases. It also affects plant growth, by covering stomata on leaf surface. It acts as the carrier of toxic compounds like heavy metals.
- 55. Hint—** The rocks are heated by the sun; they contract during night but not at same rate —resulting in cracks in rocks and ultimately to smaller particles.
- 56. Hint—** Increasing concentration (more than normal) of  $\text{CO}_2$  is harmful and considered as a pollutant. Higher concentrations of  $\text{CO}_2$  is one of the causes of green house effect/global warming.

# Chapter 15

## ANSWERS

### Multiple Choice Questions

- |         |         |         |         |
|---------|---------|---------|---------|
| 1. (b)  | 2. (d)  | 3. (d)  | 4. (d)  |
| 5. (a)  | 6. (c)  | 7. (d)  | 8. (b)  |
| 9. (a)  | 10. (a) | 11. (b) | 12. (a) |
| 13. (d) | 14. (d) | 15. (d) | 16. (c) |
| 17. (d) |         |         |         |

### Short Answer Questions

18. (a)—(ii)      (b)—(iii)      (c)—(i)      (d)—(iv)
19. (a) protein      (b) fodder      (c) Kharif      (d) vegetables  
(e) Rabi
20. Crop which has been developed by introducing a new gene from any other source, to obtain the desired character, is called as genetically modified (GM) crop. Bt Cotton is an example of GM crop which is made insect-resistant by introducing a new gene from a bacteria.
21. Useful traits of improved crops are  
(a) higher yield  
(b) improved nutritional quality  
(c) resistance to biotic and abiotic stresses  
(d) change in maturity  
(e) wide range of adaptability  
(f) desired agronomic characteristics.
22. Organic matter is important for crops because  
(a) it helps in improving soil structure.  
(b) it helps in increasing water holding capacity of sandy soil.  
(c) in clayey soil large quantity of organic matter helps in drainage and in avoiding water logging.
23. **Hint**— Excess use of fertilizers causes environmental pollution as their residual and unused amounts will become pollutants for air, water and soil.

- 24.** (a) organic farming (b) mixed cropping (c) inter cropping  
(d) crop rotation (e) weeds (f) pathogen
- 25.** (a)—(iii) (b)—(v) (c)—(iv) (d)—(i) (e)—(ii)
- 26.** Farmers of low rainfall area will be suggested to  
(a) practice farming with drought resistant and early maturing varieties of crops.  
(b) to enrich the soil with more humus content as it increases the water-holding capacity and retains water for longer duration.
- 27.** (1) Energy yielding— wheat, rice, maize  
(2) Protein yielding— gram, pigeon gram, lentil, soybean  
(3) Oil yielding— groundnut, castor, mustard, soybean  
(4) Fodder crops— barseem, oat, sudan grass
- 28.** Hybridisation— Hybridisation refers to crossing between genetically dissimilar organisms.  
Photoperiod— Duration of sunlight available to the plant is called as photoperiod. It affects the growth, flowering and maturation of crops.
- 29.** (a) Flowering of plants  
(b) June to October  
(c) November to April  
(d) Kharif  
(e) Rabi
- 30.** Different crops and cultivation practices require different climatic conditions, temperature, photoperiod for their growth and completion of life cycle. There are some crops which are grown in rainy season (Kharif crops) while some others are grown during winter season (Rabi crops).
- 31.** (a) 16  
(b) Carbon and Oxygen  
(c) Hydrogen  
(d) 13.  
(e) Six, macronutrients  
(f) seven, micronutrients
- 32.** Compost— Compost formation is the process in which farm waste materials like livestock excreta, vegetable wastes, animal refuse, domestic waste, straw, eradicated weeds are decomposed and used as manure.  
Vermicompost— The compost prepared from organic matter by using earthworm which hastens the process of decomposition.
- 33.** (b) → (c) → (a) → (d)

34. Merits of Italian bee variety *A. mellifera* are—
- (a) It stings less.
  - (b) It has high honey collection capacity.
  - (c) It stays in given bee-hive for long periods and breeds very well.
35. In agricultural practices, higher input gives higher yield. This means higher money input to raise the yield. Financial conditions of the farmers allows them to take up different farming practices and technologies. The farmer's purchasing capacity for input decides cropping system and production practices.

### Long Answer Questions

36. Hybridisation refers to crossing between genetically dissimilar plants. It may be inter varietal, inter specific and inter generic. Two crops of good characters (desired character) are selected and crossed to obtain a new crop having desired characters of parental crops. This method of hybridisation improves crops with respect to yield, disease resistance, pest resistance etc.
37. (a) *Vermicompost* — Compost is a kind of manure which is rich in organic matter and nutrients. The compost prepared by using earthworms to hasten the process of decomposition of plants and animals refuse is called as Vermicompost.
- (b) *Green manure* — The manure which is prepared by decomposing green plants in field itself is called green manure. For example — sun hemp is grown in fields, mulched by ploughing and allowed to decompose in field for the preparation of green manure.
- (c) *Bio fertilizer*— Living organisms which are used as fertilizer to supply the nutrients to plants, are called as biofertilizers. For example, blue green algae, which fix nitrogen in soil, rice fields, are called as biofertilizer.
38. Various modes of weed control are
- (a) mechanical removal
  - (b) proper seed bed preparation to avoid the weed growth
  - (c) timely sowing of crop to avoid the growth of weed.
  - (d) intercropping and crop rotation also help in weed control.
39. (a) Capture fishery is the method of obtaining fish from natural resources while culture fishery is the method of obtaining fish by fish farming.
- (b) Mixed cropping is growing two or more crops simultaneously on the same piece of land; while intercropping is growing two or more crops simultaneously on the same field in a definite pattern. i.e., in different rows.
- (c) Bee keeping is the practice to rear the honey bee for obtaining honey; while poultry farming is the practice to raise the domestic fowl for egg and meat production.

40. **Hint—Demerits** (i) threat to bio-diversity (ii) only economically important and valued fishes will be cultured.
- Merits** (i) large amount of desired fishes can be obtained in small area (ii) improvement can be done.
41. Composite fish culture is the method to culture five or six species, both indigenous and exotic, together in a single fish pond. These species are selected so that they do not compete for food among themselves having different types of food habits. As a result food available in all the parts of the pond is used. For example— Catlas are surface feeders, Rohu is middle zone feeder and Mrigals and common carps are bottom feeders.
42. Because good pasturage provides more quantity and quality of nectar for honey to honey bees.
43. **Hint**—Cutting plant parts, sucking cell sap, borers.
44. Pesticides are used in very accurate concentration and in a very appropriate manner, because if used in excess it
- harms the soil and causes loss of fertility
  - checks the replenishment of organic matter
  - kills the micro organism of soil
  - causes air, water and soil pollution.
45. **Hint**— (i) Roughage is largely fibre. (ii) Concentrates are rich in proteins and nutrients.
46. Maintenance of temperature is needed for better egg production by poultry birds. Therefore, larger size (increase in surface area of body) and no adaptability of summer may cause decline in egg production. To obtain the smaller size and higher summer adaptability, cross breeding of poultry birds are done. Small size is also needed for better housing and low feed.
47. Some preventive measures of poultry bird diseases are
- cleaning of poultry farms
  - proper sanitation of poultry farms
  - spraying of disinfectants at regular intervals
  - appropriate vaccination of birds.
48. (i) With addition of chemical fertilizer there is sudden increase in yield due to release of nutrients N,P,K etc in high quantity. The gradual decline in the graph may be due to continuous use and high quantity of chemicals which kills microbes useful for replenishing the organic matter in the soil. This decreases the soil fertility.
- (ii) Manures supply small quantities of nutrients to the soil slowly as it contains large amounts of organic matter [Hint: importance of organic matter can be included]. It enriches soil with nutrients thereby increasing soil fertility continuously.

- (iii) The difference in the two graphs indicate that use of manure is beneficial for long duration in cropping as the yield tends to remain high when the quantity of manure increases.

In case of Plot B the chemical fertilizers may cause various problems when used continuously for long time. Loss of microbial activity reduces decomposition of organic matter and as a result soil fertility is lost that affects the yield.

49. Crossword.

		<sup>10</sup> T							
	<sup>1</sup> S	U	N	<sup>2</sup> F	L	O	<sup>6</sup> W	E	R
		N		O			E		
<sup>8</sup> M		A		D			E		<sup>7</sup> L
R				D			D		E
I				E					G
G				<sup>3</sup> R	A	<sup>4</sup> B	I		H
<sup>9</sup> A	P	I	S			O			O
L						R			R
S		<sup>5</sup> N	I	T	R	O	G	E	N
						N			