

TERM 1
SEP 2016
EXAMS

OSWAAL CBSE CCE

QUESTION BANK

with Complete Solutions

CLASS 9

SCIENCE

Summative & Formative
Assessment



HIGHLIGHTS

- Strictly as per the latest CBSE curriculum
- “**Topic-wise**” presentation of chapters
- Includes CBSE Questions from 2012 to 2015 Term-1 Exams
- Includes MCQs, VSA, Short, Long & Very Long Answer Questions, Value Based & HOTS Questions
- Also includes Answers of CBSE Marking Scheme 2011 to 2015



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SEP 2016
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CBSE Continuous and Comprehensive Evaluation (CCE)

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For detailed study material of Formative Assessment please log on to www.cbse.nic.in



PREFACE

CBSE always believes in Global Trends of Educational Transformation. The CBSE curriculum gets its lead from National Curriculum Framework – 2005 and Right to Free and Compulsory Education Act – 2009. CBSE introduced CCE in the later half of 2009. CCE has been started to improve the quality of Education and was meant to lessen the burden of studies on students. CCE stands for Continuous & Comprehensive Evaluation. The term 'Continuous' in CCE refers to periodicity and regularity in assessment and the term 'Comprehensive' refers to overall assessment of the learner, in both curricular & co curricular scheme of things.

These **Oswaal CCE Question Banks for Classes IX & X** have been written so as to supplement the need of the students to prepare for these progressive assessments at school during the entire year.

CCE Question Bank has been divided into two parts: Formative assessment (FA) & Summative Assessment (SA). Formative part of the book will assist the students to prepare for the frequent class room based evaluation, both as an individual and as a group activity. The various formative techniques include Quizzes, Chapter assignment, Work sheets, Projects, Seminar, Symposium, Action Plans, etc. These activities have been elaborated by CBSE Board on www.cbse.nic.in. The students can read through all these components while revising a chapter to be always prepared for the surprise FA's in the class.

Furthermore, each chapter includes brief description and covers all typologies of Questions specified by CBSE, with well-labelled and high quality figures / diagrams for easy and fast learning. Solutions are checked twice and made precise as per the CBSE marking scheme. Practically, this book provides students everything they need to learn. Since we believe in continuous improvement, hence this book is updated, reviewed every year with new questions, changes in syllabus and reader's suggestions.

At last we would like to thank our authors, editors, reviewers and specially students who regularly send us suggestions which helps in continuous improvement of this book and makes this book stand in the category of "One of the Best". Wish you all Happy Learning.

-Publisher



SYLLABUS

Science Class - IX

For Term I (April - September)
(Code No. 086 / 090)

Course Structure FIRST TERM

Unit No.	Unit	Marks
I	Matter - Its Nature and Behaviour	29
II	Organisation in the Living World	18
III	Motion, Force and Work	30
V	Food; Food Production	13
	Total	90

The subject of Science plays an important role in developing well-defined abilities in cognitive, affective and psychomotor domains in children. It augments the spirit of enquiry, creativity, objectivity and aesthetic sensibility.

Whereas the upper primary stage demands that a number of opportunities should be provided to the students to engage them with the processes of Science like observing, recording observations, drawing, tabulation, plotting graphs, etc., the secondary stage expects abstraction and quantitative reasoning to occupy a more central place in the teaching and learning of Science. Thus, the idea of atoms and molecules being the building blocks of matter makes its appearance, as does Newton's law of gravitation.

The present syllabus has been designed around six broad themes viz. Food, Materials, The World of The Living, How Things Work, Moving Things, People and Ideas, Natural Phenomenon and Natural Resources. Special care has been taken to avoid temptation of adding too many concepts than can be comfortably learnt in the given time frame. No attempt has been made to be comprehensive.

At this stage, while science is still a common subject, the disciplines of Physics, Chemistry and Biology begin to emerge. The students should be exposed to experiences as well as modes of reasoning that are typical of the subject.

General Instructions:

1. The units specified for each term shall be assessed through both Formative and Summative Assessments.
2. In each term, there will be two Formative Assessments each carrying 10% weightage.
3. The Summative Assessment in each term will carry 30% weightage.
4. Hands on Practical examination will be conducted through Formative Assessment in every term with 20% weightage of total term marks.
5. Assessment of Practical Skills through Practical Based Questions (PBQ) will carry 15 marks in every term end Summative Assessment.



... contd. Syllabus

Theme: Materials (22 Periods)

Unit I: Matter-Nature and Behaviour

Definition of matter; solid, liquid and gas; characteristics - shape, volume, density; change of state-melting (absorption of heat), freezing, evaporation (cooling by evaporation), condensation, sublimation.

Nature of matter:

Elements, compounds and mixtures. Heterogenous and homogenous mixtures, colloids and suspensions.

Theme: The World of the Living (22 Periods)

Unit II: Organization in the Living World

Cell - Basic Unit of life : Cell as a basic unit of life; prokaryotic and eukaryotic cells, multicellular organisms; cell membrane and cell wall, cell organelles and cell inclusions; chloroplast, mitochondria, vacuoles, endoplasmic reticulum, Golgi apparatus; nucleus, chromosomes - basic structure, number.

Tissues, Organs, Organ System, Organism:

Structure and functions of animal and plant tissues (only four types of tissues in animals; Meristematic and Permanent tissues in plants).

Theme: Moving Things, People and Ideas (36 Periods)

Unit III: Motion, Force and Work

Motion: Distance and displacement, velocity; uniform and non-uniform motion along a straight line; acceleration, distance-time and velocity-time graphs for uniform motion and uniformly accelerated motion, derivation of equations of motion by graphical method; elementary idea of uniform circular motion.

Force and Newton's laws : Force and Motion, Newton's Laws of Motion, Inertia of a body, Inertia and mass, Momentum, Force and Acceleration. Elementary idea of conservation of Momentum, Action and Reaction forces.

Gravitation: Gravitation; Universal Law of Gravitation, Force of Gravitation of the earth (gravity), Acceleration due to Gravity; Mass and Weight; Free fall.

Theme: Food (10 Periods)

Unit V: Food Production

Plant and animal breeding and selection for quality improvement and management; Use of fertilizers and manures; Protection from pests and diseases; Organic farming.



PRACTICALS – FIRST TERM

Practicals should be conducted alongside the concepts taught in theory classes.

(LIST OF EXPERIMENTS)

1. To test (a) the presence of starch in the given food sample, (b) the presence of the adulterant metanil yellow in dal.
2. To prepare:
 - a) a true solution of common salt, sugar and alum
 - b) a suspension of soil, chalk powder and fine sand in water
 - c) a colloidal solution of starch in water and egg albumin/milk in water and distinguish between these on the basis of
 - transparency
 - filtration criterion
 - stability
3. To prepare
 - a) a mixture
 - b) a compound
using iron filings and sulphur powder and distinguish between these on the basis of:
 - (i) appearance, i.e., homogeneity and heterogeneity
 - (ii) behaviour towards a magnet
 - (iii) behaviour towards carbon disulphide as a solvent
 - (iv) effect of heat
4. To carry out the following reactions and classify them as physical or chemical changes :
 - a) Iron with copper sulphate solution in water
 - b) Burning of magnesium in air
 - c) Zinc with dilute sulphuric acid
 - d) Heating of copper sulphate
 - e) Sodium sulphate with barium chloride in the form of their solutions in water
5. To prepare stained temporary mounts of (a) onion peel and (b) human cheek cells and to record observations and draw their labeled diagrams.
6. To identify parenchyma and sclerenchyma tissues in plants, striped muscle fibers and nerve cells in animals, from prepared slides and to draw their labeled diagrams.
7. To separate the components of a mixture of sand, common salt and ammonium chloride (or camphor) by sublimation.
8. To determine the melting point of ice and the boiling point of water.
9. To establish relationship between weight of a rectangular wooden block lying on a horizontal table and the minimum force required to just move it using a spring balance.
10. To determine the mass percentage of water imbibed by raisins.



... contd. Syllabus

Question Paper Design For SCIENCE

TIME : 3 Hours

CLASS IX

Max. Marks : 90

S. No.	Typology of Questions	Very Short Answer (VSA)	Short Answer- I (SA)-I	Short Answer-II (SA)-II	Long Answer (LA)	Total Marks	% Weightage
		(1 Mark)	(2 Marks)	(3 Marks)	(5 Marks)		
1	Remembering - (Knowledge based Simple recall questions, to know specific facts, terms, concepts, principles, or theories; Identify, define, or recite, information)	3	-	1	1	11	15%
2	Understanding- (Comprehension -to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase, or interpret information)	-	1	4	1	19	25%
3	Application (Use abstract information in concrete situation, to apply knowledge to new situations; Use given content to interpret a situation, provide an example, or solve a problem)	-	-	4	1	17	23%
4	High Order Thinking Skills (Analysis & Synthesis - Classify, compare, contrast, or differentiate between different pieces of information; Organize and/or integrate unique pieces of information from a variety of sources)	-	2	-	1	9	12%
5	Inferential and Evaluative (Appraise, judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)	-	-	2+1*	2	19	25%
Total (Theory Based Questions)		3x1=3	3x2=6	12x3=36	6x5=30	75(24)	100%
Practical Based Questions (PBQs)		9x1=9	3x2=6	-	-	15(12)	
Total		12x1=12	6x2=12	12x3=36	6x5=30	90(36)	

Note: The question paper of SA-II will include a section on Open Text Based Assessment (OTBA) of 10 marks. The case studies will be supplied in advance. This material is designed to test the analytical and higher order thinking skills of students.

* One question of 3 marks will be included to assess the values inherent in the texts.

(iii)

**SOLVED
PAPER
(with CBSE
Marking Scheme)**

**Summative Assessment-I
(2015 – 16)
Class-IX**

**Science
Code-3GS246G**

Time : 3 Hours

Max. Marks : 90

General Instructions :

1. The question paper comprises of two Sections, A and B. You are to attempt both the sections.
2. All questions are compulsory
3. All questions of Section-A and all questions of Section-B are to be attempted separately.
4. Question numbers 1 to 3 in Section-A are one mark questions. These are to be answered in one word or in one sentence
5. Question numbers 4 to 6 in Section-A are two marks questions. These are to be answered in about 30 words each.
6. Question numbers 7 to 18 in Section-A are three marks questions. These are to be answered in about 50 words each
7. Question numbers 19 to 24 in Section-A are five marks questions. These are to be answered in about 70 words each.
8. Question numbers 25 to 33 in Section-B are multiple choice questions based on practical skills. Each question is of one mark question. You are to select one most appropriate response out of the four provided to you.
9. Question numbers 34 to 36 in Section-B are questions based on practical skills. Each question is of two marks.

SECTION - A

1. What is the primary function of leucoplasts ? 1
2. Give an example of a motion in which acceleration is in the direction of motion of an object. 1
3. Give reason for the statement, "The value of g is greater at the poles than at the equator." 1
4. Among solids, liquids and gases, which one has :
 - (a) maximum force of attraction between the particles.
 - (b) minimum spaces in between particles.Give reason in Support of your answer. 2
5. Explain the process of formation of cork. 2
6. State the type of force-balanced or unbalanced, that acts on a rubber ball when we press it between our hands. Give reason for your answer and mention the effect produced in the ball by this force. 2
7. A teacher told three students A, B and C to prepare 25% solution (mass by volume) of KOH. Student A dissolved 25g of KOH in 100g of water, student B dissolved 25g of KOH in 100 ml of water and student C dissolved 25g KOH in water and made the volume 100 ml. Which one of them has made required 25% solution ? Give your answer with reason. 3
8. Why does the temperature remain constant during the change of state of matter ? Explain it on the basis of change of solid state into liquid state. 3
9. (a) After winters people pack off their woollens by keeping Naphthalene balls in them. With passage of time these balls become smaller in size. Why does this happen ? What type of change is involved during this process ?
(b) How can you convert a saturated solution into an unsaturated solution ? 3
10. What is the energy currency of the cell ? Write it in expanded form. Which cell organelle is related to the energy currency ? 3
11. (a) State the difference between tendon and ligament.
(b) Give the function of adipose tissue. 3
12. Describe an activity with diagram to explain conservation of momentum. 3
13. State the universal law of gravitation. Mention four phenomena which can be explained by this law. 3
14. A biker rides 700 m north, 300 m east, 400 m north, 600 m west, 1200 m south, 300 m east and finally 100 m north. Draw the path of motion of the biker. What distance did he cover ? What was his displacement ? 3
15. Name the physical quantities denoted by :
 - (a) the slope of the distance-time graph
 - (b) the area under velocity-time graph
 - (c) the slope of velocity-time graph3

16. Derive the mathematical formulation for Newton's second law of motion. 3
17. Vishnu's father had two healthy Sahiwal cows. Vishnu told his father that the lactation period of cows can be increased by cross breeding cattle with foreign breeds and it was possible artificially also. In this way if villagers participated in cross-breeding programme, they would get a breed of cattle which would produce higher milk yield. 3
- What is meant by lactation period ?
 - Name two exotic cattle breeds with long lactation period.
 - What values are exhibited by Vishnu ?
18. Define mixed cropping. Write two advantages of this cropping pattern ? 3
19. (a) Can a homogeneous mixture have a variable composition ? Justify giving an example. 5
- (b) What happens when :
- Dilute sulphuric acid is added to a mixture of iron filings and sulphur powder.
 - Dilute sulphuric acid is added to a mixture of iron filings and sulphur powder heated to red hot followed by cooling.
20. Answer the following questions :
- Out of boiling and evaporation which is a surface phenomenon ? Explain. In the absence of a refrigerator butter is kept wrapped in a wet cloth during summer. Why ?
 - Why do ice-cream appears colder than water at the same temperature ? 5
21. Answer the followings :
- Name the constituents of phloem tissues.
 - Write the specific function of cardiac muscle.
 - State two differences between tendon and ligament.
 - Name the tissue that :
 - forms of inner lining of our mouth.
 - forms the soft parts of leaf, stem, roots and fruit.
 - Write two function of adipose tissues.
22. (a) A person weighs 110.84 N on moon, whose acceleration due to gravity is 1/6 of that earth. If the value of 'g' on earth is 9.8ms^{-2} . Calculate. 5
- 'g' on moon.
 - mass of person on moon
 - weight of person one earth
- (b) How does the value of g on the earth is related to the mass of the earth and its radius ? Derive it.
23. State Newton's first law of motion. Show that Newton's first law of motion is a special case of Newton's second law. Determine the acceleration of a car of mass 800 kg, on application of a force of 200 N on it. 5
24. (a) What is meant by composite fish culture ? 5
- (b) What is the basis of selecting the different species of fish ?
- (c) Which method is used to get pure fish seed ?

SECTION - B

25. Heena took a sample of arhar dal dissolved in water to test the presence of metanil yellow and added a few drop of conc. hydrochloric acid She observed that there was no change in the colour of the solution. This shows that : 1
- the dal is free from adulterant.
 - the dal didn't mix with water.
 - the dal has adulterant in small quantity
 - more conc. HCl should be used to get accurate result.
26. Test for the presence of starch in a sample of food is performed by : 1
- boiling food sample with NaOH and adding iodine solution.
 - boiling a mixture of iodine solution with conc. HCl and food sample.
 - adding a few drops of iodine solution to food sample.
 - dissolving food sample in dil. HCl and adding iodine solution.
27. Four student (A), (B), (C) and (D) observed the colour and solubility of iron, sulphur and iron sulphide in carbon disulphide. The tick mark (3) represents 'soluble' and cross mark (5) represents 'insoluble' in carbon disulphide. Their observations are tabulated below : 1

Student	Colour			Solubility in carbon disulphide		
	Iron	Sulphur	Iron sulphide	Iron	Sulphur	Iron sulphide
(A)	Yellow	Silvery	Greyish silver	(3)	(5)	(3)

(B)	Silvery	Orange	Reddish brown	(5)	(3)	(3)
(C)	Grey	Yellow	Greyish black	(5)	(3)	(5)
(D)	Silvery	White	Silvery white	(3)	(5)	(5)

In the table correctly reported observation is of student :

- (a) A (b) B
(c) C (d) D

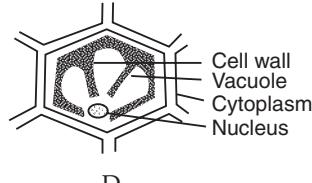
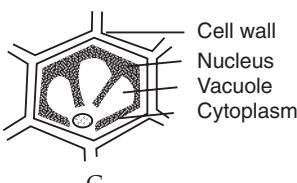
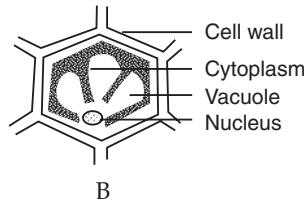
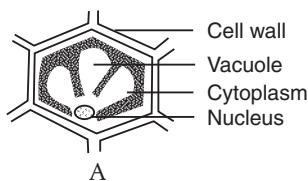
28. Some properties of a compound are given below. The correct property is : 1

- (a) It is easy to separate components of a compound by physical methods.
(b) The elements in a compound do not retain their individual properties.
(c) The proportion of the elements in a compound always varies.
(d) The elements of a compound retain their properties to some extent.

29. Take dilute sulphuric acid in a test tube and put a few zinc granules into test tube. You would observe that : 1

- (a) Zinc granules change to powder. (b) Colour of zinc changes from grey to white.
(c) Size of zinc granules keep on decreasing (d) Surface of zinc metal becomes bright.

30. Four students A, B, C and D marked an onion epidermal cell seen under a microscope as below. The correct labelled diagram is of the student : 1

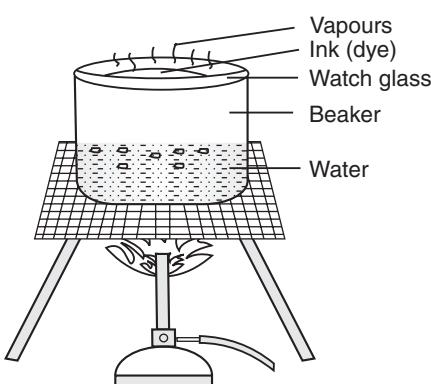


- (a) A (b) B
(c) C (d) D

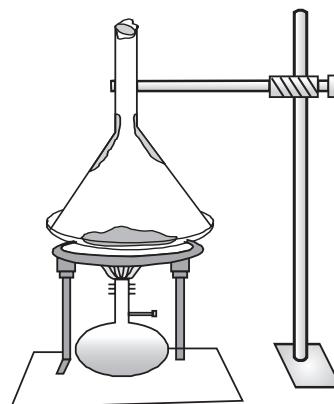
31. A science teacher asked the students to observe the permanent slides of simple permanent tissues. She explained the structural differences and functions of them. Which of them provides mechanical support but have dead cells. 1

- (a) parenchyma (b) collenchyma
(c) sclerenchyma (d) aerenchyma

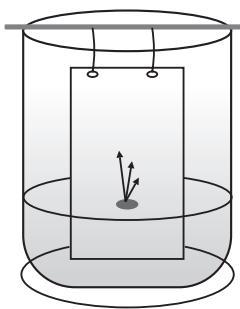
32. Which one the following figures illustrates the sublimation process ? 1



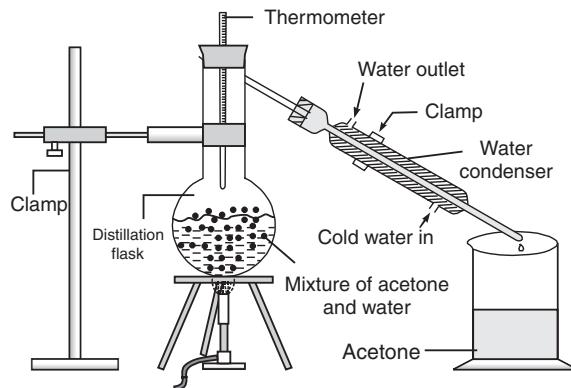
(A)



(B)



(C)



(D)

33. Range of a spring balance is : 1
- the correction that needs to be done in the observed value of weight in a spring balance.
 - the smallest difference in weight that can be detected by a spring balance
 - the difference between highest and lowest value of weight that can be measured with a spring balance.
 - none of the above.
34. How are solution, suspension and colloid different from each other in terms of transparency and scattering of beam of light. Explain in tabular form. 2
35. What precautions must a student take while determining the melting point of ice in the school laboratory ? List any two. 2
36. Before placing the raisins in water, the raisins weighed 10 g. The raisins were then taken out of water, wiped well, and then the weight was found to be 12.5 g. Determine the percentage of water absorbed by raisins. Define the process due to which raisins absorb water. 2

■ ■

SOLUTIONS

SECTION - A

- They store starch, oils, protein granules. 1
- A freely falling object. 1
- At poles the radius of the earth is lesser than that at the equator. 1
- (a) solids, particles are closely packed
(b) solids, particles are closely packed. 1
- Strip of secondary meristem replaces the epidermis of the stem. Cells on the outside are cut off from this layer which forms the cork. 2
- Balanced, because when we press the ball, an equal and opposite force is developed change in shape of ball. 2

7. Student C

Solution—25 gm of KOH in water and the volume of the solution is 100 ml.

$$\text{Mass by volume percentage of solution} = \frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100 = \frac{25(\text{g})}{100 \text{ ml}} \times 100$$

[CBSE Marking Scheme, 2015] 3

Detailed Answer :

Student C made the required 25% solution.

25 gm of KOH in water and the volume of the solution is 100 ml.

$$\begin{aligned} \text{Mass by volume percentage of a solution} &= \frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100 \\ &= \frac{25(\text{g})}{100 \text{ ml}} \times 100 = 25\% \end{aligned}$$

8. Latent heat

Heat is used up in changing the state by overcoming the force of attraction between the particles.

[CBSE Marking Scheme, 2015] 3

Detailed Answer :

The temperature remains constant as the heat gets used up in changing the state by overcoming the forces of attraction between the particles.

For example, a solid melts on heating its temperature does not rise until the entire solid is converted into liquid. This heat energy gets hidden into the contents and is known as the latent heat.

9. (a) Sublimation, Napthalene balls sublime and becomes smaller in size. It is a physical change. 3
(b) By adding large quantities of the solvent into the solution.

- ### **10. ATP; Adenosine Tri Phosphate**

Mitochondria

[CBSE Marking Scheme, 2015] 3

Detailed Answer:

Detailed Answer :
ATP is the energy currency of the cell. Its expanded form is Adenosine Triphosphate.

Mitochondria

11.	Tendon	Ligament
	Join muscles to bones	Joins bones to bones
	Limited flexibility	Elastic
	More strength	Less strength

(Any two) 3

Adipose tissue stores fat and provides insulation.

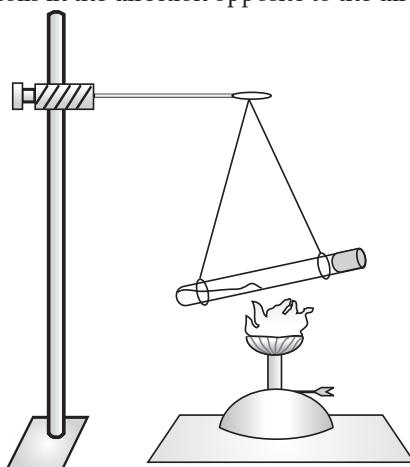
- 12.** Refer 9.6 page 123 NCERT book

[CBSE Marking Scheme, 2015] 3

Detailed Answer :

Activity :

- Take a test tube of good quality glass material and put a small amount of water in it. Place a stop cork at the mouth of it.
 - Now suspend the test tube horizontally by two strings or wires as shown in fig.
 - Heat the test tube with a burner until water vapourises and the cord blows out.
 - Observe that the test tube recoils in the direction opposite to the direction of the cork.



- Also, observe the difference in the velocity the cork appears to have and that of the recoiling test tube. Hence, the total momentum of the two objects is unchanged or conserved by the collision.

13. Refer 10.11 page 132 NCERT book

- (i) The force that binds us to earth.
(ii) The motion of the moon around the earth.
(iii) The motion of planets around the sun.
(iv) The tides due to the moon and the sun.

[CBSE Marking Scheme, 2015] 3

Detailed Answer :

Universal law of gravitation states that the force of attraction between two objects is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.

Four phenomena which can be explained by this law are :

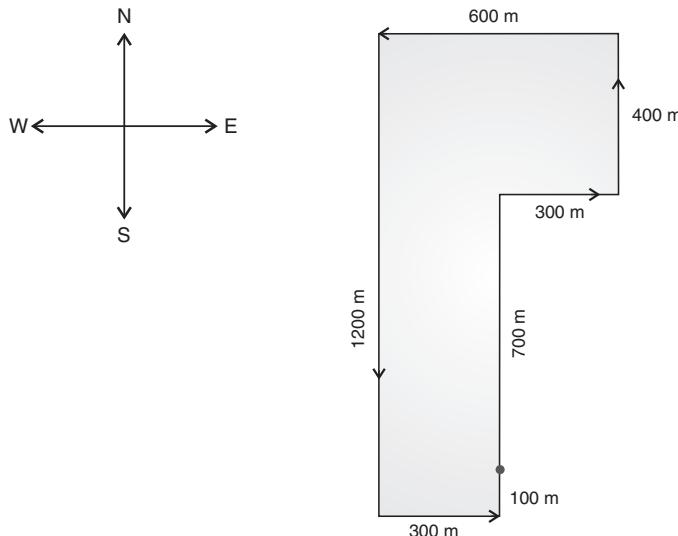
- (i) The force that binds us to earth.
- (ii) The motion of the moon around the earth.
- (iii) The motion of planets around the sun.
- (iv) The tides due to the moon and the sun.

14. Figure

3600 m, 0 m, South

[CBSE Marking Scheme, 2015] 3

Detailed Answer :



Total distance he covered = 700 m + 300 m + 400 m + 600 m + 1200 m + 300 m + 100 m

His displacement was zero as he returned back to the point of start.

15. (a) speed
 (b) displacement
 (c) acceleration

3

16. Change in momentum $\propto P_1 - P_2$

3

$$\propto mv - mu$$

$$\propto m(v-u)$$

$$\text{Rate of change of momentum} \propto \frac{m(v-u)}{t}$$

$$F \propto \frac{m(v-u)}{t}$$

(by second law of Newton Rate of change of momentum = Force)

$$\left(a = \frac{v-u}{t} \right)$$

$$F \propto ma$$

$$F = kma = k = 1 \text{ (} k = 1 \text{ by experiments)}$$

$$F = ma$$

17. Expected Answer/Value Points of Test item - 51.

3

- (i) Period of milk production after the birth of calf.

- (ii) Jersey, Brown Swiss

- (iii) Scientific temper, concern for others, cooperation etc.

18. Definition

Two advantages

[CBSE Marking Scheme, 2015] 3

Detailed Answer :

Mixed cropping is the growing of two or more crops simultaneously on the same piece of land.

Two advantages are :

- (i) Reduces risk

- (ii) Gives variety in the crop field.

19. (a) Homogenous mixtures are the mixtures with uniform composition throughout like sugar solution or another.
 (b) (i) $\text{Fe} + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{FeSO}_4 + \text{H}_2$
 (ii) $\text{FeS} + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{FeSO}_4 + \text{H}_2$
20. (a) Evaporation is a surface phenomenon. Particles from the surface gain enough energy to overcome the forces of attraction present in the liquid and change into vapour state.
 (b) Due to wet cloth the temperature is comparatively lower than room temperature so butter does not melt when remain wrapped in wet cloths.
 (c) Ice cream at 273 K, it will take latent heat from the medium to convert itself into liquid at 273 K and then into liquid at higher temperature but in water such condition is not possible. 5
21. (a) Sieve Tubes, companion cells, parenchyma, phloem fibre. 5
 (b) Creates an efficient pumping action of heart.

(c)	Tendon	Ligament
(i) It connects muscles to bones.	It connects bone to bone.	
(ii) It is tough and non elastic.	It is strong but elastic.	

(Any one)

- (c) State two differences between tendon and ligament.
 (d) (i) Squamous epithelium
 (ii) Scleroid.
 (e) Adipose tissue stores fat and acts as an insulator.

22. (a) (i) $g_{\text{moon}} = \frac{1}{6} \times 9.8 = 1.63 \text{ ms}^{-2}$

(ii) Mass on moon = $\frac{F}{g} = \frac{110.84}{1.63} = 68 \text{ kg}$

(iii) Weight on earth = $mg = 68 \times 9.8 = 666.04 \text{ N}$

(b) Derivation of $g = GM/R^2$

[CBSE Marking Scheme, 2015] 5

Detailed Answer :

(a) (i) $g_{\text{moon}} = \frac{1}{6} \times 9.8 = 1.63 \text{ ms}^{-2}$

(ii) Mass on moon will be constant and does not change from place to place. Hence, mass of the person on moon will be 110.84 N.

(iii) Weight on earth = $110.84 \times 6 = 666.04 \text{ N}$.

(b) According to Newton's law of gravitation, the force of attraction between earth and a body is given by

$$F = \frac{GmM}{r^2} \quad \dots (i)$$

Force produces an acceleration 'g'. So, from Newton's second law $F = mg$

.... (ii)

From equation (i) and (ii) we get

$$mg = \frac{GmM}{r^2}$$

$$g = \frac{GM}{r^2}$$

23. Statement of Newton first law of motion

$$F = ma$$

$$F = m \left(\frac{v-u}{t} \right) \left(\because a = \frac{v-u}{t} \right)$$

$$Ft = mv - mu$$

That is when $F = 0$ then $v = u$ thus the object continue to move with uniform velocity.

$$m = 800 \text{ kg}, f = 200 \text{ N}$$

$$a = 200/800 = 1/4 = 0.25 \text{ m/s}^2$$

[CBSE Marking Scheme, 2015] 5

Detailed Answer :

$$F = ma$$

$$F = \frac{m \times (v - u)}{t}$$

$$Ft = m(v - u)$$

That is, when $F = 0$, then $v = u$. Thus the object will continue to move with uniform velocity.

$$m = 800 \text{ kg}, \quad F = 200 \text{ N}$$

$$a = \frac{F}{m} = \frac{200}{800} = \frac{1}{4} = 0.25 \text{ m/s}^2$$

24. (a) Combination of 5 or 6 fish species in a single fish pond.

(b) Species are selected so that they do not compete for food-food available in all parts of the pond is utilized.
This increases fish yield

- (c) Hormonal Stimulation

[CBSE Marking Scheme, 2015] 5

Detailed Answer :

- (a) Composite fish culture is the poly culture system in which combination of 5 or 6 fish species are selected and grown in a single fish bond.
- (b) The selection of different species of fish is done so that they do not compete for food and the food available in all the parts of the pond is utilized. This increases the fish yield.
- (c) Hormonal stimulation.

SECTION - B

25. (a) the dal is free from adulterant. 1
26. (c) adding a few drops of iodine solution to food sample. 1
27. (c) C 1
28. (b) The elements in a compound do not retain their individual properties. 1
29. (b) Colour of zinc changes from grey to white. 1
30. (b) B 1
31. (c) sclerenchyma 1
32. (b) B 1
33. (c) the difference between highest and lowest value of weight that can be measured with a spring balance. 1
34. 2

	Solution	Suspension	Colloid
Transparency	Transparent	Opaque	Translucent
Scatter of beam of light	X	Tyndall effect	Tyndall effect

35. (1) The bulb of the thermometer should be kept surrounded with ice cubes.
(2) Ice should be stirred regularly to keep a uniform temperature throughout. 2

$$36. \% = \frac{\text{final wt} - \text{initial wt}}{10} \times 100$$

$$= \frac{2.5 \times 100}{10} = 25\% \quad 2$$

Plasmolysis : When a plant cell received water through osmosis there is big size of the cell away from cell wall. This phenomenon is known as plasmolysis.



UNIT - I**Matter : Its
Nature and
Behaviour****CHAPTER****1****MATTER
IN OUR
SURROUNDINGS****SYLLABUS**

- *Definition of matter; solid, liquid and gas; characteristics shape, volume, density; change of state—melting (absorption of heat), freezing, evaporation (cooling by evaporation), condensation, sublimation.*

**TOPIC-1****Matter, Solid, Liquid, Gas; Characteristics of Solid, Liquid and Gas****QUICK REVIEW**

- Matter is not continuous but rather consists of a large number of particles.
- Characteristics of particles :
Large number of particles constitute matter.
Particles of matter are very small in size.
Particles of matter have spaces between them.
Particles of matter are continuously moving.
- Matter around us exists in three states-solid, liquid and gas.
- Solids have definite shape, distinct boundaries and fixed volume.
- Liquids have fixed volume but no fixed shape.
- Gases neither have fixed shape nor volume.
- Solids possess least compressibility.
- Liquids possess higher compressibility than solids.
- Gases possess highest compressibility as compared to solids and liquids. Thus, used as a fuel (E.g. LPG, CNG).
- The forces of attraction between the particles are maximum in solids, intermediate in liquids and minimum in gases.
- The spaces in between constituent particles and K.E. of the particles are minimum in case of solids, intermediate in liquids and maximum in gases.

TOPIC - 1

Matter, Solid, Liquid, Gas;
Characteristics of Solid, Liquid
and Gas. **P. 01**

TOPIC - 2

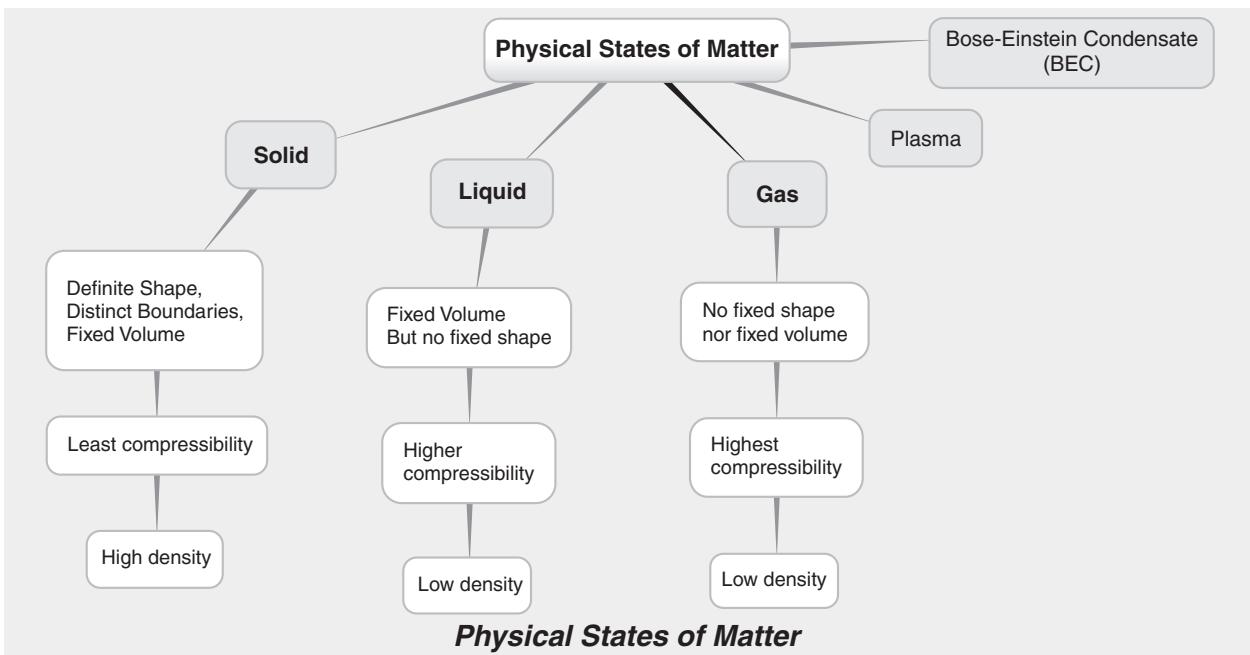
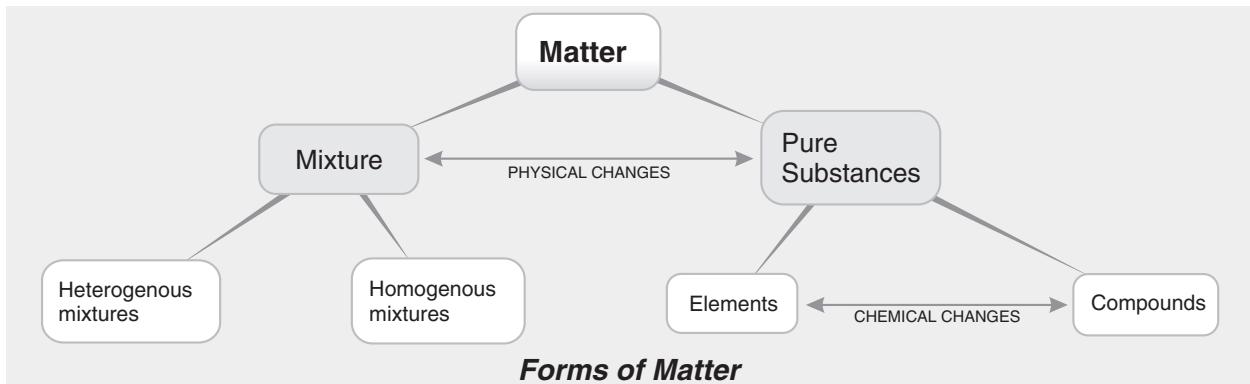
Change in State of Matter, Evaporation,
Condensation, Sublimation **P. 08**

**KNOW THE TERMS**

- **Matter :** Any thing that has mass and occupies space is called matter.
- **Solid :** Solid is defined as that form of matter which possess rigidity, is incompressible and hence has a definite shape and a definite volume.

- **Liquid :** Liquid is defined as that form of matter which possesses fluidity but is almost incompressible and hence has a definite volume but no definite shape.
- **Gas :** Gas is defined as that form of matter which possesses fluidity but is highly compressible and hence has neither definite shape nor definite volume.

FLOWCHARTS



Very Short Answer Type Questions

1 Mark each

Q. 1. Why do liquids have mostly lower density than solids ? (Board Term I, 2013, 7ZTHA8G)

Ans. Liquids have less force of attraction between molecules i.e. less mass and more volume as compared to solids. 1

(CBSE Marking Scheme, 2013)

Q. 2. Arrange the following substances in the increasing order of force of attraction between their particles : Oxygen, salt, milk. (Board Term I, 2012 Set-015)

Ans. Oxygen < milk < salt. 1
(CBSE Marking Scheme, 2012)

Q. 3. What happens when you open a bottle of perfume ? (Board Term I, 2012 Set-016)

Ans. Particles of perfume diffuses into the air and can be smelled even at a distance. 1
(CBSE Marking Scheme, 2012)

Q. 4. Sponge is a solid, yet we are able to compress it. Why ? (Board Term I, 2012 Set-019)

Ans. A sponge has minute holes, in which air is trapped. When we press it, air is expelled out and we are able to compress it. 1
(CBSE Marking Scheme, 2012)

Q. 5. When 2 ml of dettol is dissolved in 100 ml of water, the smell can be detected even on repeated dilution. Identify the physical nature of matter.

(Board Term I, 2012 Set-041; 56)

Ans. Particles of matter are very small which can be dissolved in water diffusing its smell readily in air.

(CBSE Marking Scheme, 2012) 1

Q. 6. Name the state of matter in which particles just move around randomly because of very weak force of attraction. (Board Term I, 2012 Set-042)

Ans. Gaseous state. (CBSE Marking Scheme, 2012) 1

Q. 7. Identify the name of the material which has no fixed shape but a fixed volume :

Wood, a piece of iron, oxygen and water.

(Board Term I, 2012 Set-045)

Ans. Water. (CBSE Marking Scheme, 2012) 1

Q. 8. If the food is being cooked in the kitchen, name the process which brings smell.

(Board Term I, 2012 Set-049)

Ans. Due to high speed of particles and large space between them, gases show the property of diffusing very fast. 1

Q. 9. Give two examples of practical applications which is based on high compressibility of gases.

(Board Term I, 2012 Set-050)

Ans. CNG, LPG. $\frac{1}{2} + \frac{1}{2}$
(CBSE Marking Scheme, 2012)

Q. 10. Select the substances from the following which do not have the property of sublimation : Camphor, Potassium permanganate, Copper sulphate, Naphthalene.

(Board Term I, 2012 Set-052)

Ans. Potassium permanganate, Copper sulphate $\frac{1}{2} + \frac{1}{2}$
(CBSE Marking Scheme, 2012)

Q. 11. When a drop of blue ink is put in water, the blue colour spreads and the whole solution becomes blue. Name the phenomenon due to which this happens. (Board Term I, 2012 Set-054)

Ans. Diffusion. (CBSE Marking Scheme, 2012) 1

Q. 12. A diver is able to cut through water in a swimming pool. Which property of matter does this observation show ? (Board Term I, 2012 Set-058)

Ans. Particles of water are held together by weak forces of attraction. It is these forces of attraction which the diver cuts through water in the swimming pool. 1

(CBSE Marking Scheme, 2012)

Q. 13. A gas jar 'X' containing air is inverted over another jar 'Y' containing a brown gas which is heavier than air. After some time brown colour is also observed in the gas jar 'X'. Identify the phenomenon associated with this observation

(Board Term I, 2012 Set-064)

Ans. Diffusion. (CBSE Marking Scheme, 2012) 1

Q. 14. A crystal of Copper sulphate is dropped in a glass of water and is allowed to settle at the bottom. After some time it is observed that the blue colour appears just above the solid crystal and with the passage of time whole water in glass turns blue. Identify the characteristic of particles of matter associated with this observation.

(Board Term I, 2012 Set-065)

Ans. Particles of matter are continuously moving. 1

(CBSE Marking Scheme, 2012)

Q. 15. A substance has no mass; can we consider it as matter ? (Board Term I, 2012 Set-069)

Ans. No. (CBSE Marking Scheme, 2012))

Q. 16. Mention two factors that need to be varied to liquify atmospheric gases.

(Board Term I, 2012 Set-075)

Ans. Temperature and pressure. $\frac{1}{2} \times 2$

(CBSE Marking Scheme, 2012)

Q. 17. Name the property of gases that helps aquatic plants and animals to survive in water ?

(Board Term I, 2012 Set-076)

Ans. Solubility in water. 1

(CBSE Marking Scheme, 2012)

Q. 18. A substance has a finite volume but not a definite shape. Write the physical state of substance.

(Board Term I, 2012 Set-077)

Ans. Liquid. (CBSE Marking Scheme, 2012) 1

Q. 19. Name the property of gases due to which it is possible to fill CNG in cylinders for using as fuel in cars. (Board Term I, 2012 Set-078)

Ans. Compressibility. 1

(CBSE Marking Scheme, 2012)

Short Answer Type Questions-I

2 Marks each

Q. 1. Compare the rate of diffusion of liquids and solids with reason. (Board 2014, Set-LFS3I7K)

Ans. (i) Rate of diffusion of liquids is higher because particles of liquid move freely.
(ii) Particles of liquid have greater spaces between each other than solids.

(CBSE Marking Scheme, 2014) 1 + 1

Q. 2. Explain :

(a) Sponge though compressible is a solid.

(b) Rubber band though stretchable is a solid.

(Board 2015, Set-LOV7LN7, Board 2014, Set-MNM9GZH)

Ans. (a) In minute pores of sponge air is trapped. When pressed, air is expelled out so it is compressible. It is a solid as it has definite shape and volume.

(b) Rubber band changes shape under force and regain shape when force is removed. 1 + 1

(CBSE Marking Scheme, 2015, 2014)

Q. 3. Among solids, liquids and gases, which one has :

(a) maximum force of attraction between the particles.

(b) minimum spaces in between particles.

(Board Term I, 2015, 3GS246G)

Ans. (a) solids, particles are closely packed

(b) solids, particles are closely packed.

(CBSE Marking Scheme, 2015) 1 + 1

Detailed Answer :

(a) Solids have maximum force of attraction between the particles & closely packed.

(b) Solids have minimum spaces in between particles as the particles are closely packed.

Q. 4. Write the chemical name of dry ice. Justify its name. How is it stored ?

(DDE 2014, Board Term I, 2012 Set-076; 77)

Ans. Chemical name of dry ice is solid CO₂. It just looks like ice but is absolutely different. Solid CO₂ converts directly to gaseous state on decreasing pressure to one atmosphere without coming into liquid state. It is stored at high pressure. ½ + 1 + ½

Q. 5. State reason for the following :

(a) The smell of lighted incense stick reaches you several metres away but to get the smell from unlighted incense stick you have to go close.

(b) Naphthalene balls disappear with time without leaving any solid.

(DDE 2014, Board Term I, 2012 Set-054)

Ans. (a) Particles of matter are continuously moving. Rate of movement of particles increases with temperature; therefore the smell of lighted incense stick reaches us several metres away due to diffusion.

(b) Because it sublimes, due to which it directly converts into vapour and disappear without leaving any solid. 1 + 1

(CBSE Marking Scheme, 2012)

Q. 6. (a) How can we liquify gases ?

(b) Why do clothes take more time in drying on a rainy day ? (CBSE Term I, 2013 7ZTHA8G)

Ans. (a) We can liquify gases by applying pressure and reducing temperature.

(b) On a rainy day, the amount of water vapours present in air (humidity) is already high, the rate of evaporation decreases.

(CBSE Marking Scheme, 2014) 1 + 1

Q. 7. A wooden chair is solid at room temperature. Give two reasons. (Board Term I, 2012 Set-019)

Ans. A wooden chair is solid at room temperature because :

(i) it has definite shape and volume,
(ii) it cannot be compressed. 1 + 1

(CBSE Marking Scheme, 2012)

Q. 8. 2 ml of dettol is added to a beaker containing 500 ml of water and stirred. State four observations that you make. (Board Term I, 2012 Set-020)

Ans. (i) Level of water remains same.

(ii) A uniform mixture is formed / a true solution is obtained.

(iii) The solution becomes white in colour.
(iv) Smell can be detected even on repeated dilution. (CBSE Marking Scheme, 2012) ½ × 4

Q. 9. Arrange the three states of matter in the increasing order of :

(i) rate of diffusion (ii) particle motion.

(Board Term I, 2012 Set-021)

Ans. (i) Rate of diffusion : solid < liquid < gas.

(ii) Particle motion : solid < liquid < gas 1 + 1
(CBSE Marking Scheme, 2012)

Q. 10. Mention two properties of water to justify that water is liquid at room temperature.

(Board Term I, 2012 Set-035)

Ans. Water is liquid at room temperature as it takes the shape of the container in which it is put and it shows fluidity. 1 + 1

(CBSE Marking Scheme, 2012)

Q. 11. A small amount of gas is let into a large evacuated chamber.

(a) How much of the chamber gets filled with the gas ?

(b) What property of the gas helps it to do so ?

(Board Term I, 2012 Set-040)

Ans. (a) The whole chamber gets filled with gas.

(b) The particles move about randomly at high speed. 1 + 1

(CBSE Marking Scheme, 2012)

Q. 12. Write the physical state of matter that shows the property given below :

(a) Most compressible form of matter.

(b) Has definite shape and volume.

(c) Has definite volume but no fixed shape.

(d) Rigid and incompressible.

(Board Term I, 2012 Set-041)

Ans. (a) Gas

(b) Solid

(c) Liquid

(d) Solid

½ × 4

(CBSE Marking Scheme, 2012)

Q. 13. Gases are more compressible. Write two reasons for this. (Board Term I, 2012 Set-069)

Ans. Gases are more compressible due to weak forces of attraction between molecules of gases and more intermolecular spaces. 1 + 1

(CBSE Marking Scheme, 2012)

Q. 14. Rate of diffusion is faster in gases. Why ?
(Board Term I, 2012 Set-060)

Ans. In case of gaseous state, due to negligible force of attraction they can move freely. That is why rate of diffusion is faster in gases. 2

(CBSE Marking Scheme, 2012)

Q. 15. Design an experiment to show that air contains water vapours. (Board Term I, 2012 Set-064)

- Ans.** (i) Take ice cold water in a metallic tumbler and keep it in open air.
(ii) After some time water droplets will be seen on the outer surface of the tumbler.
(iii) The water vapours present in air on coming in contact with the cold metallic surface of the tumbler loses energy and gets converted to liquid state.
(iv) This shows that air contains water vapours. 2

Q. 16. Ice, water and steam are three states of a substance and not different substances. Justify.

(Board Term I, 2012 Set-074)

Ans. When ice is melted water is produced and when water is heated steam is produced. Conversely when steam is cooled water is produced and when water is cooled ice is produced. 1 + 1

(CBSE Marking Scheme, 2012)

**Q. 17. (a) Write the full form of (i) L.P.G., (ii) C.N.G.
(b) Give one use for each.**

(Board Term I, 2012 Set-075)

Ans. (i) L.P.G. : Liquified Petroleum Gas.
(ii) C.N.G. : Compressed Natural Gas

(b) Use of L.P.G. : Fuel at home.

Use of C.N.G. : Fuel of vehicles.

½ × 4

(CBSE Marking Scheme, 2012)

Q. 18. (a) A diver is able to cut through water in a swimming pool. Which property of matter does this observation suggest ? How ?

(b) Liquids generally have lower density as compared to solids, but ice floats on water. Find out why ? (Board Term I, 2012 Set-070)

Ans. (a) The particles of water are held together by weak forces of attraction. It is these forces of attraction which the diver cuts through water in the swimming pool.

(b) In ice, the mass per unit volume $\left[\frac{M}{V} = D\right]$ i.e. density of ice is lesser than the density of water, hence ice floats on water. 1 + 1

Short Answer Type Questions-II

3 Marks each

Q. 1. What is the effect of change of pressure on physical state of matter ? Explain with an example of a gas.

(Board 2015, Set-K34UQKW)

Ans. The physical state of matter can be changed by changing the pressure. By lowering temperature and increasing the pressure gases can be changed into liquids and some solids can be changed into gases on decreasing the pressure.

This happens with gases as there is lots of space between the particles of a gas and upon applying high pressure particles come close to each other which upon cooling gets liquified. 1 + 1 + 1

**Q. 2. (a) After winters people pack off their woollens by keeping Naphthalene balls in them. With passage of time these balls become smaller in size. Why does this happen ? What type of change is involved during this process ?
(b) How can you convert a saturated solution into an unsaturated solution ?**

(Board Term I, 2015, 3GS246G)

Ans. (a) Sublimation, Naphthalene balls sublime and becomes smaller in size. It is a physical change.
(b) By adding large quantities of the solvent into the solution. (CBSE Marking Scheme, 2015) 3

Detailed Answer :

- (a) With time these naphthalene balls sublimes directly into vapour. It is a physical change and the process is known as sublimation.

(b) By adding large quantities of the solvent into the solution.

Q. 3. List three characteristics of particulate nature of matter. (Board 2014, Set-MNM9GZH)

Ans. (a) Particles of matter have space between them
(b) Particles of matter are continuously moving
(c) Particles of matter attract each other

(CBSE Marking Scheme, 2014) 1 × 3

Q. 4. Give reasons for the following :

- (a) Solids are incompressible
(b) Solids have negligible kinetic energy.

(Board 2014, Set-SO1QHJ)

Ans. (a) Solids are incompressible because the particles are closely packed and there is no space for their movement.

(b) The particles of solids do not have any intermolecular space and hence no movement. Therefore, they have negligible kinetic energy.

1½ + 1½

Q. 5. Give reasons :

- (a) Why gases exert pressure on the walls of container.
(b) Gases undergo diffusion very fast.

(Board Term I, 2013, 7ZTHA8G)

Ans. (a) The particles of a gas are free to move randomly in all directions. During the motion they collide with each other and also with the walls of container.

- (b) Particles of a gas are loosely packed, move randomly due to space between them, so they intermix with other particles present there.

(CBSE Marking Scheme, 2013) $1\frac{1}{2} + 1\frac{1}{2}$

Q. 6. Give reasons :

- (a) Naphthalene balls disappear with time without leaving any solid. (DDE, 2014)
 (b) A gas fills a vessel completely.

(Board Term I, 2013, AGRO 94)

Ans. (a) Naphthalene being volatile converts from solid to gas directly by the process called sublimation. Therefore, no solid residue is left after sometime as it takes the heat from surroundings and sublimes.

- (b) Particles of gas have negligible force of attraction between them and possess high kinetic energy. Therefore, they move very fast to fill the vessel completely in which they are kept. $1\frac{1}{2} + 1\frac{1}{2}$

Q. 7. Explain the inter conversion of three states of matter in terms of force of attraction and kinetic energy of the molecules.

(Board Term I, 2012 Set-019)

Ans. During the inter conversion of a solid into a liquid, and liquid into gas, on increasing the temperature the kinetic energy of the molecules increases and force of attraction among molecules decreases and vice versa. (CBSE Marking Scheme, 2012) 3

Q. 8. Carbon dioxide was taken in an enclosed cylinder and compressed by applying pressure :

- (a) Which state of matter will we obtain after completion of the process ?
 (b) Name and define this process.
 (c) What is the common name of the product obtained in the above process ?

(Board Term I, 2012 Set-020)

Ans. (a) Solid.

- (b) Sublimation : The process of conversion of solid directly into vapours or vice-versa.

(c) Dry ice 1×3

Q. 9. State all the factors that affect the rate of evaporation of water and also state how these factors affect it. (Board Term I, 2012 Set-034)

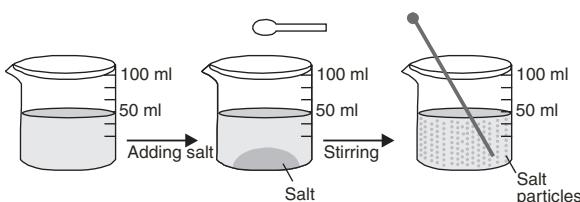
Ans. Rate of evaporation increases with an increase in surface area, an increase in temperature, a decrease in humidity, an increase in speed of wind. ($\frac{1}{2} \times 6$)

Q. 10. Write in brief, an activity to show the particulate nature of matter. List any two characteristics of particles of matter. (Board Term I, 2012 Set-035)

Ans. Activity :

- (a) Take a 100 ml beaker.
 (b) Fill half the beaker with water and mark the level of water.
 (c) Dissolve some salt / sugar with the help of a glass rod.
 (d) Observe any change in water level.

Observation : Level of water remains same and salt/sugar, has now spread throughout water. When we dissolve salt in water, the particles of salt get into the spaces between particles of water. This shows the particulate nature of matter.



Two characteristics of particles of matter are :

- (i) They have space between them.
 (ii) They are continuously moving.
 (iii) They attract each other. (Any two)

(1 For drawing skill +1 For explanation) + 1

Q. 11. With the help of labelled diagram describe an activity to show that the particles of matter are very small. Use the following material that has been provided to you.

4 beakers, spatula, 4 test-tubes, distilled water and a few crystals of potassium permanganate.

(Board Term I, 2012 Set-064)

Ans. (i) Take 2-3 crystals of potassium permanganate and dissolve them in 100 ml of water.

- (ii) Take out approximately 10 ml of this solution and put it into 90 ml of clear water.

- (iii) Take out 10 ml of this solution and put it into another 90 ml of clear water.

- (iv) Keep on diluting the solution like this 5 to 8 times.

- (v) This experiment shows that just a few crystals of potassium permanganate can change colour of a large volume of water (about 1000 L).

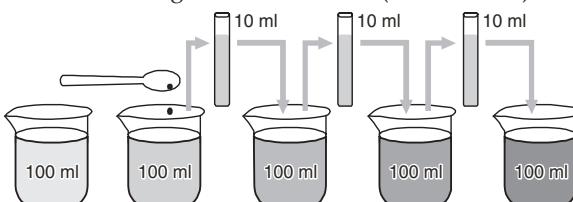


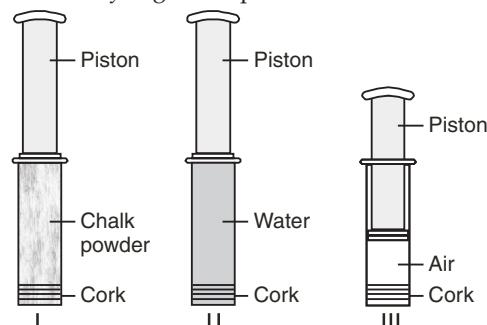
Fig : Set up to explain that particles of matter are very small. With every dilution, though the colour becomes light, it is still visible.

So, we conclude that there must be millions of tiny particles in just one crystal of potassium permanganate, which kept on dividing themselves into smaller and smaller particles. 3

Q. 12. Design an activity to show that gases are highly compressible as compared to solids and liquids.

(Board Term I, 2012 Set-060)

Ans. Take three 100 ml syringes and remove their pistons. Also, close the nozzles of the syringes with rubber corks. Then, fill one syringe with chalk powder and the other with water. Now, insert the pistons back into the syringes and push them.



You will observe that the pistons of the syringes (containing chalk pieces and water) require a large amount of force, while the piston of the third

syringe is comparatively easier to push. Hence it shows that gases are highly compressible. 3

Long Answer Type Questions

5 Marks each

Q. 1. Compare in tabular form, the properties of solids, liquids and gases with respect to : (a) shape, (b) volume, (c) compressibility, (d) diffusion, (e) fluidity or rigidity. (DDE-2014; Board Term I, 2012 Set-034)

Ans.

S. No.	Property	Solids	Liquids	Gases
(a)	Shape	Definite shape	No definite shape, takes the shape of container	No definite shape, takes the shape of container
(b)	Volume	Definite volume	Definite volume	No definite volume
(c)	Compressibility	Non-compressible	Slightly compressible	Highly compressible
(d)	Diffusion	Can diffuse in liquids	Can diffuse in liquids	Can diffuse in other gases
(e)	Fluidity or rigidity	Rigid	Shows fluidity	Shows fluidity

1 × 5

Q. 2. (a) List any two properties that liquids have in common with gases.

(b) Give two reasons to justify that an iron almirah is a solid at room temperature.

(c) What happens to the heat energy which is supplied to the solid once it starts melting ?

(Board Term I, 2013 7ZTHA8G)

Ans. (a) (i) Gases and liquids do not have fixed shape.

(ii) Gases and liquids flow easily.

(or any other relevant points)

(b) The shape does not change when pressed i.e. it is hard and rigid.

It has a definite shape and has high density.

(or any other relevant points)

(c) The heat energy supplied is taken up by solid particles and helps in melting or fusion.

(CBSE Marking Scheme, 2013) 2 + 2 + 1

Q. 3. (a) Distinguish between solids and gases on the basis of following parameters :

(i) Interparticle distance

(ii) Interparticle forces of attraction,

(iii) Compressibility. (DDE 2014)

(b) Give two factors that determine the rate of diffusion of a liquid in another liquid.

(Board Term I, 2013 AGRO 94)

Ans. (a) Differences between Solids and Gases :

S. No.	Solids	Gases
(i)	Interparticle space is small so the distance is less.	Interparticle space is maximum so the distance is more.
(ii)	Interparticle force of attraction is maximum.	Interparticle force of attraction is minimum.
(iii)	Solids are rigid and non-compressible.	Gases are not rigid and they are compressible.

(b) The two factors that determine the rate of diffusion of a liquid in another liquid are :

(i) Temperature

(ii) Pressure

3 + 2

Q. 4. (a) Explain with the help of an activity which shows that particles of matter are very small.

(b) Define matter. Name the states of matter in which the forces between the constituent particles are : (i) strongest, (ii) weakest.

(c) When sugar and common salt are kept in different jars, they take the shape of the jars. Are they solid ? Justify your answer.

(Board Term I, 2012 Set-016)

Ans. (a) (i) Take 2-3 crystals of copper sulphate and dissolve in 100 ml of water.

(ii) Take out approximate 10 ml of this solution and put it into 90 ml of clear water.

(iii) Take out 10 ml of this solution and put it into another 90 ml of clear water.

(iv) Keep diluting for 5-8 times.

Inference : A crystal of copper sulphate contains millions of tiny particles which keeps on dividing into smaller and smaller numbers with each dilution.

(b) Anything which possesses mass and occupies space is called matter.

(i) Solid – strongest, (ii) Gas – weakest.

(c) The shape of each individual sugar or salt crystal remains fixed. Therefore, they are solids.

2 + 1 + 1 + 1

(CBSE Marking Scheme, 2012)

Q. 5. (a) Arrange the following in the increasing order of (i) force of attraction, (ii) intermolecular space : iron nail, kerosene and oxygen gas.

(b) Define the following terms : (i) Rigidity, (ii) Compressibility, (iii) Diffusion.

(Board Term I, 2012 Set-020)

- Ans. (a)**
- (i) **Force of attraction :** Oxygen gas < Kerosene < Iron nail
 - (ii) **Intermolecular space :** Iron nail < Kerosene < Oxygen gas
- (b)**
- (i) **Rigidity :** It is the property of matter to maintain shape against external force.
 - (ii) **Compressibility :** It is the property of matter by virtue of which molecules of matter are brought closer to each other.
 - (iii) **Diffusion :** The inter mixing of the particles of matter is known as diffusion.

1 + 1 + 1 + 1 + 1

(CBSE Marking Scheme, 2012)

- Q. 6. (a)** Describe an activity to show that the particles of matter are continuously moving using red ink, honey and water in beakers. What is the effect of increase of temperature on the movement of particles ? Give reason.

- (b) Why is oxygen called a gas ? Give two reasons.**
(Board Term I, 2012 Set-069)

Ans. (a) Take two beakers filled with water, put a drop of red ink in one beaker and honey in the second beaker and leave them undisturbed. After sometime it can be observed that the colour of the ink spreads evenly throughout the water and also the honey in the second beaker. This happens because the molecules continuously keep on moving. When temperature is increased, the movement of particles become faster. This is due to increase in their kinetic energy.

- (b)**
- (i) Oxygen has neither fixed volume nor fixed shape.
 - (ii) Oxygen exerts pressure due to collision of the molecules on the walls of containing vessel and among themselves.
- 3 + 2**



TOPIC-2

Change in State of Matter, Evaporation, Condensation, Sublimation

QUICK REVIEW

- SI unit of temperature is Kelvin. $T(K) = T(^{\circ}C) + 273$.
- The melting point of a solid is an indication of the strength of the force of attraction between its particles.
- The temperature at which a liquid starts boiling at the atmospheric pressure is known as boiling point.
- Latent heat of vaporization is the heat energy required to change 1 kg of liquid to gas at atmospheric pressure at its boiling point. Boiling is a bulk phenomenon.
- In evaporation, the conversion of liquid to gaseous state occurs at a much slower rate, compared to boiling.
- Evaporation takes place only at the surface of the liquid while boiling can take place in all parts of the liquid.
- Evaporation is surface phenomenon.
- Evaporation is a continuous or ongoing process. Evaporation causes cooling.
- The rate of evaporation is affected by the surface area exposed to atmosphere, temperature, humidity and wind speed.
- Since evaporation is a surface phenomenon, therefore, it increases with an increase in surface area.
- Evaporation increases with an increase in temperature.
- Evaporation decreases with an increase in humidity.
- Evaporation increases with the increase in wind speed.

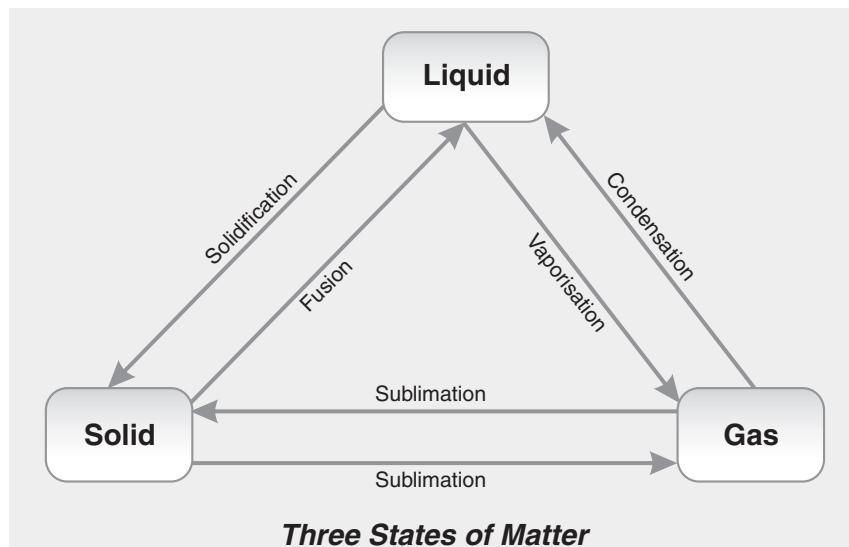


KNOW THE TERMS

- **Humidity :** The amount of water vapour present in the air.
- **Density :** It is the mass occupied by a solid per unit volume and is obtained by dividing the mass of a particular solid by the volume occupied by that mass of the solid.
- **Fusion :** The process in which a solid changes to liquid state by absorbing heat at constant temperature.
- **Diffusion :** The process in which particles of one substance occupy the vacant spaces present in the particles of the other substance, is called diffusion.
- **Condensation :** The process in which a gas changes into liquid state by giving out heat at constant temperature.
- **Latent heat :** The hidden heat which breaks the force of attraction between the molecules during change of state.

- **Latent heat of fusion :** The amount of heat energy that is needed to convert one kg of a solid into the liquid state at atmospheric pressure at its melting point is termed as latent heat of fusion.
- **Boiling point :** The temperature at which a liquid starts boiling at the atmospheric pressure is known as boiling point.
- **Freezing point :** The temperature at which a liquid changes to solid by giving out heat at the atmospheric pressure.
- **Latent heat of vaporisation :** The amount of heat energy that is needed to convert one kg of a liquid at its boiling point temperature into its vapour state without any rise in temperature, is termed as latent heat of vaporisation.
- **Melting point :** The melting point of a solid may be defined as the temperature at which a solid melts to become a liquid at the atmospheric pressure.
- **Sublimation :** Sublimation is the change of a solid directly into the gaseous state without passing through the liquid state upon heating and back to the solid state when the temperature is lowered.
- **Evaporation :** The phenomenon of change of liquid to the vapour state at any temperature below the boiling point of the liquid is termed as evaporation.
- **Transpiration :** The process of evaporation of water from the aerial parts of plants especially leaves is called transpiration.

FLOWCHART



Very Short Answer Type Questions

1 Mark each

Q. 1. What is meant by latent heat of fusion ?
(Board Term I, 2013, AGRO 94)

Ans. The amount of heat energy that is required to change 1 kg of a solid into liquid at atmospheric pressure at its melting point is known as the latent heat of fusion. 1
(CBSE Marking Scheme, 2013)

Q. 2. The molecules of water have more energy as compared to molecules of ice at same temperature. Justify this statement. (Board Term I, 2012 Set-020)

Ans. Water has more energy than ice at same temperature because particles in water have absorbed more energy during the change of state. (CBSE Marking Scheme, 2012) 1

Q. 3. State one difference between gas and vapour.
(Board Term I, 2012 Set-028)

Ans. **Gas :** It is a stable state as compared to vapour. e.g. O₂, H₂.

Vapour : It is an unstable state. On normal cooling vapour changes into liquid state. ½ + ½

(CBSE Marking Scheme, 2012)

Q. 4. The boiling point and freezing point of water are 100°C and 0°C respectively. Convert these temperatures in K.

(Board Term I, 2012 Set-031; 35)

Ans. 100°C + 273 = 373 K
0°C + 273 = 273 K ½ + ½

(CBSE Marking Scheme, 2012)

Q. 5. Why does palm of your hand feel cold when you pour some acetone on your palm ?

(Board Term I, 2012 Set-034)

Ans. It will evaporate taking latent heat of vaporization from the palm. The hand loses heat and gets cooled leaving temperature on hand low. 1
(CBSE Marking Scheme, 2012)

Q. 6. The boiling point of alcohol is 78°C . What is the corresponding temperature on the Kelvin scale ?
(Board Term I, 2012 Set-046)

Ans. $78 + 273 = 351 \text{ K}$ **(CBSE Marking Scheme, 2012)** 1

Q. 7. Name the phenomenon of changing of a liquid into vapours at a temperature even below its boiling point. **(Board Term I, 2012 Set-058)**

Ans. Evaporation. 1
(CBSE Marking Scheme, 2012)

Q. 8. Kinetic energy of particles of water in three vessels A, B, C are E_A , E_B , and E_C respectively and $E_A > E_B > E_C$. Arrange the temperatures T_A , T_B and T_C of water in the three vessels in increasing order.
(Board Term I, 2012 Set-061)

Ans. $T_C < T_B < T_A$ 1
(CBSE Marking Scheme, 2012)

Q. 9. A rubber band can change its shape on stretching. Will you classify it as solid or not ? Justify your answer. **(Board Term I, 2012 Set-021)** (HOTS)

Ans. Rubber band changes shape under force and regains the shape when the force is removed, so it is classified as a solid. 1

Q. 10. What happens to the boiling point of a liquid when atmospheric pressure decreases ? **(HOTS)**

Ans. Boiling point decreases because boiling point is the temperature at which vapour pressure of a liquid becomes equal to atmospheric pressure. 1

Q. 11. What happens to the melting point of ice when pressure is increased ? **(HOTS)**

Ans. When pressure is applied on the surface of ice, the change into liquid state is assisted. Thus, melting point decreases. 1

Short Answer Type Questions-I

2 Marks each

Q. 1. Explain whether the following statement is true or false ?

"Sublimation occurs only when the solid is heated". **(Board 2014, Set-SO1QHXJ)**

Ans. False, it can occur at room temperature also. e.g., Naphthalene balls sublime at room temperature.

1 + 1

Q. 2. Define the term sublimation. Write the names of any two substances which sublime.

(Board Term I, 2012 Set-015; 033)

Ans. Sublimation is the change of solid directly into the gaseous state without passing through the liquid state. e.g. ammonium chloride and naphthalene.

(CBSE Marking Scheme, 2012) 1 + 1

Q. 3. Give reason why we are able to sip hot tea or milk faster from a saucer rather than a cup ?

(Board Term I, 2012 Set-028)

Ans. Evaporation is directly proportional to surface area. Surface area of saucer is more so evaporation is more. **(CBSE Marking Scheme, 2012)** 2

Q. 4. Give reasons for the following :

- (a) In summer wearing of cotton clothes is more comfortable.
- (b) Water kept in an earthen pot becomes cool in summer. **(Board Term I, 2012 Set-042)**

Ans. (a) Cotton clothes are good absorber of sweat. During evaporation of sweat, heat is lost by the body which makes us feel cool.

- (b) On a hot day, evaporation of water from the pot through its pores becomes faster. During evaporation, it takes heat from the water of pot. **(CBSE Marking Scheme, 2012)** 1 + 1

Q. 5. Explain why heat energy is needed to melt a solid. Define latent heat of fusion.

(Board Term I, 2012 Set-050)

Ans. Heat energy is needed to melt a solid because there exist forces of attraction between the molecules and heat energy is essential to overcome the forces of attraction.

Latent heat of fusion is the amount of heat energy required to change 1 kg of solid into liquid at atmospheric pressure at its melting point.

(CBSE Marking Scheme, 2012) 1 + 1

Q. 6. Which of the following two will give you more severe burns and why ?

- (a) Steam at 373 K
 - (b) Water at 373 K.
- (Board Term I, 2012 Set-051)**

Ans. Steam at 373 K will give more severe burns. Steam has more heat content because of latent heat of vaporization. When it touches our body it gives this extra amount of heat causing more severe burns. 2

Q. 7. Identify and explain the factor responsible for changed rate of evaporation in the following situations :

- (a) While putting clothes for drying, we spread them out.
 - (b) Water coolers are not effective on a rainy day.
- (Board Term I, 2012 Set-052)**

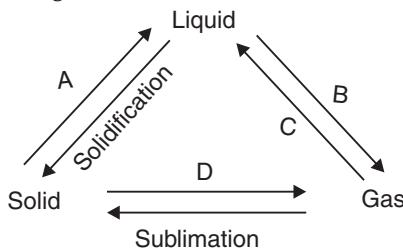
Ans. (a) Spreading the clothes for drying increases the surface area which helps it to dry faster as the rate of evaporation increases with increase in surface area.

- (b) Humidity $\frac{1}{\text{evaporation}}$

On a rainy day humidity increases, which decreases the rate of evaporation. 1 + 1

(CBSE Marking Scheme, 2012)

Q. 8. The following triangle exhibits inter-conversion of the three states of matter. Complete the triangle by labelling the arrows marked as A, B, C and D.



Ans. A – Fusion B – Vaporization
C – Condensation D – Sublimation $\frac{1}{2} \times 4$

Q. 9. Ramesh took two beakers A and B containing hot water and cold water respectively. In each beaker, he dropped a crystal of copper sulphate. He kept the beakers undisturbed. After sometime what did he observe and why? (HOTS)

Ans. The solutions in both beakers turned blue after sometime. But the colour change was observed earlier in beaker A containing hot water as

compared to beaker B containing cold water. This happened due to the faster rate of diffusion at a higher temperature. 2

Q. 10. Give reasons for the following :

- A gas exerts pressure on the walls of the container in which it is kept ?
- A gas fills completely the vessel in which it is kept ? (HOTS)

Ans. (a) Molecules of the gas are continuously moving. They collide with themselves and with the walls of container exerting pressure.
(b) As molecules of gas are continuously moving, they occupy all the available space. 1 + 1

Q. 11. Osmosis is a special kind of diffusion. Comment. (HOTS)

Ans. Diffusion is the process in which molecules of a substance move from the place of (their) higher concentration to the place of lower concentration. But during osmosis, the water molecules (or solvent) move from concentrated solution to dilute solution through a semipermeable membrane. Thus, osmosis is termed as a special kind of diffusion. 2

Short Answer Type Questions-II

3 Marks each

Q. 1. People of village use earthen pots to get cool water in water. Explain the reason that why water remains cool in earthen pots ?

(Board 2015, Set-LOV7LN7)

Ans. There are pores in an earthen pot through which the liquid inside the pot evaporates. This evaporation makes the water inside the pot cool. In this way, water kept in an earthen pot becomes cool during summers. 3

(CBSE Marking Scheme, 2015)

Q. 2. Distinguish among three state of matter with respect to property indicated :

(Board 2015, Set-K34UQKW)

Ans.

		Solid	Liquid	Gas
(a)	Density	Highest	Intermediate	Lowest
(b)	Diffusion	Negligible	Slower	Rapid
(c)	Particle	No	Yes, but confined	Yes, free motion

1 + 1 + 1

Q. 3. Why does the temperature remain constant during the change of state of matter ? Explain it on the basis of change of solid state into liquid state.

(Board Term I, 2015, 3GS246G)

Ans. Latent heat

Heat is used up in changing the state by overcoming the force of attraction between the particles. 3

(CBSE Marking Scheme, 2015)

Detailed Answer :

The temperature remains constant as the heat gets used up in changing the state by overcoming the forces of attraction between the particles.

For example, a solid melts on heating. Its temperature does not rise until the entire solid is converted into liquid. This heat energy gets hidden into the contents and is known as the latent heat.

Q. 4. Explain with the examples from your daily life where cooling is caused by evaporation.

(Board 2014, Set-LFS3I7K)

Ans. When a liquid evaporates, it draws the latent heat of vaporization from anything which it touches. Thus cause cooling.

For example : Sweating and Water in earthen pot.
(CBSE Marking Scheme, 2014) 2 + 1

Q. 5. (a) Define latent heat of vaporization.

(b) Give reasons for the following :

- You feel cold when you pour some nail polish remover on your palm.
- During summer, sitting under a fan makes us comfortable.

(Board Term I 2013, OAHJD6G)

Ans. (a) The amount of heat energy required to change 1 kg of a liquid to gas at atmospheric pressure at its boiling point is called latent heat of vaporization.

- Particles gain heat energy from the palm and evaporate causing the palm to feel cool.

(ii) When we sit under a fan during summer, rate of evaporation of sweat increases due to increase in wind speed, sweat takes heat from body to evaporate leaving us cool.

(CBSE Marking Scheme, 2013) 1 + 1 + 1

- Q. 6. (a) Enumerate the changes that take place inside the matter during the change of states.
 (b) When a solid melts, its temperature remains the same. Give reason.

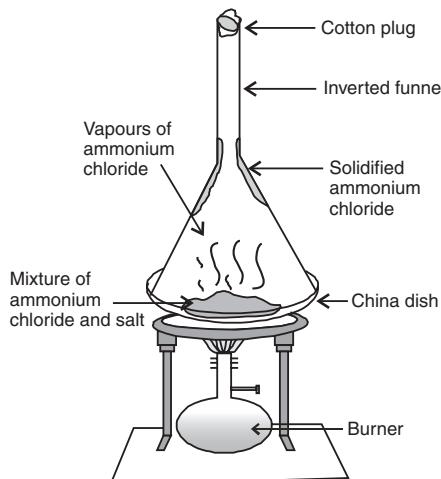
(Board Term I, 2012 Set-021)

- Ans. (a) On increasing temperature, kinetic energy of the molecules increases and force of attraction between the molecules decreases and the state of matter changes.
 (b) This is because the heat supplied to the matter is utilized in changing the state by overcoming the force of attraction. 2 + 1
 (CBSE Marking Scheme, 2012)

- Q. 7. With the help of a well-labelled diagram (with two labelling) explain how solid ammonium chloride converts directly to gaseous state on heating ?

(Board Term I, 2012 Set-041; 059)

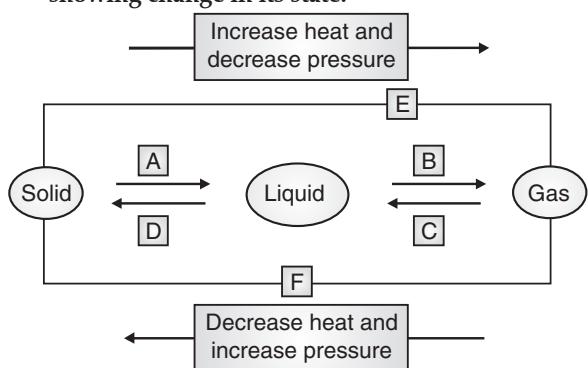
Ans.



Take some camphor or ammonium chloride. Crush it and put it in a China dish.

Put an inverted funnel over the China dish. Put a cotton plug on the stem of the funnel. Now heat slowly. It is observed that NH_4Cl sublimes and gets deposited on the inner core of funnel. 3

- Q. 8. Name A, B, C, D, E and F in the following diagram showing change in its state.



Ans. (i) A – Fusion

(ii) B – Vaporization

(iii) C – Condensation

(iv) D – Solidification

(v) E – Sublimation

(vi) F – Sublimation

$\frac{1}{2} \times 6$

- Q. 9. Define evaporation. How does it differ from boiling ? How does evaporation cause cooling ?
 (Board Term I, 2012 Set-067)

Ans. Evaporation is change of a liquid into vapours at any temperature below its boiling point.

Evaporation is a surface phenomenon; it takes place at all temperatures. Boiling is a bulk phenomenon. It takes place at fixed temperature.

When a liquid evaporates, it draws the latent heat of vaporization from anything which it touches or is in contact with. Thus causes cooling. 1 + 1 + 1

(CBSE Marking Scheme, 2012)

- Q. 10. (a) List any four characteristic properties of gases.
 (b) Steam produces more severe burns than boiling water. Why ?

(Board Term I, 2012 Set-074)

- Ans. (a) (i) Gases neither have a definite shape nor a definite volume.
 (ii) Gases are compressible.
 (iii) It exerts pressure on the walls of the container due to the collision of molecules.
 (iv) Gases flow easily.

(b) When water at 373 K is converted into steam at 373 K, it absorbs energy equal to the latent heat of vaporization. Thus, steam at 373 K has more heat energy than water at 373 K and hence steam produces more severe burns than boiling water. $\frac{1}{2} \times 4 + 1$

(CBSE Marking Scheme, 2012)

- Q. 11. (a) Wax is heated in a China dish. How will the following change during heating :
 (i) Kinetic energy of particle.
 (ii) Inter particle distance ?
 (b) Melting points of three substances A, B, C are 52°C, 175°C and 80°C. Arrange them in the decreasing order of the inter particle force of attraction in each of them. Give reason for your answer. (Board Term I, 2012 Set-052)

- Ans. (a) (i) Kinetic energy will increase.
 (ii) Inter particle distance will increase.

- (b) B, C, A.

Higher melting point indicates that inter particle force is stronger so more heat is required by particles to break away from bonds. 1 + 2

(CBSE Marking Scheme, 2012)

- Q. 12. Write answer in one word :

- (a) The process by which the solid directly changes into gases without liquifying.

- (b) Energy required to change 1 kg of a liquid to gas at atmospheric pressure at its boiling point.
 (c) The property of gases which makes it possible to inflate a large number of balloons from a small cylinder of hydrogen gas.

(Board Term I, 2012 Set-054)

- Ans.** (a) Sublimation,
 (b) Latent heat of vaporization,
 (c) Compressibility of hydrogen gas. 1×3
 (CBSE Marking Scheme, 2012)

- Q. 13. How does the following affect the rate of liquid of vaporization or evaporation ?**

- (a) Surface area,
 (b) Temperature and
 (c) Humidity.

- Ans.** (a) **Surface area :** As surface area increases, more number of particles get converted into vapours, and rate of evaporation increases.
 (b) **Temperature :** With increase in temperature, kinetic energy of the particles of liquid also increases and rate of evaporation increases.
 (c) **Humidity :** As humidity in air increases, rate of evaporation decreases. 1×3

Long Answer Type Questions-I

5 Marks each

- Q. 1.** (a) Explain the term diffusion. Illustrate with an activity that rate of diffusion increases with temperature.
 (b) Name two compressed gases which are used in :
 (i) Our homes for cooking.
 (ii) Are supplied to hospital in cylinders.

(Board 2015, Set-LOV7LN7)

- Ans.** (a) When particles of one substance occupy the vacant space present in the particles of the other substance, this is called diffusion.

Activity :

- Take 5 g of copper sulphate each in three beakers.
- Pour 100 ml of distilled water slowly in one of the beakers.
- Cover this beaker with a watch glass.
- Pour 100 ml of cold water in a second beaker slowly.
- Place a third beaker containing 100 ml of water on a tripod stand for heating.
- Observe the diffusion process which begins in all the beakers.
- Record the time taken for the dissolution of copper sulphate in all the three cases.

Conclusion : The rate of diffusion of copper sulphate in water is in the order :

Beaker 3 > Beaker 2 > Beaker 1.

- (b) (i) Liquified Petroleum Gas (LPG)
 (ii) Oxygen. $1 + 2 + 1 + 1$

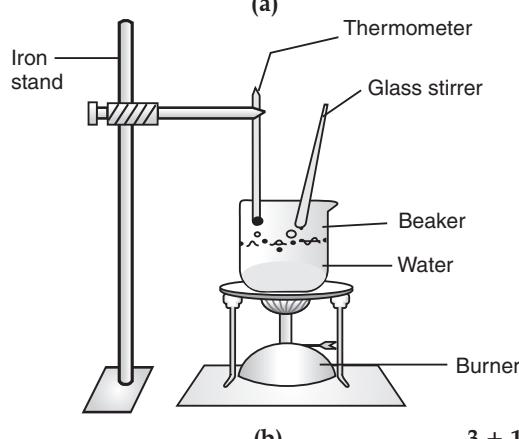
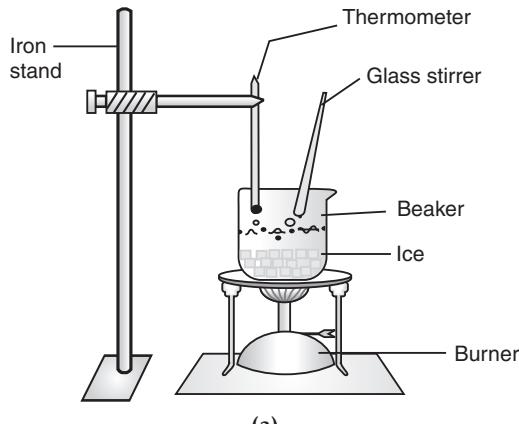
- Q. 2.** (a) Define melting point. Describe an activity with labelled diagram to find melting point of ice.
 (b) Explain why temperature remains same during melting of ice. (Board 2015, Set-K34UQKW)

- Ans.** (a) Melting point of a solid is defined as the temperature at which a solid melts to become a liquid at the atmospheric pressure.

Activity :

- Take about 150 g of ice in a beaker and suspend a laboratory thermometer so that its bulb is in contact with the ice.
- Start heating the beaker on a low flame.
- Note the temperature when the ice starts melting.

- Note the temperature when all the ice has converted into water.
- Record your observations for this conversion of solid to liquid state.
- Now, put a glass rod in the beaker and heat while stirring till the water starts boiling.
- Keep a careful eye on the thermometer reading till most of the water had vaporised.
- Record observations.
- The temperature remains constant during the melting of ice even though heat is supplied regularly as the temperature is supplied for changing the state of matter. The heat of temperature is consumed by the particles of ice and they vibrate faster and breaks the force of attraction and becomes liquid.

 $3 + 1 + 1$

Q. 3. Answer the following questions :

- (a) Out of boiling and evaporation which is a surface phenomenon ? Explain. In the absence of a refrigerator butter is kept wrapped in a wet cloth during summer. Why ?
- (b) Why do ice-cream appears colder than water at the same temperature ?

Ans. (a) Evaporation is a surface phenomenon. Particles from the surface gain enough energy to overcome the forces of attraction present in the liquid and change into vapour state.

Due to wet cloth the temperature is comparatively lower than room temperature so butter does not melt when remain wrapped in wet cloths.

- (b) Ice cream at 273 K, it will take latent heat from the medium to convert itself into liquid at 273 K and then into liquid at higher temperature but in water such condition is not possible.

(CBSE Marking Scheme, 2015) 5

Q. 4. (a) Define evaporation. Out of nylon and cotton clothes, which will be more comfortable during summer and why ?

- (b) Is evaporation and boiling are same ? If not, then why ?

(Board 2014, Set-LFS3I7K, Set-MNM9GZH)

Ans. (a) The process of conversion of liquid state into vapour state at any temperature below the boiling point of the liquid is called evaporation.

Cotton is a better absorber of water than Nylon. So, during summer, cotton clothes absorb sweat, which on evaporation causes a cooling sensation in the body.

- (b) Not exactly same. Boiling of liquid takes place at its Boiling point, whereas evaporation can occurs at any temperature or room temperature.

(CBSE Marking Scheme, 2014) 1 + 2 + 2

Q. 5. Explain with the examples from your daily life where cooling is caused by evaporation.

(Board 2014, Set-MNM9GZH)

Ans. (a) Rain water takes heat from road to get evaporated leaving road dry.

- (b) Cotton being good absorber of water, helps in absorbing the sweat and expose to the atmosphere for easy evaporation.

- (c) In summer trees absorb more water and minerals from the soil as the rate of transpiration increases.

- (d) Acetone evaporates by taking heat from palm leaving it cool.

- (e) Water evaporates from the roof taking heat from surroundings on hot summer day leaving roof cool.

(CBSE Marking Scheme, 2014) 1 × 5

Q. 6. (a) Mention the physical state of water at :

- (i) 100°C (ii) 0°C.
- (b) Convert the following temperature into Celsius scale :
- (i) 298 K (ii) 300 K (iii) 280 K
(Board 2014, Set-SO1QHXJ)

Ans. (a) (i) Liquid and gas (ii) Liquid and solid.

- (b) (i) $298 - 273 = 25^\circ\text{C}$
(ii) $300 - 273 = 27^\circ\text{C}$
(iii) $280 - 273 = 7^\circ\text{C}$

1 + 1 + 1 + 1 + 1

Q. 7. (a) Define evaporation.

- (b) Write ways in which evaporation differs from boiling.
- (c) Explain two factors affecting evaporation.

(DDE 2014; Board Term I, 2013 AGRO 94)

Ans. (a) Refer Q. 4(a).

(b) Differences between Boiling and Evaporation :

S. No.	Boiling	Evaporation
(a)	Boiling occurs at a particular temperature i.e. boiling point of that liquid.	Evaporation takes place when the liquid is placed in an open container at any temperature below its boiling point.
(b)	Heating takes place during boiling.	Cooling takes place during evaporation.
(c)	(i) When temperature is increased, the rate of evaporation increases because with the increase of temperature, more number of particles get enough kinetic energy to go into the vapour state. (ii) When humidity is decreased, the rate of evaporation increases and vice-versa.	1 + 2 + 2

Q. 8. Account for the following :

- (a) When sugar crystals dissolve in water, the level of water does not rise appreciably.
- (b) Doctors advise to put strips of wet cloth on the forehead of a person having high fever.
- (c) Naphthalene balls disappear with time without leaving any solid residue.
- (d) A wooden table should be called a solid.
- (e) Dogs generally hang out their tongue in summer. (Board Term I, 2012 Set-016)

Ans. (a) Particles of sugar crystals occupy the space between the particles of water.

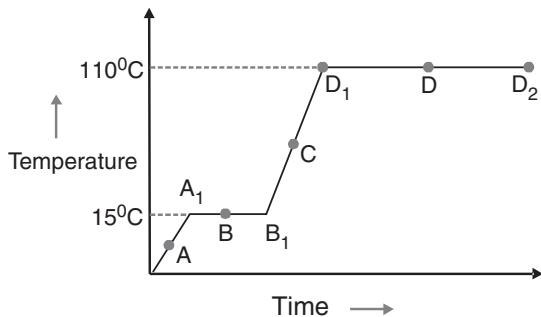
- (b) The excess heat from the body is taken by high latent heat of vaporization of water. As a result, temperature of body decreases.

- (c) Sublimation, naphthalene gets converted into vapours.

- (d) Because a wooden table has a fixed shape as well as fixed volume and it is uncompressible also.
 (e) Evaporation of saliva causes cooling. 1×5
 (CBSE Marking Scheme, 2012)

Q. 9. The temperature - time graph given below shows the heating curve for pure wax. After studying the graph answer the following questions :

(Board Term I, 2012 Set-035)



- (a) What is the physical state of the substance at the point A, B, C and D ?
 (b) What is the melting point of the substance ?
 (c) What is its boiling point ?
 (d) Which portions of the graph indicate that change of state is taking place ?
 (e) Name the terms used for heat absorbed during change of states involved in the above process.

- Ans. (a) A – solid B – fusion
 C – liquid D – vaporization
 (b) 15°C
 (c) 110°C
 (d) A₁B₁ and D₁D₂
 (e) Latent heat of fusion and latent heat of vaporization. 1×5

(CBSE Marking Scheme, 2012)

Q. 10. 5 ml of water was taken in a test-tube and China dish separately. These samples were then kept under different conditions as below :

- (a) Both the samples are kept under a fan.
 (b) Both the samples are kept inside a cupboard. State in which case evaporation will be faster ? Give reasons to support your answer. How will the rate of evaporation change if above activity is carried out on a rainy day ? Justify your answer. (Board Term I, 2012 Set-020)

- Ans. (a) Evaporation will be faster when china dish is kept under a fan.
 This is because rate of evaporation increases with surface area and wind speed.
 (b) Rate of evaporation will decrease. Rate of evaporation decreases as humidity increases on a rainy day. $1 + 2 + 2$
 (CBSE Marking Scheme, 2012)

Q. 11. While heating ice in a beaker with a thermometer suspended in it, a student recorded the following observations :

Time (in min)	Temp. (in °C)
0	-3
1	-1
2	0
3	0
4	5
5	8
6	12
7	15
8	19
10	22
15	30
20	50
25	73
30	100
35	100

Based on the above observations, answer the following questions :

- (a) State the change(s) observed between 2 min. to 3 min., and name the process involved.
 (b) Between 30 min. to 35 min., the temperature remains constant. State the reason for this. Name the heat involved in the process and define it. (Board Term I, 2012 Set-042)

- Ans. (a) Ice converts to water.
 Process : Fusion.
 (b) Heat is used for conversion of state.
 Reason : Because of latent heat of vaporization. The latent heat of vaporization is the amount of heat required to convert a unit mass of liquid into its vapour state, without a change in its temperature at its boiling point.

$1 + 1 + 1 + 1 + 1$
 (CBSE Marking Scheme, 2012)

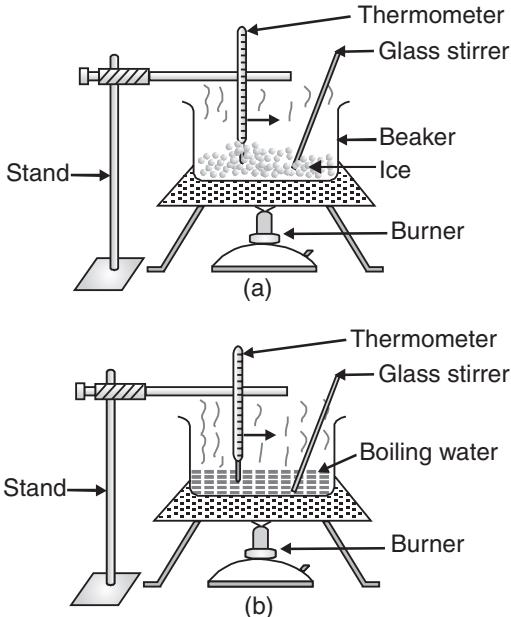
Q. 12.(a) Give reasons for the following :

- (i) Why do we see droplets of water on the outer surface of a glass containing ice cold water ?
 (ii) After a hot sunny day, people sprinkle water on the roof or open ground.
 (b) Describe an activity with labelled diagram to illustrate the effect of increase of temperature on ice. (Board Term I, 2012 Set-052; 71)

- Ans. (a) (i) Water vapour of air condenses because it loses energy when it comes in contact with cool surface.
 (ii) Evaporation leads to decrease in temperature because water takes heat for evaporation from floor.

- (b) Take about 150 g of ice in a beaker and suspend a laboratory thermometer so that its bulb is in contact with the ice.
- Start heating the beaker on a low flame.
 - Note the temperature when the ice starts melting.
 - Note the temperature when all the ice has converted into water.
 - Record your observations for this conversion of solid to liquid state.
 - Now, put a glass rod in the beaker and heat while stirring till the water starts boiling.
 - Keep a careful eye on the thermometer reading till most of the water has vaporised.

Observation : As the ice reaches its melting point, it starts converting into water.



2 + 3

Value Based Questions

Q. 1. One day, when Suhani was playing with mother's cosmetics, she felt cold, when a liquid bottle broke and some liquid fell on her hand, she got worried. She washed her hand and immediately asked her mother why she felt cold. Her mother answered her.

- Can you guess what was that liquid ?
- Why Suhani felt cool when liquid fell on her hand ?
- What values are shown by Suhani's mother ?

Ans. (i) The liquid is nail paint remover which contains an ether or acetone.

(ii) Ether evaporates by taking heat energy from the hand (body). That's why she felt cold.

(iii) She exhibits knowledge, carefulness and educating nature towards her daughter.

1 + 1 + 1

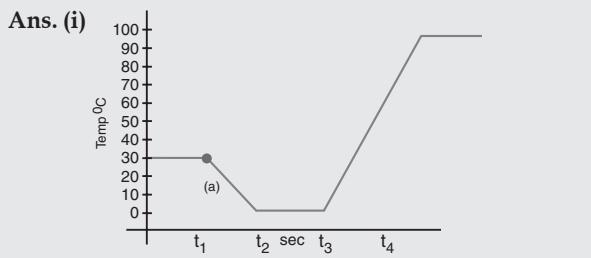
Q. 13. Rahul observes the changes in temperature at different intervals as follows :

- For the first time interval from ' t_1 ' to ' t_2 ' seconds, the temperature first gradually dropped from 30°C to 0°C.
- For the next time interval from ' t_2 ' to ' t_3 ' seconds, the temperature remained constant until all the ice melted.
- In the next time interval from ' t_3 ' to ' t_4 ' seconds, the temperature then increased gradually from 0°C to 100°C.
- Draw the graph to show the above mentioned changes.

Now answer the following :

- Name the property by virtue of which the temperature remained constant in observation (b).
- What should be subsequent reading of temperature on further heating after ' t_4 ' seconds of Rahul's observation ?

(Board Term I, 2012 Set-054)



- (ii) Latent heat of fusion.
(iii) The temperature will remain constant at 100°C.

(CBSE Marking Scheme, 2012) 1 × 3 + 1 + 1

Q. 2. Sakhi went to her grandmother's village, where she found most of the ladies preparing dal in a sauce pan. She advised them to use pressure cooker instead of sauce pan to cook food faster.

- How pressure cooker is helpful in cooking food faster ?
- What values are displayed by Sakhi ?
- How the use of pressure cooker is useful ?

Ans. (a) The pressure in the enclosed volume above the liquid reaches much greater values than atmospheric pressure, thus the temperature of boiling water within the cooker is greater than the normal boiling temperature. Hence, food cooks much faster.

(b) She is trying to do social work by educating village women about the usefulness of pressure cooker as faster means of cooking food.

- (c) Pressure cooker helps in cooking food at faster rate, thus saves energy and time. $1 + 1 + 1$
- Q. 3. Rahul is fond of mountaineering. In his summer holidays, he planned to climb a high mountain with his friends. During climbing one of his friends got hurt and required hot water for the treatment. He quickly took out his burner to boil the water. He found that on the mountain water took much less time to boil than on the ground.**
- Why does water boil at a lower temperature at higher altitudes ?
 - What values are displayed by Rahul ?
 - Give one more example related to this phenomenon.
- Ans.** (a) Boiling occurs at a point where vapour pressure is equal to the external atmospheric pressure. At higher altitudes atmospheric pressure is much less. Less thermal energy is required to get vapour pressure equal to the atmospheric pressure.
- (b) This shows that Rahul is sympathetic and friendly.
- (c) Cooking of potatoes take much longer at the top of a mountain because boiling temperature of water is lower. $1 + 1 + 1$
- Q. 4. One day Ravi fell ill and was suffering from high fever. Doctor advised his mother to put wet strips of cloth on his forehead. His mother took the doctor's advice properly and put wet strips of cloth on Ravi's forehead. The process was very helpful in bringing down his fever.**
- Why wet strips of cloth are put on the forehead of the person suffering from high fever ?
 - What values are displayed by mother ?
 - Name the phenomenon involved in this process.
- Ans.** (a) Water in the wet strips of the cloth takes heat from the body of the person while evaporating. This brings down the body temperature of the person.
- (b) This shows that Ravi's mother is caring and intelligent.
- (c) Evaporation. $1 + 1 + 1$
- Q. 5. (a) Archit dropped a crystal of potassium permanganate into two beakers A and B containing hot water and cold water respectively. After keeping the beakers undisturbed for some time what did he observe and why ?**
- State two characteristic properties each of :
 - (i) solid, (ii) liquid and (iii) gas.
 - What values are shown by Archit ?
- Ans.** (a) Potassium permanganate crystals diffuse faster in hot water because as the temperature increases diffusion increases.
- (b) **Properties of solid :** They have a fixed shape and volume. They are rigid.
Properties of liquid : They have fixed volume but not fixed shape. They are not rigid.
Properties of gas : They neither have fixed shape nor fixed volume. They are highly compressible.
- (c) Archit showed his experimental and observatory skills. $1 + 3 + 1$
- Q. 6. (a) You want to wear your favourite shirt in a party, but the problem is that it is still wet after a wash. Mention three steps with reason that you would take to dry it faster ?**
- It is a hot summer day; Priyanshi and Ali are wearing cotton and nylon clothes respectively.
 - (i) Who do you think would be more comfortable and why ?
 - (ii) During rainy season we feel sticky and uncomfortable even under the fan why ?
- Ans.** (a) To dry it faster, rate of evaporation has to be increased, for this :
- We can spread it to increase surface area.
 - We can iron it to increase temperature.
 - We can spread it under fan to increase wind speed.
- (b) (i) Priyanshi will be more comfortable as in cotton clothes sweat will evaporate faster by taking latent heat of vapourization from the body and thus making it comfortable by taking away body's heat faster.
- (ii) During rainy season humidity is high so rate of evaporation is slower. $1 \times 3 + 1 + 1$

Practical Based Questions

Multiple Choice Questions

(1 mark each)

- Q. 1. Out of the following substance which does not undergo sublimation ?**
 (Board 2015, Set-LOV7LN7)
- Sugar
 - Camphor
 - Iodine
 - Naphthalene
- Q. 2. Which of the following substance cannot be separated by the method of sublimation :**
 (Board 2015, Set-K34UQKW)
- Sodium chloride
 - Ammonium chloride
 - Camphor
 - Iodine
- Q. 3. When liquid starts boiling, further heat is supplied, which is : (Board Term I, 2013 AGRO 94)**
- absorbed as latent heat of vaporization by the liquid
 - lost to surrounding
 - absorbed to increase the temperature
 - absorbed to convert the liquid into solid
- Q. 4. Under which condition, can we boil water at room temperature ? (Board Term I, 2013 OAHJD6N)**
- at high pressure
 - at low pressure
 - at atmospheric pressure
 - not possible
- Q. 5. At the melting point temperature :**
 (Board Term I, 2013 7ZTHA8G)

- (a) only ice is present
- (b) only water is present
- (c) both ice and water are present
- (d) none of the above

Q. 6. When solid starts melting, further heat energy which is supplied : (Board Term I, 2012 Set-070)

- (a) is lost to the surroundings as such
- (b) is absorbed as latent heat of fusion by the solid
- (c) increases the temperature of the liquid
- (d) increases the kinetic energy of the particles of the liquid.

Q. 7. To find the boiling point of water 3 students used water, at 0°C , at room temperature and luke-warm water respectively. On comparing their observations it would be found that the boiling point of water will be : (Board Term I, 2012 Set-070)

- (a) same in all the cases
- (b) least in the water taken at 0°C
- (c) maximum in the case of luke-warm water
- (d) different in all the three cases

Q. 8. In an experiment to find the melting point of ice the correct reading of thermometer is noted when (Board Term I, 2012 Set-070)

- (a) ice starts melting
- (b) whole of the ice melts
- (c) temperature starts increasing
- (d) temperature becomes constant

Q. 9. At room temperature (30°C) a student sets up an apparatus to determine the melting point of ice. He takes a beaker filled with ice and dips a mercury thermometer in it. The correct observation is : (Board Term I, 2012 Set-071)

- (a) Mercury in the thermometer keeps on falling till it reads 1°C , it remains constant thereafter
- (b) Temperature falls, reaches 0°C , then it remains constant even after the whole ice has melted
- (c) The temperature falls initially but begins to rise as soon as the ice starts melting
- (d) Temperature falls, reaches to 0°C and remains constant only as long as both ice and water are present in it

Q. 10. A student takes some water in a beaker and heats it over a flame to determine the boiling point of water. He keeps on taking temperature readings. He observes that the temperature of water :

(Board Term I, 2012 Set-071)

- (a) keeps on increasing regularly.
- (b) keeps on increasing irregularly.
- (c) first increases slowly, then decreases rapidly and eventually becomes constant.
- (d) first increases gradually and then becomes constant.

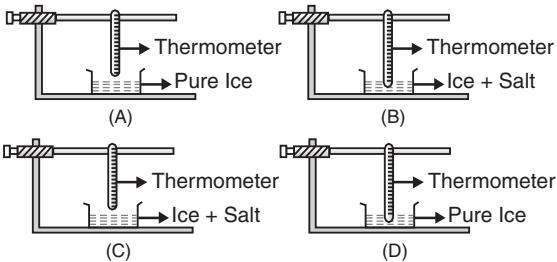
Q. 11. To determine the boiling point of water the bulb of the thermometer should :

(Board Term I, 2012 Set-076)

- (a) be completely dipped in water
- (b) just touch the bottom of flask
- (c) be near the mouth of the flask
- (d) be just above the surface of water

Q. 12. Which of the following is the correct method of finding the melting point of ice ?

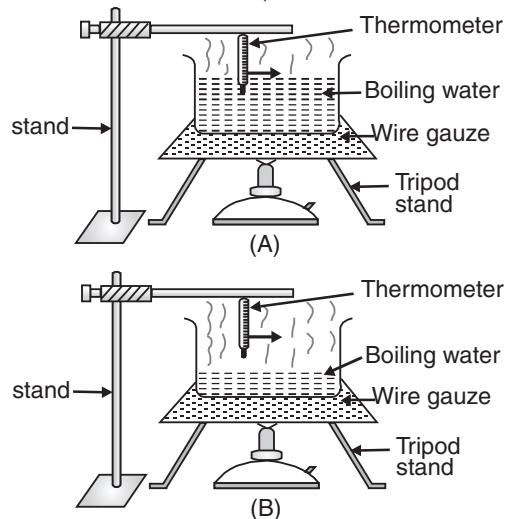
(Board Term I, 2012 Set-015)



- (a) A
- (b) B
- (c) C
- (d) D

Q. 13. Two students Arpit and Rakshita are asked to arrange the apparatus to determine the boiling point of water. They arranged the apparatus as shown below by figures A and B respectively :

(Board Term I, 2012 Set-015)

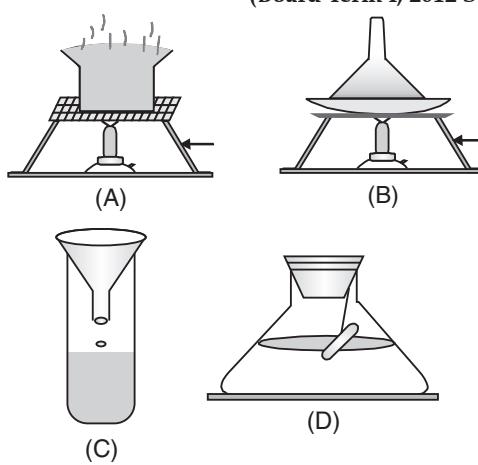


The diagram in which the apparatus is correctly arranged is :

- (a) (A) only
- (b) (B) only
- (c) both (A) and (B)
- (d) neither (A) nor (B)

Q. 14. Which one of the following figure describes the process of Solid vapours ?

(Board Term I, 2012 Set-016)



10. (d) Temperature first increases gradually and then becomes constant due to latent heat.
11. (a) Bulb should be completely dipped in water.
12. (d) Bulb of thermometer should be completely dipped in water and there should be no added salt.
13. (a) Bulb should be completely dipped in water.
14. (b) Apparatus B shows the process of sublimation.
15. (b) On stirring the temperature within the liquid becomes uniform.
16. (b) Temperature remains constant till all the ice melts.
17. (a) Because sides of the beaker may be at slightly higher temperature than 100°C.
18. (b) 19 divisions is equivalent to 9.5°C. Thus overall temperature is 99.5°C.
19. (d) Distilled water does not contain any impurity.
20. (b) To make sure that the boiling point obtained is accurate even when water sample contains non-volatile impurities dissolved.
21. (a) Liquid, solid, gas.
22. (a) On boiling, temperature remains constant till all the water is converted into steam.
23. (b) $10 \text{ C}/20 \text{ div.} = 0.5$.
24. (b) Boiling point may increase due to presence of impurities.
25. (c) Pumice stone pieces helps in avoiding bumping.
26. (a) It has a wide range of temperature tolerance.

Short Answer Type Questions (2 marks each)

Q. 1. Why are pieces of pumice stone placed in the container before heating water while determining the boiling point of water in the laboratory ? Explain briefly.(Board Term I, 2015 Set-LOV7LN7)

Ans. Pieces of pumice stones are placed in the container before heating to avoid bumping of liquid when the temperature increase. On boiling, water releases energy as bubbles. If the bubbles do not form it can develop lot of heat and possibly explode. Addition of stones given lots of surface area for bubbles to form and release the energy gradually. 2

Q. 2. To find the boiling point of water, three students A, B and C used distilled water at 0°C, at room temperature and luke warm respectively. Compare the boiling point of water observed by the three students and give reason for your answer.

(Board Term I, 2015 Set-K34UQKW)

Ans. The value of the boiling point does not depend on the temperature of the liquid when pressure is kept constant. Thus, all the three students will observe same boiling point. 2

Q. 3. In an experiment to determine the melting point of ice, mention two important precautions to be taken.

(Board 2015, Set-3GS246G)

Ans. (i) The bulb of the thermometer should be completely inside the crushed ice.
(ii) The solution should be stirred regularly to keep a uniform temperature. 1 + 1
(CBSE Marking Scheme, 2015)

Q. 4. In an experiment to determine the boiling point of water, the stop watch used to note down the temperature of water at different intervals of time has 20 divisions between 0 to 10s marks. Find the least count of the stop watch.

(Board Term I, 2015, 3GS246G, Board 2014, Set-MNM9GZH)

Ans. Least count = $10/20$
= 0.5 (s)

(CBSE Marking Scheme, 2014) 2

Q. 5. In an experiment to determine the melting point of ice in laboratory, what form of ice should be preferably used ? When should the reading of thermometer be noted ?

(DDE 2014, Board 2014, Set-LFS3I7K)

Ans. (i) Crushed ice preferably from distilled water.
(ii) When whole of the ice melts and temperature becomes constant. 1 + 1

(CBSE Marking Scheme, 2014)

Q. 6. In an experiment to determine the boiling point of water, mention two important precautions to be taken.

(Board Term I, 2013, OAHJD6N)

Ans. (i) Pumice stone pieces should be added to stop bumping of water.
(ii) The thermometer should be just above the surface of water.

(CBSE Marking Scheme, 2014) 1 + 1

Q. 7. In an experiment to determine the boiling point of water, state reason for the following precautions :
(Board Term I, 2013, 7ZTH8AG)

(i) The bulb of thermometer should not touch the sides of beaker.
(ii) While boiling water, pumice stones should be added.

Ans. (i) Sides of the beaker are at slightly higher temperature.
(ii) To avoid bumping.

(CBSE Marking Scheme, 2014) 1 + 1

Q. 8. Why do we fix a two holed-cork in the round bottom flask while determining the boiling point of water ?

Ans. We fix a two holed-cork in the round bottom flask in order to fix the thermometer through one of the holes in the cork and the glass tube through the other. 2

Q. 9. Why does the temperature of a substance remain constant during its melting point or boiling point ?
Ans. During melting, latent heat of fusion and during

boiling, latent heat of vaporisation overcome the interparticle force of attraction, therefore, temperature remains constant. **2**



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CHAPTER

2

IS MATTER AROUND US PURE ?

SYLLABUS

- *Nature of matter : Elements, compounds and mixtures; Heterogeneous and homogeneous mixtures; colloids and suspensions.*



TOPIC-1

Elements, Compounds, Mixtures, Heterogeneous and Homogeneous mixtures

QUICK REVIEW

- Matter can be classified as pure substances or mixtures.
- A pure substance may either contain constituent particles of only one kind or of different kinds. A pure substance has a fixed composition.
- An element is a basic form of matter which cannot be broken down into simpler substances by any physical or chemical means.
- Elements can be broadly classified as metals, non-metals and metalloids.
- Metals are one category of elements that have lustre. They conduct heat and electricity. They are sonorous. They are malleable and ductile.
- Non-metals do not have lustre, are not sonorous and are bad conductors of heat and electricity.
- Metalloids are elements having properties intermediate between those of metals and non-metals.
- A compound is a pure substance composed of two or more elements chemically combined in a fixed proportion. It can be broken down into simpler substances by chemical or electrochemical methods.
- Properties of compounds are different from those of its constituent elements, whereas a mixture shows the properties of its constituent elements or compounds.
- A mixture contains two or more elements or compounds which are mixed together in any proportion. In a mixture no new compound is formed. A mixture shows the properties of the constituent substances.
- Mixtures are classified as homogeneous or heterogeneous mixtures.
- Mixtures whose components mix completely with each other to make a uniform composition are called homogeneous mixtures.
- A heterogeneous mixture has a non-uniform composition.
- Alloys are mixture of two or more metals or a metal and a non-metal and cannot be separated by physical methods.
- The ability of a substance to dissolve in another substance is called solubility.
- Homogeneous mixture of two or more substances is called a solution.
- Component of a solution present in small quantity is called a solute.
- Component of a solution present in large quantity is called a solvent.
- Particles of a solution are smaller than 1 nm in diameter. They cannot be seen by naked eyes.
- Particles of solution do not scatter beam of light.

TOPIC - 1

Elements, Compounds, Mixtures, Heterogeneous and Homogeneous mixtures P. 22

TOPIC - 2

Separation Techniques, Physical and Chemical Change P. 30

- Solute particles cannot be separated from the mixture by filtration.
- Solution with high solute concentration is called concentrated solution and those with low concentration is called dilute solution.
- The concentration of a solution is the amount of solute present in a given amount (mass or volume) of solvent or solution. Concentration of a solution =
$$\frac{\text{Amount of solute}}{\text{Amount of solution}}$$
- Percentage by mass is one of the methods of expressing concentration of solution.
- There are two kinds of heterogeneous mixtures, colloids and suspensions.
- Colloids are mixtures with particle sizes from 1 nm to 100 nm.
- The component of colloid present in small amount is called dispersed phase.
- The medium in which colloidal particles disperse or suspend themselves is called dispersion medium.
- In a colloidal system particles are always suspended and do not settle down. This constant colliding of the particles in continuous motion is called Brownian movement.
- Scattering of a beam of light when light is passed through a colloidal solution is called the Tyndall effect.
- Colloids are classified according to the state (solid, liquid or gas) of the dispersed medium or dispersing medium and the dispersed phase.
- Colloid in which dispersed medium is a liquid and dispersed phase is solid is called as solution.
- Colloid in which both dispersed phase and dispersed medium are in liquid state is called as an emulsion.
- Colloid in which dispersed phase is either liquid or a solid and dispersed medium is a gas is called as aerosol.
- A suspension is heterogeneous mixture in which the solute particles do not dissolve but remain suspended throughout bulk of medium. Particles of suspension are visible to naked eye. Suspensions are heterogeneous mixtures with particles that have a size greater than 1000 nanometers.

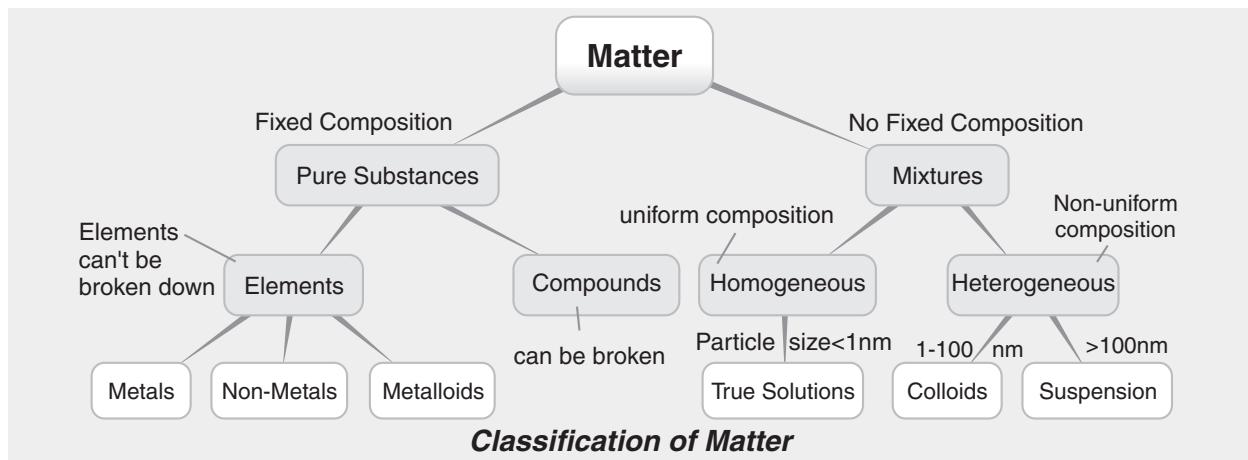


KNOW THE TERMS

- **A pure substance** consists of particles of only one kind matter which are similar to one another and which cannot be separated into other kinds of matter by any physical process.
- **An element** is defined as a basic form of matter which cannot be broken down into simpler substances by any chemical method. For example, hydrogen, oxygen, mercury, gold, iron, copper, etc.
- **Metals** : Possess lustre. They are malleable and ductile, good conductors of heat and electricity and are sonorous. For example, iron, copper, aluminium, silver, etc.
- **Non-metals** : Are neither malleable nor ductile. They are not lustrous and non-conductors of heat and electricity. For example, hydrogen, oxygen, bromine, sulphur, phosphorus, etc.
- **Metalloids or semi-metals** : Have intermediate properties between those of metals and non-metals. For example, silicon, germanium, arsenic and antimony.
- **A compound** is defined as a pure substance made up of two or more elements chemically combined in a fixed proportion by mass. For example, water, carbon dioxide, limestone, etc.
- **Mixtures** : A mixture contains two or more substances (elements or compounds) which are physically mixed in any proportion but not chemically combined.
- **A solution** is a homogeneous mixture of two or more substances. The major component of the solution is called the solvent and the minor component is called the solute.
- **Alloys** are homogeneous mixtures. They may also be regarded as solid in solid solution.
- **Concentration of a solution** is the amount of solute present per unit volume or per unit mass of the solution/ solvent.
- **Saturated solution** is a solution which contains the maximum amount of the solute dissolved in a given quantity of the solvent at the given temperature and which cannot dissolve any more solute at that temperature is called a saturated solution.
- **Unsaturated solution** is a solution which can dissolve more amount of solute in it at the given temperature is called the unsaturated solution.

- **Supersaturated solution** is a solution which temporarily contains more solute than the saturation level is called a supersaturated solution.
- A **suspension** is a heterogeneous mixture in which the solute particles do not dissolve but remain suspended throughout the bulk of the medium.
- **Colloids** are heterogeneous mixtures in which the size of the particles lies in between those of true solutions and suspensions.

FLOWCHART



Very Short Answer Type Questions

1 Mark each

Q. 1. What is a pure substance ?

Ans. A substance which is made up of only a single type of particle is called a pure substance. 1

Q. 2. What are mixtures ?

Ans. Mixtures are constituted by more than one kind of pure form of matter, i.e. pure substances. 1

Q. 3. What is a substance ?

Ans. A substance is a kind of matter that cannot be separated into other kinds of matter by any physical process. 1

Q. 4. What are the constituents of milk ?

Ans. Milk is a mixture of water, fat and proteins. 1

Q. 5. Which of the following is/are pure substance(s) ?

Ink, paper, water, milk, butter, ghee, sugar, blood.

Ans. Water and sugar. 1

Q. 6. Name the two types of mixtures.

Ans. Homogeneous mixtures and heterogeneous mixtures. 1

Q. 7. What is a homogeneous mixture ?

Ans. A mixture that has uniform composition throughout its mass is called a homogeneous mixture. 1

Q. 8. What is a heterogeneous mixture ?

Ans. A mixture that does not have uniform composition throughout its mass is called a heterogeneous mixture. 1

Q. 9. Define a solution.

Ans. A homogeneous mixture of two or more substances is called a solution. 1

Q. 10. Give an example of a liquid in liquid type solution.

Ans. Vinegar (acetic acid + water). 1

Q. 11. Give an example of a solid in liquid solution.

Ans. A solution of sugar and water. 1

Q. 12. Give an example of a solid solution.

Ans. Brass (an alloy having 70% copper and 30% zinc). 1

Q. 13. Give an example of a gas in liquid solution.

Ans. Aerated drinks like soda water. 1

Q. 14. Define concentration of a solution.

Ans. It indicates the exact amount of solute dissolved in an exact amount of solvent or solution. 1

Q. 15. What is solubility ?

Ans. Solubility of a substance (solute) is the mass of the substance in grams that dissolves in 100 g of a solvent to form a saturated solution. 1

Q. 16. What is a saturated solution ?

Ans. A solution is said to be saturated if no more of solute can be dissolved in it at a given temperature and pressure. 1

Q. 17. What is a suspension ?

Ans. It is a heterogeneous mixture in which the solute particles do not dissolve and remain suspended throughout the liquid. 1

Q. 18. What is a colloidal solution ?

Ans. It is a heterogeneous mixture in which the size of the solute particles is between 1 nm (10^{-9} m) to 100 nm. 1

Q. 19. Why can't we see the colloidal particles with naked eyes ?

Ans. Because their size ranges from 1 nm to 100 nm, hence we can't see such small particles with naked eyes. 1

Q. 20. What is a gel ?

Ans. It is a colloidal solution of a liquid in solid. e.g. butter, cheese etc. 1

Q. 21. What is an emulsion ?

Ans. A colloidal solution of two immiscible liquids is called an emulsion. e.g. milk. 1

Q. 22. Name the three types of elements.

Ans. Metals, non-metals and metalloids. 1

Q. 23. Which metal is liquid at room temperature ?

Ans. Mercury. 1

Q. 24. Name the substance that is composed of atoms of different elements in a fixed proportion.

Ans. Compound. 1

Short Answer Type Questions-I

2 Marks each

Q. 1. (a) Name the two components of a colloidal solution. (DDE 2014)

(b) Colloids are quite stable. Name the process by which you can separate the components of a colloidal solution.

(Board Term I 2013, OAHJD6N)

**Ans. (a) Dispersed phase and the dispersion medium.
(b) Centrifugation.**

(CBSE Marking Scheme, 2013) 1 + 1

Q. 2. Differentiate between true solution and colloids on the basis of particle size and homogeneity.

(Board Term I 2013, AGRO 94)

Ans. Difference Between True Solution and Colloids :

S. No.	True Solutions	Colloids
(a)	The particle size of solute is less than 1 nm.	The particle size ranges from 1 to 100 nm.
(b)	It is homogeneous.	It may appear to be homogeneous but it is heterogeneous.

1 + 1

Q. 3. A solution is prepared by adding 40 g of sugar in 100 g of water. Calculate the concentration in terms of mass by mass percentage of solution.

(Board Term I, 2012 Set-015)

$$\begin{aligned}\text{Ans. Mass \%} &= \frac{\text{mass of solute}}{\text{mass of solution}} \times 100 \\ &= \frac{40}{40+100} \times 100 \\ &= \frac{40}{140} \times 100 = 28.57\end{aligned}$$

1 + 1

(CBSE Marking Scheme, 2012)

Q. 4. A solution contains 50 g of sugar in 350 g of water. Calculate the concentration of solution in terms of mass percent of the solution.

(Board Term I, 2012 Set-021)

$$\begin{aligned}\text{Ans. Mass \%} &= \frac{\text{mass of solute}}{\text{mass of solution}} \times 100 \\ &= \frac{50}{50+350} \times 100 = 12.5\%\end{aligned}$$

(CBSE Marking Scheme, 2012)

Q. 5. On dissolving chalk powder in water, a suspension is obtained. Give any four reasons to support the fact that mixture so obtained is a suspension only.

(Board Term I, 2012 Set-028)

Ans. Reasons :

- (a) Heterogeneous mixture
 - (b) Particles can be seen with the naked eye
 - (c) Scatter a beam of light
 - (d) Unstable
 - (e) Can be filtered.
- (Any four) $\frac{1}{2} \times 4$

(CBSE Marking Scheme, 2012)

Q. 6. Identify solute and solvent in the following :

- (a) Tincture of iodine, (b) Aerated drinks.

(Board Term I, 2012 Set-033)

Ans. Tincture of iodine : Iodine (solute) and alcohol (solvent),

Aerated drinks : CO_2 (solute) and water (solvent).

(CBSE Marking Scheme, 2012) 1 + 1

Q. 7. Define metalloid. Write names of two metalloids.

(Board Term I, 2012 Set-045)

Ans. (i) Metalloids are the elements which have intermediate properties between metals and non-metals.

(ii) Boron, silicon and germanium. (any two)

(CBSE Marking Scheme, 2012) 1 + 1

Q. 8. State two reasons to justify that air is a mixture and water is compound. (Board Term I, 2012 Set-049)

Ans.

S.No.	Air	Water
(a)	Variable composition.	Definite composition i.e. 2 atoms of hydrogen and 1 atom of O.

(b)	Constituents can be separated by simple physical methods	Cannot be separated into its constituents by physical methods.
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(CBSE Marking Scheme, 2012) 1 + 1

Q. 9. What are the two components of a solution ? Write two properties of a solution.

(Board Term I, 2012 Set-058)

- Ans.** (i) The two components of a solution are solute and solvent.
(ii) The solution is stable, particles of solution are very small in size, smaller than 1 nm.

(CBSE Marking Scheme, 2012) 1 + 1

Q. 10. Identify the dispersed phase and dispersing medium in the following colloids :

- (a) Fog, (b) Cheese. (Board Term I, 2012 Set-059)

Ans.

S. No.	Colloids	Dispersed phase	Dispersing Medium
(a)	Fog	Liquid	Gas
(b)	Cheese	Liquid	Solid

(CBSE Marking Scheme, 2012) 1 + 1

Q. 11. Classify the following into element, compound and mixture : (Board Term I, 2012 Set-064)

Brass, gold, hydrogen sulphide, air.

Ans. Brass and air – mixture, Gold – element, Hydrogen sulphide – compound. $\frac{1}{2} \times 4$

(CBSE Marking Scheme, 2012)

Q. 12. What is meant by concentration of a solution ? How will you prepare a 10% solution of sugar ?

(Board Term I, 2012 Set-067)

Ans. Concentration of a solution is the amount of the solute present in a given amount (mass or volume) of solution (or solvent).

Dissolve 10 g of sugar in $(100 - 10) = 90$ g of water
(CBSE Marking Scheme, 2012) 1 + 1

Q. 13. A mixture of alcohol and water is homogeneous while that of oil and water is heterogeneous. Explain. (Board Term I, 2012 Set-072)

Ans. When alcohol combines with water, the components mix uniformly to form a single phase and there is no boundary of separation. When oil is added to water, the components are not thoroughly mixed

and there is a boundary of separation between oil and water forming separate layers. $1 + 1$

Q. 14. (a) What does it mean when we say that the solubility of sodium chloride is 36 g at 293 K ?

(b) The quantity of sodium chloride dissolved in 100 g of water at 310 K will be : (i) more than 36 g, (ii) less than 36 g ? Give reasons for your answer. (Board Term I, 2012 Set-051)

Ans. (a) This means that 36 g of NaCl can dissolve in 100 g of water at 293 K and at 1 atm. pressure (Solubility).

(b) More than 36 g because increase in temperature will increases the solubility of a solid in a liquid. (CBSE Marking Scheme, 2012) 1 + 1

Q. 15. Beakers A and B contain a solution of potassium permanganate and a mixture of chalk powder in water. Mention one point of difference that you would observe in the two mixtures. On the basis of the observation categorize the two as homogeneous or heterogeneous mixture.

(Board Term I, 2012 Set-061)

Ans. A : Uniform composition/particles not visible.
B : Non-uniform composition/particle may be visible.

Therefore, A is homogeneous and B is heterogeneous. $\frac{1}{2} \times 2 + 1$

Q. 16. Both smoke and fog are called as Aerosols. Identify the dispersed phase and dispersing medium in each of them. (Board Term I, 2012 Set-076)

Ans. In smoke dispersed phase is solid and dispersing medium is gas. In fog dispersed phase is liquid and dispersing medium is gas. $1 + 1$

(CBSE Marking Scheme, 2012)

Q. 17. Roopa mixed sugar and common salt in a pot by mistake, what will be the nature of this mixture ? Write any two observations on the basis of which you would categorise it.

(Board Term I, 2012 Set-062)

Ans. Heterogeneous.

This mixture will have :

- (i) Physically distinct parts,
(ii) Non-uniform composition $1 + \frac{1}{2} \times 2$

(CBSE Marking Scheme, 2012)

Short Answer Type Questions-II

3 Marks each

Q. 1. Give an example for each of the following :

- (a) Solid - Liquid homogeneous mixture.
(b) Gas - Gas homogeneous mixture.
(c) Liquid - Liquid heterogeneous mixture.

(Board 2015, Set-LOV7LN7)

- Ans.** (a) Sugar in water
(b) Air
(c) Oil in water

 $1 + 1 + 1$

Q. 2. (a) How can we say that sugar is a pure substance whereas milk is not ?

(b) Which of the following materials fall in the category of a pure substance ?

- (i) Ice (ii) Iron (iii) Wood (iv) Brick

(Board 2015, Set-LOV7LN7)

Ans. (a) Sugar is a pure substance because it cannot be separated and formed of only single type of molecule. In the case of milk it can be separated

by physical process into its components. It has components like water, fat, proteins etc.

- (b) Ice and iron are pure substances as they contain particles of only one kind of matter while wood and brick contains more than one kind of matter. $1\frac{1}{2} + 1\frac{1}{2}$

Q. 3. What do you mean by a concentration of a solution ? Mention two ways, of expressing the concentration of a solution.

(Board 2015, Set-K34UQKW)

Ans. The concentration of a solution is the amount of solute present in a given amount (mass or volume) of solution, or the amount of solute dissolved in a given mass or volume of solvent. 1

Two ways of expressing the concentration of a solution :

- (i) Mass by mass percentage of a solution

$$= \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

- (ii) Mass by volume percentage of solution

$$= \frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100$$

$1 + 1$

Q. 4. Name the only liquid metal and the only liquid non-metal. Mention two gaseous non-metals.

(Board 2015, Set-K340QKW)

Ans. Mercury is the only liquid metal and bromine is the only liquid non-metal.

Two gaseous non-metals are hydrogen and nitrogen. $1 + 1 + 1$

Q. 5. Differentiate between mixture and compound.

(DDE 2014)

Ans.

S. No.	Mixture	Compounds
1.	Elements or compounds just mix together to form a mixture and no new compounds is formed.	Combination of two or more elements.
2.	Variable composition.	Composition of new substance is always fixed.
3.	Shows the properties of the constituent substances.	New substance has totally different properties.
4.	Constituents can be separated fairly easily by physical methods.	Constituents can be separated by only chemical or electrochemical reaction.

(Any three) 1×3

Q. 6. Compare solution, suspension and colloids in terms of :

- (a) Stability
(c) Tyndall effect

- (b) Filterability

(Board 2014, Set MNM9GZH)

Ans.

S.No.		Solutions	Suspension	Colloids
(a)	Stability	Stable	Unstable	Stable
(b)	Filterability	Cannot be filtered	Can be filtered	Cannot be filtered
(c)	Tyndall effect	Do not show tyndall effect	Do not show tyndall effect	Shows Tyndall effect

(CBSE Marking Scheme, 2014) 1×3

Q. 7. (a) State any one difference between pure and impure substances. $(DDE 2014)$

- (b) What will you observe when :

- (i) Carbon disulphide is added to the compound iron sulphide ?
(ii) Dil. hydrochloric acid is added to a mixture of iron filings and sulphur powder.

(Board Term I, 2012 Set-042)

Ans. (a) Pure substances contain only one kind of particles or two or more particles in a fixed ratio while impure substance contain more than one kind of particles.

- (b) (i) No reaction,

- (ii) Evolution of gas. $2 + 1$

Q. 8. (a) Compare metals and non-metals based on their physical properties (any four points).

- (b) What are metalloids. Give two example.

(c) Identify metals from the following : boron, sodium, mercury, carbon.

(Board 2013, Set 7ZTHA8G)

Ans. (a) Differences between Metals and Non-Metals :

S. No.	Metal	Non-Metals
(i)	They have lustre.	They are not lustrous.
(ii)	They are ductile.	They are non-ductile.
(iii)	They are malleable.	Non-malleable.
(iv)	Conduct heat and electricity.	Poor conductors of heat and electricity.
(v)	They are sonorous.	They are non-sonorous

(any four)

(b) Metalloids : Some elements have intermediate properties between those of metals and non-metals. e.g. Boron/Silicon etc.

(c) Sodium and mercury are metals. $2 + \frac{1}{2} + \frac{1}{2}$

Q. 9. Name the three categories in which elements can be normally divided. Give any one property of each element belonging to each category.

(Board Term I, 2012 Set-033)

Ans. Metals, non-metal, metalloids.

Metals have lustre / conduct heat / ductile / malleable / sonorous / conduct electricity etc.

Non-metals have variety of colours / poor conductors of heat and electricity etc.

Metalloids have properties intermediate between those of metals and non-metals. (any one in each)
(CBSE Marking Scheme, 2012) $1\frac{1}{2} + 1\frac{1}{2}$

Q. 10. Classify sol, aerosol and gel, from the following list :

Milk of magnesia, smoke, cheese, mist, mud, butter.
(Board Term I, 2012 Set-031)

Ans. Milk of magnesia - Sol, Smoke- Aerosol,
Cheese - Gel, Mist - Aerosol,
Mud- Sol, Butter - Gel. $\frac{1}{2} \times 6$
(CBSE Marking Scheme, 2012)

Q. 11. You are provided with soda water, milk and muddy water. How can you differentiate between them in terms of : (a) Homogeneity, (b) Filtration, (c) Tyndall effect.

(Board Term I, 2012 Set-050)

Ans.

S. No.	Property	Soda water	Milk	Muddy water
(a)	Homogeneity	Homogeneous	Heterogeneous	Heterogeneous
(b)	Filtration	Cannot be separated	Cannot be separated	Cannot be separated
(c)	Tyndall effect	Does not show	Shows	Shows

(CBSE Marking Scheme, 2012) $\frac{1}{2} \times 6$

Q. 12. Give reasons :

- (i) (a) Survival of fish and other aquatic animals become difficult during summers ?
(b) When a beam of light is thrown on a clear solution of copper sulphate kept in a dark room, it does not glow.
- (ii) Give two reasons why crystallization is better than simple evaporation.

(Board Term I, 2012 Set-051)

Ans. (i) (a) Because at high temperature solubility of a gas in a liquid decreases. Thus, less amount of dissolved oxygen is available.

(b) Because it doesn't show Tyndall effect.

(ii) (a) Some solids decompose on heating to dryness.

On evaporation these contaminate the solid.

(b) Some impurities may remain dissolved in the solution even after filtration.

On evaporation these contaminate the solid.

(CBSE Marking Scheme, 2012) $1 + 1 + 1$

Q. 13. List three differences between properties of metals and non-metals. (Board Term I, 2012 Set-060)

Ans. Metals :

- (1) Metals are sonorous i.e., they produce sound.
- (2) Metals can be beaten into thin sheets i.e., malleable.
- (3) Metals can be drawn into wires i.e., ductile.

Non-metals : (1) Non-metals are non-sonorous as they do not produce any sound.

(2) Non-metals are fragile.

(3) Non-metals are non-ductile. $1\frac{1}{2} + 1\frac{1}{2}$

Q. 14. (a) Write one point of difference between concentration and solubility.

(b) What is the effect of temperature on the rate of solubility ? (Board Term I, 2012 Set-059)

Ans. (a) Concentration of solution is the amount of solute present in a given amount of solution or the amount of solute dissolved in a given mass or volume of the solvent.

Solubility is the maximum amount of solute that can be dissolved in a given solution at a given temperature.

(b) The rate of solubility increases with increase in temperature. $1 + 1 + 1$

(CBSE Marking Scheme, 2012)

Q. 15. (a) Classify the following as homogeneous or heterogeneous mixture : Air, Soil, Filtered tea, Wood. (Board Term I, 2012 Set-074)

(b) Which of the following materials are categorized as pure substance :

- (i) Mercury, (ii) Milk,
- (iii) Calcium oxide, (iv) Ink.

Ans. (a) Air, filtered tea : Homogeneous.
Soil, Wood : Heterogeneous.

(b) Mercury & Calcium oxide : Pure substances.
(CBSE Marking Scheme, 2012) $1 + 1 + 1$

Q. 16. Is air a mixture or a compound ? State three reasons in support of your answer.

(Board Term I, 2012 Set-067)

Ans. Air is a mixture.

(i) Air can be separated into its constituents like oxygen, nitrogen etc. by the physical process of fractional distillation.

(ii) Air shows the properties of all the gases present in it.

(iii) Air has a variable composition.

(iv) Liquid air does not have a fixed boiling point.

(Any three) 1×3
(CBSE Marking Scheme, 2012)

Long Answer Type Questions

5 Marks each

- Q. 1. (a) Can a homogeneous mixture have a variable composition ? Justify giving an example.

(b) What happens when :

 - Dilute sulphuric acid is added to a mixture of iron filings and sulphur powder.
 - Dilute sulphuric acid is added to a mixture of iron filings and sulphur powder heated to red hot followed by cooling.

Ans. (a) Homogenous mixtures are the mixtures with uniform composition throughout like sugar solution or another. 3

(b) (i) $\text{Fe} + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{FeSO}_4 + \text{H}_2$
(ii) $\text{FeS} + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{FeSO}_4 + \text{H}_2$

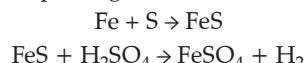
(CBSE Marking Scheme, 2015) 1 + 1

Detailed Answer :

- (a) No. Homogenous mixtures are the mixtures with uniform composition throughout like sugar solution or another.

(b) (i) Results in the formation of ferrous sulphate and evolution of hydrogen.
 $\text{Fe} + \text{H}_2\text{SO}_4\text{(aq)} \rightarrow \text{FeSO}_4 + \text{H}_2$

(ii) Results in the formation of iron sulphide which reacts with sulphure acid to form ferrous sulphate and release of hydrogen disulphide gas.



- Q. 2. (a) State two ways by which you can change a saturated solution to unsaturated solution.

(b) Distinguish between homogeneous and heterogeneous mixture by giving one example

Ans. (a) (i) By increasing the temperature/by heating the solution

- (ii) By increasing the amount of solvent
(b)

S. No.	Homogeneous Mixture	Heterogeneous Mixture
(a)	Uniform composition.	Non-uniform composition.
(b)	No distinct boundaries of separation. e.g., sugar + water.	Distinct boundaries of separation. e.g., sand + water.

2 + 3

- Q. 3. (a) List any three characteristics of colloid.**
(NCT 2014)

(b) Name the two components of a colloid.

(c) Identify colloid from the following mixtures :
Muddy water, Sugar in water, Ink, Blood,
Soda water, Foam.

(Board Term I, 2012 Set-021), (DDE 2014)

Ans. (a) (i) It is heterogeneous mixture.

- (ii) Particles of colloids scatter a beam of light.
 (Tyndall effect)

(iii) It is stable.

(b) Dispersing medium and dispersed phase.

(c) Ink, Blood, Foam. 3 + 1 + 1

Q. 4. (a) Give two reasons to support the statement that CO_2 is a compound and not a mixture.

(b) Classify the following as pure substance or a mixture. If mixture, indicate whether homogeneous or heterogeneous.

 - (i) 24 carat gold
 - (ii) Air
 - (iii) Concrete. (Board Term I 2013, AGRO 94)

Ans. (a) (i) Carbon and oxygen are present in a fixed ratio of 3 : 8 by mass in carbon dioxide.

(ii) The constituents of carbon dioxide cannot be separated by simple physical methods.

(b) (i) 24 carat gold is a pure substance.

(ii) Air is a homogeneous mixture in which the constituents are uniformly distributed throughout without any clear boundary of separation.

(iii) Concrete is a heterogeneous mixture that does not have uniform constituents. 2 + 3

Q. 5. (a) A solution contains 60 g of common salt in 240 g of water. Calculate the concentration in terms of mass by mass percentage of solution.

(b) Give the principle of the following technique used in separation of mixture :

 - (i) Centrifugation
 - (ii) Chromatography
 - (iii) Distillation.

(Board Test)

$$= \frac{\text{Mass of solute}}{\text{Total mass}} \times 100$$

35 6 14 62

Mass of common salt in

Mean solution = $60 + 240 = 300$

$$\text{Concentration of solution} = \frac{60}{300} \times 100 = 20\%$$

- (b) (i) **Centrifugation** : Two components having difference in densities can be separated by centrifugation. When the mixture is rotated fast, the lighter particles come to the top and the heavier remain at the bottom.

(ii) **Chromatography** : This method is used to separate a mixture of different dyes. It is based on the difference in solubilities of different solutes in the same solvent.

(iii) **Distillation** : Two miscible liquids can be separated by simple distillation. It is based on the difference in boiling points of the liquid components of the mixture.

2 + 1 + 1 + 1

Q. 6. Based on the following characteristics distinguish in tabular form the behaviour of true solution, suspension and colloidal solution.

Ans.

S. No.	True Solution	Colloidal Solution	Suspension
1.	A true solution is a homogeneous mixture of solute and solvent.	A colloidal solution appears to be homogeneous but actually it is a heterogeneous mixture of solute and solvent.	It is a heterogeneous mixture.
2.	It is transparent.	It is translucent.	It is opaque.
3.	The solute particles are very small, i.e., less than 1 nm.	The solute particles are between 1-100 nm.	The solute particles are quite large i.e., more than 100 nm.
4.	The particles are not visible even with a powerful microscope.	The particles are visible with the help of microscope.	The particles are visible even with naked eye.
5.	The entire solution passes through filter paper as well as semi-permeable membrane.	The particles can pass through ordinary filter paper but not through a semi-permeable membrane.	The particles cannot pass through either a filter paper or through a semi-permeable membrane.
6.	The solute particles do not show Tyndall effect.	The particles show Tyndall effect.	The particles may or may not show Tyndall effect.
7.	The particles do not settle due to gravity e.g., salt in water solution.	The particles do not settle due to gravity e.g., blood.	The particles may settle due to gravity e.g., chalk powder in water.

(CBSE Marking Scheme, 2012) (any 5) 1 × 5

Practical Based Questions

Multiple Choice Questions

(1 mark each)

Q. 1. Some properties of a compound are given below.

The correct property is :

- (b) The elements in a compound do not retain their individual properties.
 (c) The proportion of the elements in a compound always varies.
 (d) The elements of a compound retain their properties to some extent.

Answers with Explanation

1. (b) The elements in a compound do not retain their individual properties.



TOPIC-2 Separation techniques, Physical and Chemical change

QUICK REVIEW

- Heterogeneous mixtures can be separated by simple physical methods like handpicking, sieving, filtration.
- Magnetic impurities can be separated from non-magnetic impurities by magnetic separation.
- Volatile compounds can be separated from non-volatile compounds by sublimation.
- Mixtures of two or more liquid components can be separated by simple or fractional distillation or by using a separating funnel.
- Simple distillation is used for separating liquids having a difference in boiling points of more than or equal to 25° C.

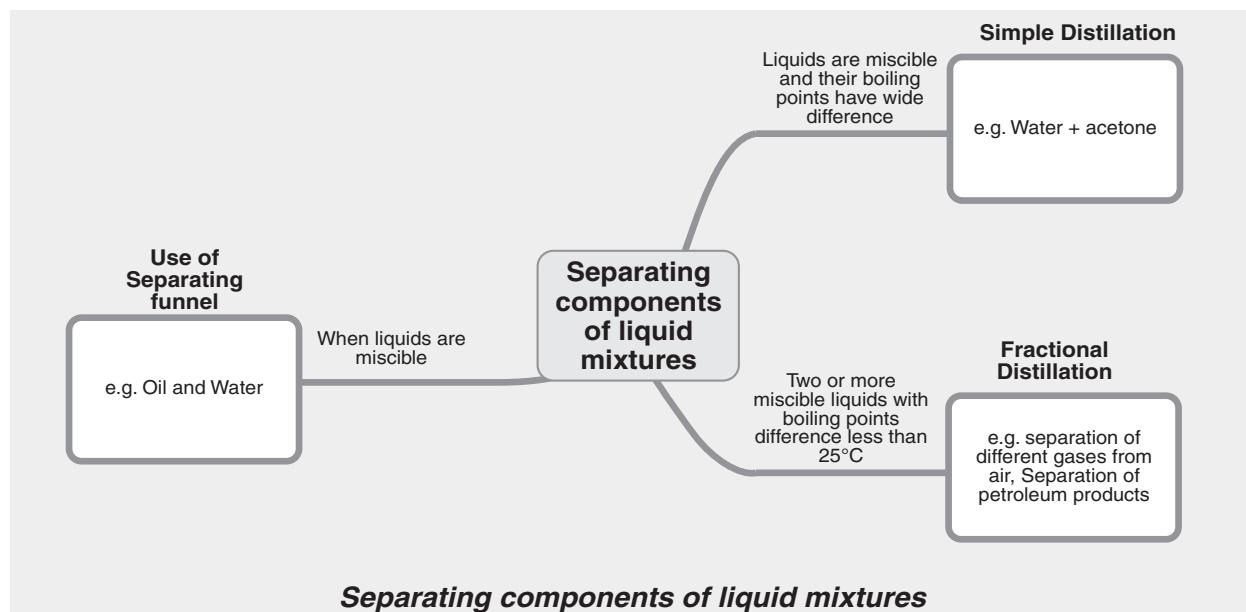
- Fractional distillation is used for separating liquids having a difference in boiling points of less than 25° C.
- Liquids that are immiscible in each other differ in their densities and so can be separated by making use of a separating funnel.
- Chromatography is used for separation of those solutes which dissolve in same solvent.
- Chromatography is a method of separating and identifying various components in a mixture, which are present in small trace quantities.
- Mixture containing two solid substances out of which one is soluble in a particular solvent and other is insoluble can be separated by dissolving the soluble constituent in a suitable solvent and then separating the insoluble substance through filtration.
- The change in which the shape, size, appearance or state of a substance may alter but its chemical composition remains the same is called a physical change. In a physical change no new substance is formed.
- Any change that involves the formation of a new substance and leads to a transformation of chemical identity is called chemical change.
- Chemical changes are usually accompanied with heat exchanges. Chemical changes are permanent changes which are usually irreversible.
- **Applications of crystallisation :** Purification of salt from sea water and separation of crystals of alum from impure samples.

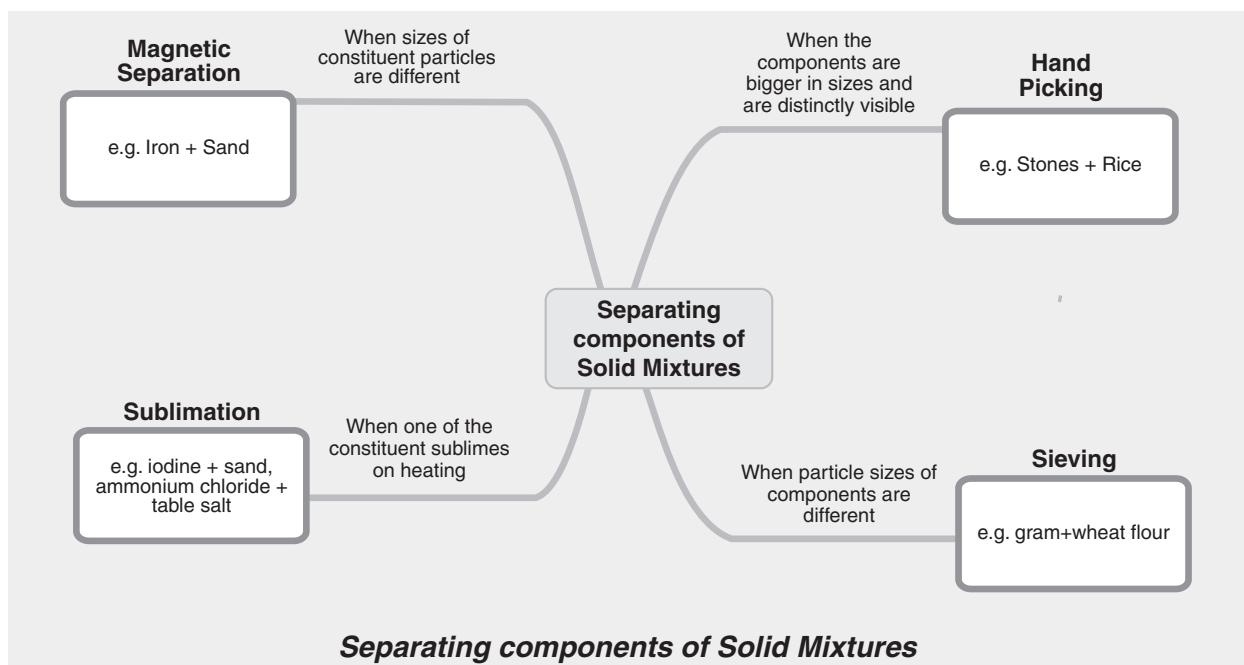
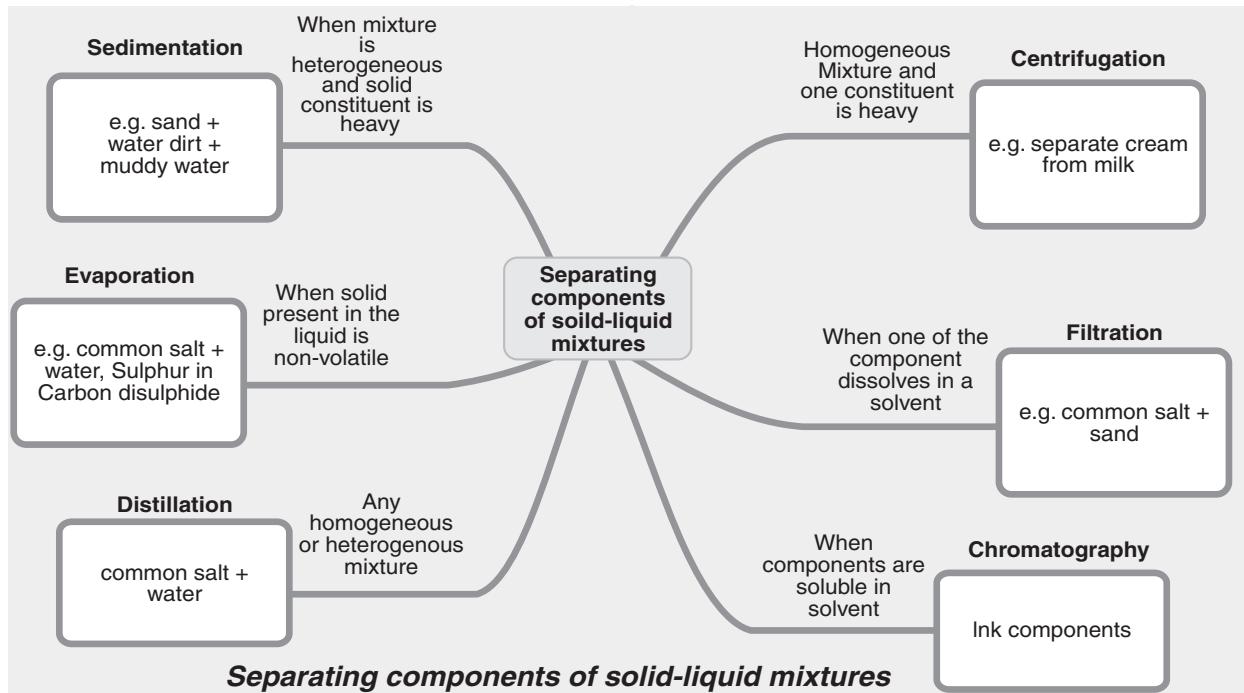


KNOW THE TERMS

- **Magnetic separation**—A method to separate magnetic impurities from non-magnetic impurities as substance.
- **Distillation**—A technique to separate two miscible liquids.
- **Fractional distillation**—A technique to separate more than two miscible liquids.
- **Chromatography**—Chromatography is a method of separating and identifying various components in a mixture, which are present in small trace quantities.
- **Centrifugation**—The process of separating the suspended particles of an insoluble substance, from a liquid, by rotating it at high speed is called centrifugation.
- **Crystallisation** is a process that separates a pure solid in the form of its crystals from a solution.
- **Decantation** is a process of separating mixtures by removing a layer of liquid, generally one from which precipitate has settled.
- **Winnowing** is an agricultural method to separate grains from lighter particles like chaff, dirt etc., by throwing a forced current of air.
- **Evaporation**—The process by which a soluble solid can be obtained from a solution by allowing the solvent to vapourize.

FLOWCHARTS





Very Short Answer Type Questions

1 Mark each

Q. 1. How can we separate cream from milk ?

Ans. By centrifugation method.

1

Q. 2. How can we separate a mixture of two immiscible liquids ?

Ans. By using a separating funnel.

1

Q. 3. How can we separate a mixture of two miscible liquids ?

Ans. By distillation.

1

Q. 4. What is filtration ?

Ans. When the insoluble component is separated by filtering the solution through a medium or membrane it is called filtration.

1

Q. 5. For the separation of what kind of solutes is the process of chromatography used ?

Ans. Chromatography is used for the separation of those solutes that dissolve in the same solvent.

1

Q. 6. How can we obtain different gases from air ?

Ans. By fractional distillation.

1

Q. 7. How can we obtain pure copper sulphate from an impure sample ?		Q. 10. Why Tincture of iodine has an antiseptic property? (HOTS)
Ans. By crystallization.	1	Ans. Tincture of iodine is prepared by dissolving iodine in alcohol.
Q. 8. Give an application of crystallization.		Q. 11. Is a new compound formed when a mixture is formed ? (HOTS)
Ans. Purification of salt that we get from sea water.	1	Ans. No. Elements or compounds just mix together to form a mixture and no new compound is formed.
Q. 9. How will you justify that rusting of iron is a chemical change ? (HOTS)		Q. 12. You are provided with a mixture of iron filings and sulphur powder. When you add carbon disulphide to the mixture what would you observe ? (HOTS)
Ans. Rust is totally different from iron. Iron is an element while rust is hydrated oxide of iron [Fe ₂ O ₃ · x H ₂ O]. Thus, formation of rust from iron is a chemical change.	1	Ans. We observe that sulphur powder dissolves and the solution turns yellow.

Short Answer Type Questions-I

2 Marks each

- Q. 1.** Properties of a compound are different from its constituents, while a mixture shows the properties of its constituent elements. Justify this statement taking the example of iron and sulphur.
(Board Term I, 2012 Set-020)

Ans. When a bar magnet is brought closer to the mixture of iron filings and sulphur powder, iron particles stick to the magnet, while in case of iron sulphide no change will be observed. When a mixture of iron and sulphur is added to carbon disulphide, sulphur dissolves while in case of iron sulphide no dissolution takes place.

1 + 1

(CBSE Marking Scheme, 2012)

- Q. 2.** State the principle of each of the following methods of separation of mixtures :
(i) Separation using separating funnel,
(ii) Centrifugation method.
(Board Term I, 2012 Set-034)

Ans. (i) Immiscible liquids separate out in layers depending on their densities.
(ii) The denser particles are forced to settle at the bottom and the lighter particles stay at the top when spun rapidly.

1 + 1

(CBSE Marking Scheme, 2012)

- Q. 3.** Identify the separation technique used :
(a) To separate the components of ink
(b) To separate cream from milk
(c) To separate alcohol from water
(d) To separate mustard oil from water
(Board Term I, 2012 Set-052)

Ans. (a) Chromatography, (b) Centrifugation,
(c) Distillation, (d) Separating funnel

½ × 4

(CBSE Marking Scheme, 2012)

- Q. 4.** Name the separation technique you will apply for the separation of the following :
(a) The different pigments from the flower petals,
(b) Butter from curd,
(c) Tea leaves from tea
(d) Camphor powder from sand.
(Board Term I, 2012 Set-048)

Ans. (a) Chromatography,
(b) Centrifugation,
(c) Filtration,
(d) Sublimation

(CBSE Marking Scheme, 2012) ½ × 4

- Q. 5.** Name the phenomenon due to which sunlight that passes through the canopy of a dense forest becomes visible. Explain the cause of this phenomenon in the forest. Name one more substance through which this phenomenon can be observed. (HOTS) (Board Term I, 2012 Set-031)

Ans. (i) Tyndall effect.
(ii) In the forest, the mist contains tiny droplets of water which acts as particles of colloid suspended in air.

(iii) Milk.

½ + 1 + ½

- Q. 6.** When will you say that a given solution of a solute is saturated ? What would you observe when a hot saturated solution of the same solute is allowed to cool ? (HOTS) (Board Term I, 2012 Set-070)

Ans. When no more solute can be dissolved in the solution at a given temperature then the given solution is saturated. On cooling, crystals of solute separate out from the solution.

1 + 1

- Q. 7.** Prachi took 50 ml of water in two beakers at room temperature and added sodium chloride to one beaker while sugar to the other, till no more solute would be dissolved. Then she heated the contents of the beakers and added more solutes in them.

(a) Will the amount of salt and sugar that can be dissolved in water at given temperature same ?
(b) What will you expect to happen if she cools the contents of the beakers ? Justify your answer.

(HOTS)

Ans. (a) No.
(b) Crystals of salt and sugar will appear. This is because solubility of a solid decreases with decrease in temperature.

½ + ½

- Q. 8.** The teacher instructed three students A, B and C respectively to prepare a 50% (mass by volume) solution of sodium hydroxide (NaOH). Student A dissolved 50gm of NaOH in 100ml of water, student B dissolved 50g of NaOH in 100g of water.

Student C dissolved 50g of NaOH in water to make 100 ml of solution. Which one of them has made the desired solution and why ? (HOTS)

Ans. Student C has prepared the desired solution

$$\therefore \text{Mass by Volume (\%)} = \frac{\text{Mass of solute} \times 100}{\text{Volume of solution}}$$

$$= \frac{50 \times 100}{100} = 50\% \quad 2$$

Q. 9. Explain why particles of colloidal solution do not settle down when left undisturbed, while in the case of a suspension they do settle ? (HOTS)

Ans. Colloidal particles are smaller in size. They remain in state of zig-zag motion (Brownian motion) always, so the force of gravity is encountered and they do not settle down. But the particles in suspension are larger in size, so they settle down under the influence of gravity. 2

Short Answer Type Questions-II

3 Marks each

Q. 1. A teacher told three students A, B and C to prepare 25% solution (mass by volume) of KOH. Student A dissolved 25g of KOH in 100g of water, student B dissolved 25g of KOH in 100 ml of water and student C dissolved 25g KOH in water and made the volume 100 ml. Which one of them has made required 25% solution ? Give your answer with reason. (Board Term I, 2015, 3GS24G)

Ans. Student C

Solution—25 gm of KOH in water and the volume of the solution is 100 ml.

Mass by volume percentage of solution =

$$\frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100 = \frac{25(\text{g})}{100 \text{ ml}} \times 100$$

(CBSE Marking Scheme, 2015) 3

Detailed Answer :

Student C made the required 25% solution.

25 gm of KOH in water and the volume of the solution is 100 ml.

Mass by volume percentage of a solution =

$$\frac{\text{Mass of solute}}{\text{Volume of solution}} \times 100$$

$$= \frac{25(\text{g})}{100 \text{ ml}} \times 100 = 25\%$$

**Q. 2. (a) Name the compound formed on heating a mixture of Iron filing and sulphur.
(b) If dilute HCl is added to above compound then name the gas evolved and write down its two properties. (Board 2014, Set-LFS3I7K)**

**Ans. (a) Iron sulphide
(b) Hydrogen sulphide gas**

Properties—

- (i) It is colourless.
- (ii) It has the smell of rotten eggs. $1 + 1 + 1$

(CBSE Marking Scheme, 2014)

Q. 3. You are provided with mixture of camphor, common salt and soil. Using various techniques how will you separate the components of this mixture. Write the various steps involved.

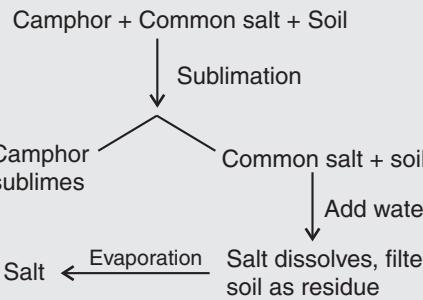
(Board 2014, Set-LFS3I7K)
(Board 2014, Set-SO1QHXJ)

Ans. (i) Firstly the mixture will be heated. As camphor is sublimable, it will vapourize and so it can be separated through sublimation.

(ii) To separate mixture of common salt and soil, we will dissolve them in water. As salt is soluble in water, and soil is not soluble in water, soil can be separated through filtration.

(iii) At the end, we get salt solution. Salt can be separated from water by evaporation. 3

OR



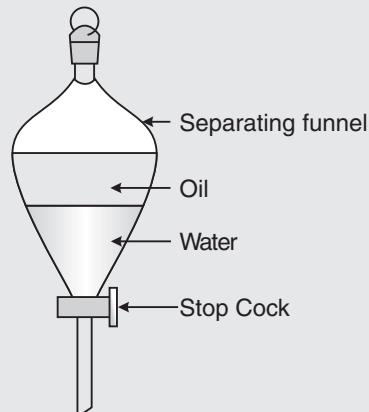
(CBSE Marking Scheme, 2014) 3

**Q. 4. (a) You are given a mixture of mustard oil and water. Name the process that can be used to obtain mustard oil from the above mixture.
(b) Draw a well labelled diagram of the above process.**

(Board Term I, 2012 Set-015, NCT 2014)

Ans. (a) Process : Using separating funnel.

(b)



1 + 2

(CBSE Marking Scheme, 2012)

Q. 5. Write two points of difference between simple distillation and fractional distillation. Write example where fractional distillation is used.

(Board Term I, 2012 Set-028; 21, NCT 2014)

Ans.

S. No.	Simple distillation	Fractional distillation
(i)	By simple distillation, we can separate two miscible liquids having sufficient difference in their boiling points.	By fractional distillation, we can separate a mixture of two or more miscible liquids for which the difference in the boiling points is less than 25°C.
(ii)	It is done by using an air condenser or a water condenser.	A fractionating column is fitted in between the distillation flask and the condenser for the process.

E.g., Different gases from air are separated by fractional distillation. 2 + 1

(CBSE Marking Scheme, 2012)

Q. 6. Write any two differences between physical and chemical changes. Give one example in which both physical and chemical changes take place.

(Board Term I, 2012 Set-020; NCT 2014; DDE 2014)

Ans.

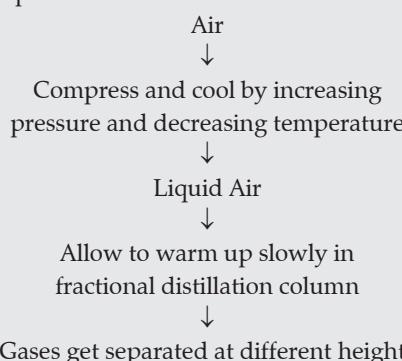
S. No.	Physical change	Chemical change
(i)	No new substance is formed.	A new substance is formed.
(ii)	Only physical properties of matter change. Example : Melting of wax.	Chemical properties of substance change. Example : Burning of wax.

One example in which both physical and chemical change take place is burning of a candle. 2 × 1

Q. 7. Draw a flow chart showing the separation of components of air. Also, name this process.

(Board Term I, 2012 Set-019)

Ans. Air is a homogeneous mixture and can be separated into its components by the process of fractional distillation. The flow diagram shows the steps of the process.



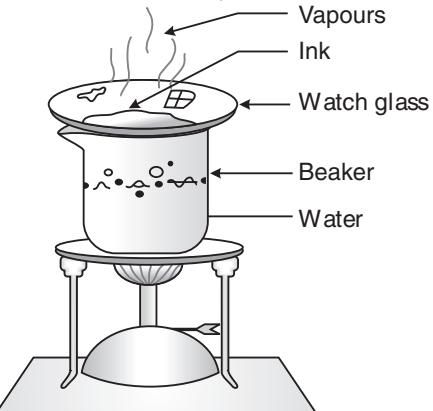
(CBSE Marking Scheme, 2012) 2 + 1

Q. 8. (i) Name and define the process shown in the diagram.

(ii) Which type of substance can be separated by this method ?

(iii) What can we interpret about the nature of ink?

(Board Term I, 2012 Set-021)



Ans. (i) Boiling : It is the process of conversion of a liquid into its vapours.

(ii) The volatile solvent from its non-volatile solute.

(iii) Ink is a mixture of dyes in water. 1 + 1 + 1

(CBSE Marking Scheme, 2012)

Q. 9. (a) Describe an activity to separate the crystals of alum (phitkari) from its impure sample. Name the technique.

(b) Give one application of alum (phitkari) in your day to day life. (Board Term I, 2012 Set-052)

Ans. (a) (i) Take some (approximately 5 g) impure sample of alum in a china dish.

(ii) Dissolve it in minimum amount of water.

(iii) Filter the impurities out.

(iv) Evaporate water from the alum solution so as to get a saturated solution.

(v) Cover the solution with a filter paper and leave it undisturbed at room temperature to cool slowly for a day.

(vi) You will obtain the crystals of alum in the China dish.

This process is called crystallization.

(b) Application : Purification of water (loading). Antiseptic (after shave) 1 ½ + ½ + 1

Q. 10. Name the gas produced when a mixture of 7 g of iron filing and 4 g of sulphur powder is treated with dil H_2SO_4 at room temperature. What gas would be produced if the same mixture is first heated strongly, cooled and then treated with dil H_2SO_4 ? State the cause of this difference in behaviour. (Board Term I, 2012 Set-065)

Ans. Hydrogen gas.

Hydrogen sulphide gas.

In case I, a mixture of iron filings and sulphur is treated with dil. H_2SO_4 , hence H_2 gas is produced.

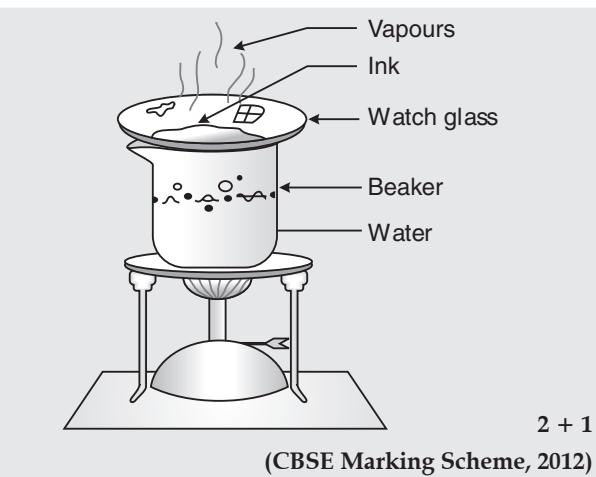
In case II, a compound (FeS) of iron and sulphur is treated with dil. H_2SO_4 , hence H_2S gas is produced. ½ + ½ + 1 + 1

(CBSE Marking Scheme, 2012)

Q. 11. Describe an activity with labelled diagram to obtain dye from blue ink. Name the component which gets evaporated. (Board Term I, 2012 Set-048)

Ans. Fill half a beaker with water. Put a watch-glass on the top of the beaker. Add a few drops of blue ink on the watch-glass (as shown in the figure). Now, heat the beaker till a solid mass is obtained.

You will observe that a solid residue of the dye is obtained in the watch-glass. Ink is a colloidal solution. It is a heterogeneous mixture of dye and water. Heating leads to the evaporation of water. This leaves behind the dye in the watch-glass.



Long Answer Type Questions

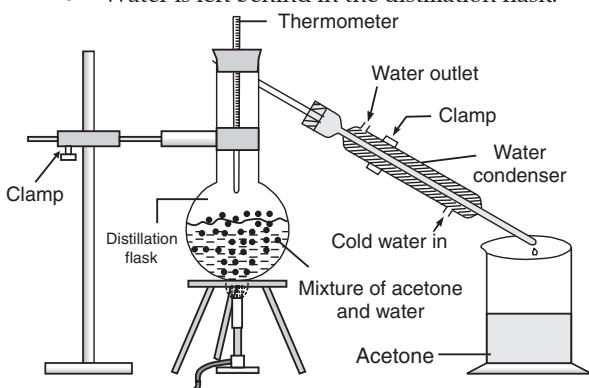
5 Marks each

Q. 1. You are given a mixture of alcohol and water. Explain the process to separate it into its constituents. Draw a labelled diagram of the technique used.

(Board 2015, Set-LOV7LN7)

Ans. The process of separating alcohol and water is as follows :

- Take the mixture in a distillation flask.
- Fit it with a thermometer.
- Arrangement of the apparatus is done as shown in the below given figure.
- Heat the mixture slowly keeping a close watch at the thermometer.
- The alcohol vapourises, condenses in the condenser and can be collected from the condenser outlet.
- Water is left behind in the distillation flask.



3 + 2

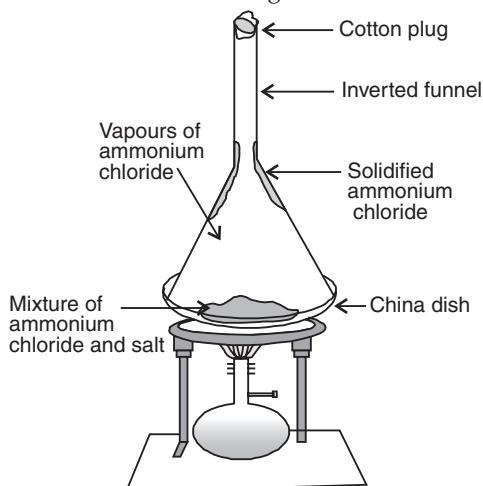
Q. 2. (a) How can we separate a mixture of sodium chloride and ammonium chloride ? Draw a labelled diagram to show the set up for the process.

- (b) Name two more substances which can be separated from their mixture by the above method.** (Board 2015, Set-K34UQKW)

Ans. (a) Ammonium chloride changes directly from solid to gaseous state on heating. So, to separate

mixtures containing a sublimable volatile component from a non-sublimable impurity i.e., sodium chloride, the sublimation process is used.

- Place the china dish over a wire gauze placed over a tripod stand.
- Cover the china dish with an inverted glass funnel and plug in a little cotton at the opening stem.
- On heating the mixture, white fumes evolve.
- Stop heating when the fumes stop rising and allow the funnel to cool.
- On cooling, remove the funnel and transfer the solid ammonium chloride sticking on the walls of funnel to a watch glass.



(b) Camphor and naphthalene.

4 + 1

Q. 3. Write your observation when the following processes take place

- (a) an aqueous solution of sugar is heated to dryness.
- (b) a saturated solution of potassium chloride prepared at 60°C is allowed to cool at room temperature.

- (c) a mixture of iron filings and sulphur powder is heated strongly.
 (d) A beam of light is passed through a colloidal solution.
 (e) dil-HCl is added to the mixture of iron and sulphur. (Board 2014, Set-LFS3I7K)

Ans. (a) Sugar remains as residue in the form of a solid mass.
 (b) Potassium chloride crystallises out.
 (c) A black coloured compound is formed.
 (d) The path of the light becomes visible.
 (e) A colourless gas is evolved.

(CBSE Marking Scheme, 2014) 1+1+1+1+1

Q. 4. Which separation techniques you will apply for the separation of the following mixtures :

- (a) Oil from water
 (b) Camphor from sand
 (c) Sodium chloride from its solution in water
 (d) Metal pieces from engine oil of a car
 (e) Cream from milk

(Board 2014, set MNM9GZH)

Ans. (a) Separating funnel
 (b) Sublimation
 (c) Evaporation
 (d) Filtration / using magnet
 (e) Centrifugation

(CBSE Marking Scheme, 2014) 1 + 1 + 1 + 1 + 1

Q. 5. (a) Mention any two differences between physical and chemical changes. Give one example of each.

- (b) List any two properties for each of the following case of metals which make them suitable to be used as :
 (i) Utensils for cooking food
 (ii) Wires for electrical connections.

(DDE 2014; Board Term I 2013, OAHJD6N)

Ans. (a) **Physical change** : reversible change, chemical composition do not change, no new substance is formed.

Chemical change : irreversible change, chemical composition changes, new substance is formed. (Any two differences)

Example—Tearing a paper—physical change
 Burning a match stick—chemical change

- (b) (i) Metals are malleable and good conductors of heat.
 (ii) Metals are ductile and good conductors of electricity.

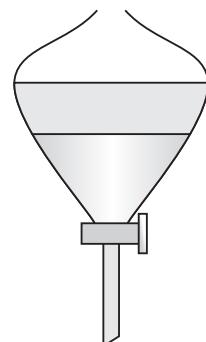
(CBSE Marking Scheme, 2014) 3 + 2

Detailed Answer :

- (a) Difference between physical and chemical changes :

S. No.	Physical change	Chemical change
(i)	These are reversible changes and their chemical composition do not change.	These are irreversible changes and the chemical composition also changes.
(ii)	No new substance is formed. e.g. Tearing of paper.	New substance is formed. e.g. Burning a match-stick.

Q. 6. An apparatus of a separation technique is given below :



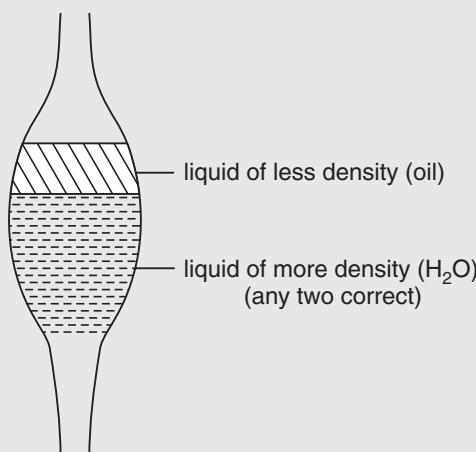
- (a) Explain the above technique.
 (b) Which principle is used in it ?
 (c) Complete the diagram with proper labelling. (any two)
 (d) Give its two applications. (DDE 2014)

(Board Term I, 2012 Set-040)

Ans. (a) Separating funnel is to separate immiscible liquids : The mixture is taken in a separating funnel and the mixture is allowed to stand for some time. On standing, the liquid with higher density forms the lower layer whereas the liquid having lower density forms the upper layer. Then the two liquids are taken out from the separating funnel in separate conical flasks.

(b) It separates immiscible liquids of different densities.

(c)



- (d) It is used to separate oil from water and carbon disulphide from water. 2 + 1 + 1 + 1

(CBSE Marking Scheme, 2012)

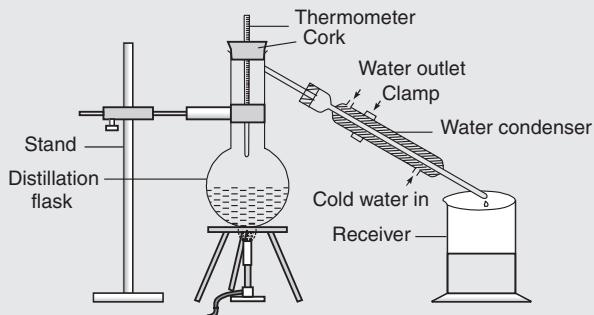
Q. 7. Define distillation. What type of mixture can be separated by distillation? Draw a labelled diagram of the apparatus used for fractional distillation.

(Board Term I, 2012, Set-033;21)
OR

How can we separate a mixture of two miscible liquids. Describe the process. (ODE 2014)

Ans. Distillation is a process employed to obtain pure liquid from its solution. It can be defined as the conversion of impure liquid into vapours by evaporation and then condensation of the vapours to get pure liquid.

This method is generally used for the separation of components of a mixture containing two miscible liquids that boil without decomposition and their boiling points are quite different (more than 25–30°C).



(CBSE Marking Scheme, 2012)
(1 + 1 + 3 Drawing skill 1 Mark)

Q. 8. (i) Name the separation techniques which you will apply for the separation of the following mixtures :

- (a) Small pieces of metal in the engine oil of a car. (b) Fine mud particles suspended in water. (c) Oil from water. (d) Sodium chloride from its solution in water. (e) Camphor from salt. (f) Wheat grains from husk.

(ii) Classify the following as a chemical or physical change :

- (a) Water boils to form steam. (b) Burning of paper. (c) An almirah gets rusted. (d) Making a fruit salad with raw fruits.

(Board Term I, 2012 Set-016)

Ans. (i) (a) Filtration.

- (b) Sedimentation and Decantation.
- (c) Separating funnel.
- (d) Evaporation.
- (e) Sublimation.
- (f) Winnowing.

(ii) (a) Water boils to form steam : Physical change.

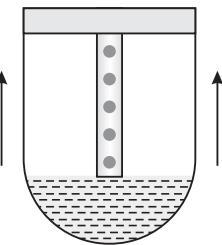
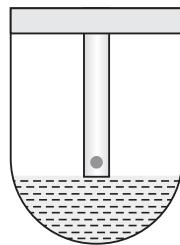
- (b) Burning of paper : Chemical change.

- (c) An almirah gets rusted : Chemical change.

- (d) Making a fruit salad with raw fruits : Physical change.

$\frac{1}{2} \times 6 + \frac{1}{2} \times 4$

Q. 9. Observe the diagrams and answer the following questions :



- (a) Identify the separation technique in the above diagram.
- (b) What do you observe on the filter paper as the water rises up ?
- (c) Give a reason for the rise of coloured spot on the paper strip.
- (d) Give any two applications where you can use this technique. (Board Term I, 2012 Set-041)

Ans. (a) Chromatography.

- (b) Different colours will appear at different heights.
- (c) Different colours have different rates of absorption.
- (d) Applications : To separate colours in a dye; To separate drugs from blood.

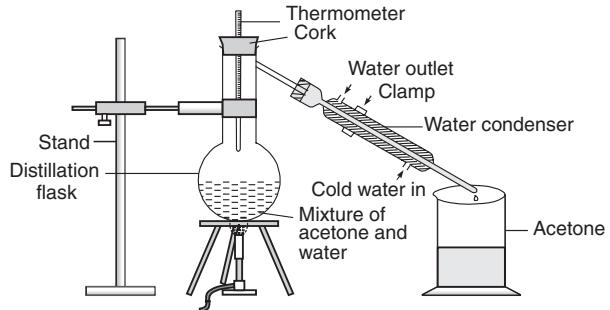
$1 + 1 + 1 + 2$

(CBSE Marking Scheme, 2012)

Q. 10. With a neat labelled diagram explain the process used for separating acetone and water from their mixture. List two criteria that must be fulfilled for using this process.

(Board Term I, 2012 Set-035)

Ans.



Activity :

- Take the mixture in a distillation flask. Fit it with a thermometer.
- Arrange the apparatus as shown in figure.
- Heat the mixture slowly keeping a close watch at the thermometer.
- The acetone vapourizes, condenses in the condenser and can be collected from the condenser outlet.
- Water is left behind in the distillation flask.

Criterion : Two miscible liquids that boil without decomposition and have sufficient difference in their boiling points can be separated by this method.

$2 + 2 + 1$

Q. 11. (a) What is saturated solution? How solubility in a solution can be increased?

(b) Draw a flow chart to explain water purification system in water works.

(Board Term I, 2012 Set-075)

Ans. (a) Saturated solution is the one which contains maximum amount of solute dissolved in a given quantity of the solvent at a given temperature.

By increasing the temperature.

(b)

Reservoir sedimentation tank to allow solids to settle

↓

Loading tank to sediment the suspended impurities

↓

Filtration tank

↓

Chlorination to kill bacteria

↓

Supply

1 + 1 + 3

(CBSE Marking Scheme, 2012)

Q. 12. (a) Define sublimation and sedimentation.

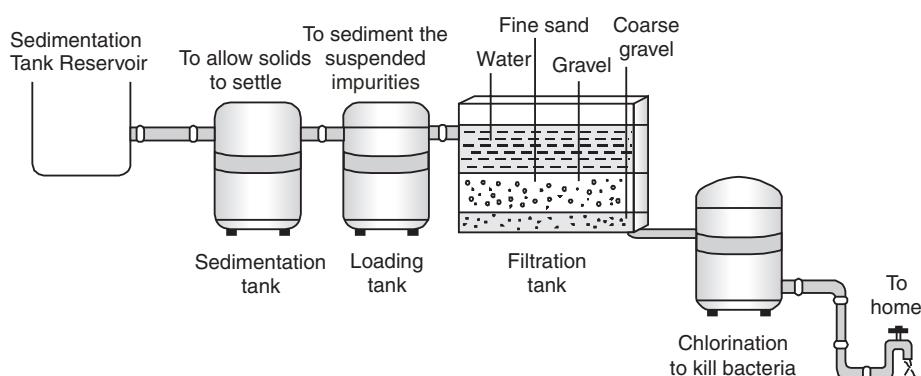
(b) You are provided with a mixture of ammonium chloride, common salt, sand and iron filings. Which of these substances can be separated by sublimation and which by sedimentation?

(c) Can salt be separated by sedimentation? Justify your answer.

(Board Term I, 2012 Set-070)

Q. 14. Show diagrammatically how water is purified in the waterworks system and list the processes involved.

Ans.



Water purification system in water works

Processes involved : Sedimentation, Loading, Filtration and Chlorination.

3 + 2

Value Based Questions

Q. 1. Neha's mother is a good cook. She uses natural colours to give colours to food stuffs like she uses turmeric for yellow colour, spinach for green colour and pomegranate for reddish colour. She always avoids synthetic food colours.

Answer the following question based on above information :

- Name the technique used to separate pigments from natural colours.
- Write the principle of that technique.
- Explain the values that are displayed by Neha's mother. (Board 2013, Set-7ZTHA89)

Ans. (a) Sublimation is a process in which a solid is directly converted into vapour state on heating and vice versa.

Sedimentation is a process of settling down of solid particles at the bottom in a mixture of solid and liquid.

(b) Ammonium chloride by sublimation. Sand and iron filings by sedimentation.

(c) No, because the common salt dissolves in water.

(CBSE Marking Scheme, 2012) 2 + 2 + 1

Q. 13. Mention in sequential order the steps involved in separating the components of air by fractional distillation. Name two main components of air and also give their percentage in air. Which gas is liquified first as the air is cooled and why?

(Board Term I, 2012 Set-061)

Ans. (a) (i) Compress and cool by increasing pressure and decreasing temperature.

(ii) Allow to warm up slowly in fractional distillation column.

(iii) Gases get separated at different heights.

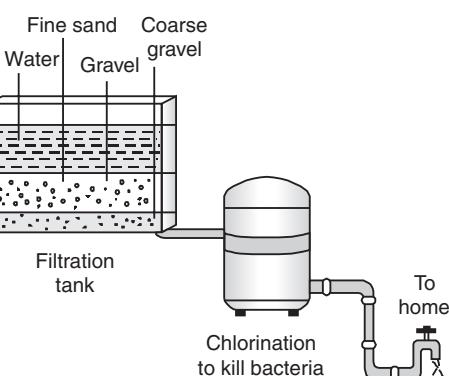
Two main components : Oxygen 21% and Nitrogen 78%.

Oxygen gets liquified first because its boiling point is higher than that of the other components.

(CBSE Marking Scheme, 2012) 2 + 2 + 1

Q. 14. Show diagrammatically how water is purified in the waterworks system and list the processes involved.

Ans.



Water purification system in water works

Processes involved : Sedimentation, Loading, Filtration and Chlorination.

3 + 2

Ans. (a) Chromatography.

(b) Different colours get separated due to dissolution in the same solvent and different rates of rising due to different rates of absorption.

(c) Awareness, caring attitude for the family, skillful person.

(CBSE Marking Scheme, 2013) 1 + 1 + 1

Q. 2. Aarushi's mother always squeezes water from wet clothes in the spinner of washing machine and then uses it to clean the floor :

Q.6. When barium chloride solution is added to sodium sulphate solution, a white precipitate is formed. White precipitate is :
 (Board 2015, Set-K34UQKW)

- (a) Barium chloride
- (b) Sodium chloride
- (c) Barium sulphate
- (d) Sodium chloride

Q.7. Four students (A), (B), (C) and (D) observed the colour and solubility of iron, sulphur and iron sulphide in carbon disulphide. The tick mark (3) represents soluble and cross mark (5) represent insoluble in carbon disulphide. Their observations are tabulated below :
 (Board Term I 2013, 7ZTHA8G)

Student	Colour			Solubility in carbon disulphide		
	Iron	Sulphur	Iron sulphide	Iron	Sulphur	Iron sulphide
(A)	Yellow	Silvery	Greyish silver	(3)	(5)	(3)
(B)	Silvery	Orange	Reddish brown	(5)	(3)	(3)
(C)	Grey	Yellow	Greyish black	(5)	(3)	(5)
(D)	Silvery	White	Silvery white	(3)	(5)	(5)

In the table correctly reported observations is of student :

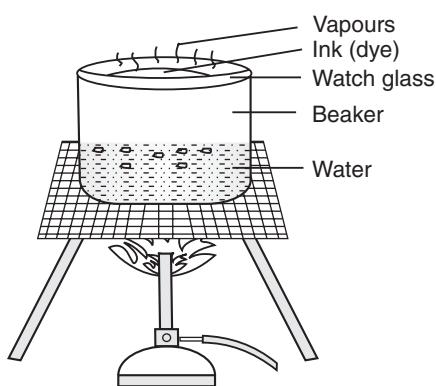
- (a) A
- (b) B
- (c) C
- (d) D

Q.8. Take dilute sulphuric acid in a test tube and put a few zinc granules into test tube. You would observe that :
 (Board 2014, Set-LFS3I7K)

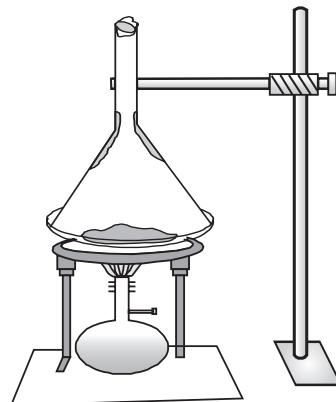
- (a) Zinc granules changes to powder
- (b) Colour of zinc changes from grey to white
- (c) Size of zinc, granules keep on decreasing
- (d) Surface of zinc metal becomes bright

Q.9. Which one the following figures illustrates the sublimation process ?

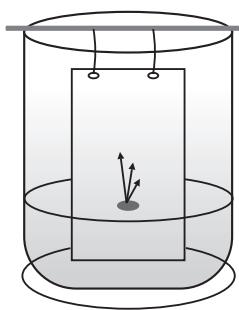
1



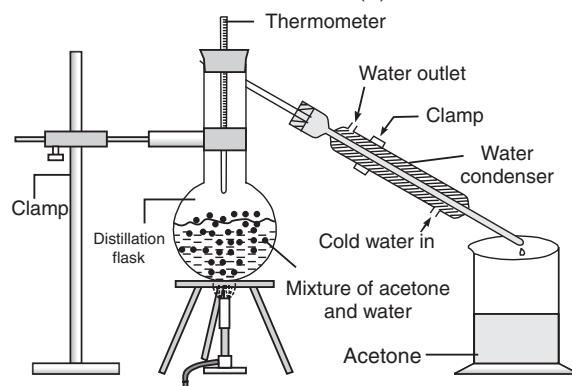
(A)



(B)



(C)



(D)

(Board Term I, 2015, 3GS246G)

- (a) A
- (b) B
- (c) C
- (d) D

Q.10. A mixture containing iron filings and sulphur powder is spread on the white paper and a magnet is rolled in it. The particles which cling to the magnet are :
 (Board 2014, Set-MNM9GZH)

- (a) Sulphur
- (b) Iron particles
- (c) Iron sulphide
- (d) Mixture of iron and sulphur

Q. 11. When the bar magnet is rolled over mixture 'A' of iron and sulphur over the compound 'B' Iron sulphide, which of the following observation is incorrect ? (Board 2014, Set-LFS3I7K)

- (a) Mixture 'A' is heterogeneous
- (b) Compound 'B' is homogeneous
- (c) Iron clings to the magnet from mixture 'A'
- (d) Iron clings to the magnet from compound 'B'

Q. 12. Which among the following statement is incorrect for sulphur powder ?

(Board 2014, Set-MNM9GZH)

- (a) It is a yellow powder with low melting point.
- (b) It is soluble in water.
- (c) It is soluble in carbon disulphide.
- (d) It is insoluble in water.

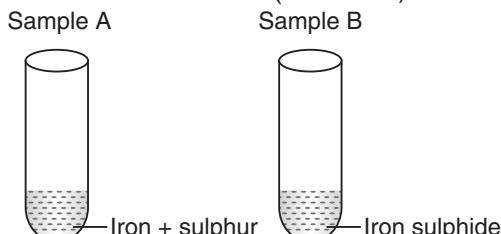
Q. 13. An iron nail was dipped in a salt solution of 'A'. After some time a brown substance was deposited on the iron nail. The salt A could be :

(Board 2014, Set-MNM9GZH)

- (a) Silver chloride (b) Iron sulphate
- (c) Copper sulphate (d) Silver nitrate

Q. 14. Sample 'A' is mixture of iron filings and sulphur powder. Sample 'B' is a compound of Iron sulphide. Reema was asked to study the effect of heat on both sample 'A' and 'B'. Which of the following observation was incorrect ?

(Board 2014, Set-LFS3I7K)



- (a) yellow coloured sulphur from sample 'A'; starts melting.
- (b) sample 'A' mixture of Iron and sulphur glows.
- (c) No effect of heat on sample 'B'.
- (d) colour of sample 'B' changes from black to yellow.

Q. 15. A mixture containing (I) Sodium Chloride (II) Camphor and (III) Ammonium Chloride was heated in a china dish. The substance left in the china dish was : (Board 2014, Set-LFSS3I7K)

- (a) (I) and (II) (b) (II) and (III)
- (c) (I) only (d) (III) only.

Q. 16. Out of the following the substance which does not undergo sublimation is :

(Board 2014, Set-MNM9GZH)

- (a) Sugar (b) Camphor
- (c) Iodine (d) Naphthalene

Q. 17. The process used to separate ammonium chloride from mixture of sand and common salt is :

- (a) sublimation
- (b) evaporation

- (c) centrifugation
- (d) winnowing

Q. 18. A few pieces of zinc were treated with dilute H_2SO_4 in a test tube. Which of the following observations are correct ?

- (a) It is a physical change and zinc dissolves.
- (b) It is a chemical change and zinc dissolves with the evolution of H_2 gas.
- (c) It is a chemical change, zinc dissolves.
- (d) It is a physical change and H_2 gas is evolved.

Q. 19. Which of the following will show Tyndall effect ?

(Board Term I, 2013, AGRO 94)

- (a) Soda water (b) Salt solution
- (c) Chalk in water (d) Milk in water.

Q. 20. On adding zinc to sulphuric acid, hydrogen gas and zinc sulphate solution is formed. The colour of zinc sulphate solution formed is :

(Board Term I, 2013, OAHJD6N)

- (a) light blue (b) light yellow
- (c) light green (d) colourless.

Q. 21. Out of the following substances which does not undergo sublimation ?

- (a) Dry ice
- (b) Camphor
- (c) Sand
- (d) Iodine.

Q. 22. The magnesium oxide obtained on burning magnesium in air appears to be like :

(Board Term I, 2013, 7ZTHA8G)

- (a) powdered chalk (b) common salt
- (c) wood ash (d) powdered sugar.

Q. 23. A mixture can be characterized by :

(Board Term I, 2013, 7ZTHA8G)

- (a) no fixed composition of the components.
- (b) homogeneity
- (c) no occurrence of chemical reaction
- (d) heterogeneous.

Q. 24. To test the properties of iron sulphide formed it should be taken in the form of :

- (a) lumps (b) small pieces
- (c) powder (d) its solution.

Q. 25. When a mixture of sand, sodium chloride and ammonium chloride is heated in a China dish, dense white fumes are evolved. On cooling these fumes on a glass plate, a white deposit is obtained. The white deposit may be :

(Board Term I, 2012 Set-015)

- (a) sodium chloride
- (b) sand
- (c) sodium chloride and ammonium chloride
- (d) ammonium chloride

Q. 26. When we heat a mixture of iron and sulphur for a short time and then move a magnet over it, the observation made is :

(Board Term I, 2012 Set-048)

- (a) iron gets attracted
- (b) sulphur gets attracted

- (c) iron and sulphur both get attracted
 (d) iron, sulphur as well as the product formed all get attracted

Q. 27. The gas evolved when zinc reacts with dilute sulphuric acid is : (Board Term I, 2012 Set-015)

- (a) colourless, odourless, burns with a pop sound
 (b) colourless, foul smelling, burns with a pop sound
 (c) colourless, pungent smelling, burns with a pop sound
 (d) brown coloured, pungent smelling, does not burn

Q. 28. Mohan heated a mixture of sulphur and iron filings in a China dish till a grey-black product was formed. On adding carbon disulphide and stirring the contents he observed that :

(Board Term I, 2012 Set-035)

- (a) particles of sulphur dissolve
 (b) particles of iron dissolve
 (c) grey black product dissolves
 (d) no change takes place

Q. 29. When we burn a cleaned piece of magnesium ribbon in air, we observe :

(Board Term I, 2012 Set-065)

- (a) a white dazzling light while burning
 (b) a white residue left after burning.
 (c) a black residue left after burning
 (d) (a) and (b)

Q. 30. The correct sequence of steps taken for separating the mixture of ammonium chloride, sand and common salt is : (Board Term I, 2012 Set-020)

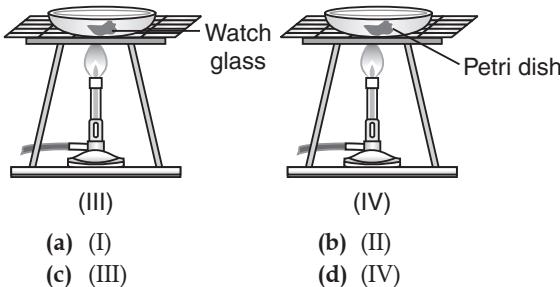
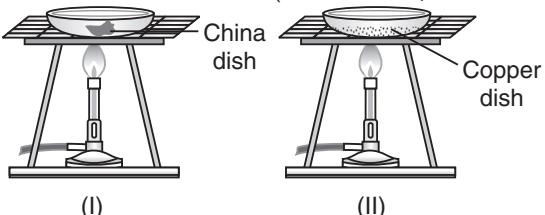
- (a) filtration, evaporation, sublimation and dissolving in water
 (b) sublimation, dissolving in water, filtration and evaporation
 (c) filtration, dissolving in water, sublimation and evaporation
 (d) evaporation, dissolving in water, filtration and sublimation

Q. 31. A student was asked to prepare a true solution of sugar in water. By chance, he added sugar in excess. He stirred for quite some time but some of it settled down. He filtered the contents. The filtrate will be : (Board Term I, 2012 Set-020)

- (a) true solution
 (b) colloidal solution
 (c) suspension
 (d) can be true solution or colloidal solution.

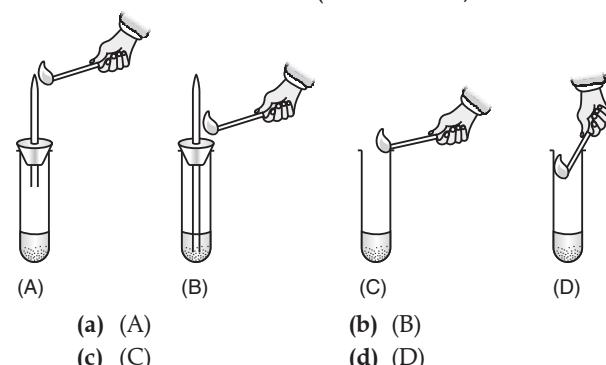
Q. 32. The correct procedure for heating a mixture of iron filings and sulphur powder is :

(Board Term I, 2012 Set-028)



Q. 33. Ankur was doing an experiment to carry out the reaction of zinc granules with dil. sulphuric acid. He observed that a gas is being evolved. The safest method to detect whether the gas produced in the reaction is hydrogen is :

(Board Term I, 2012 Set-020)



Q. 34. When a magnet is moved repeatedly through a mixture of iron filings and sulphur powder, the observation which is correct is :

(Board Term I, 2012 Set-021)

- (a) iron fillings will stick to the magnet
 (b) a black mass of iron sulphide will be produced
 (c) sulphur powder will be left in a tray
 (d) both (a) and (c)

Q. 35. An iron nail is placed in a beaker containing copper sulphate solution. In the beaker, a sensitive thermometer is suspended and the temperature of copper sulphate solution is recorded. The nail is taken out after 10 minutes and the temperature is again recorded. The thermometer at the end of experiment records : (Board Term I, 2012 Set-035)

- (a) higher temperature
 (b) lower temperature
 (c) no change in temperature
 (d) change in temperature depends upon the amount of copper sulphate solution taken

Q. 36. While heating a mixture of ammonium chloride and sodium chloride, it is advised to keep your face away from the apparatus because :

(Board Term I, 2012 Set-021)

- (a) ammonium chloride vapours may cause irritation to eyes and nose
 (b) sodium chloride vapours may cause irritation to eyes
 (c) chlorine vapour may cause irritation to eyes
 (d) ammonium vapours may block nose

Q. 37. Out of the given four mixtures, the one that appears clear and transparent is :

(Board Term I, 2012 Set-060)

- (a) sugar and water
- (b) sand and water
- (c) starch and water
- (d) chalk powder and water

Q. 38. When a mixture of common salt, ammonium chloride and sand is subjected to heat then the component(s) that will sublime off is :

(Board Term I, 2012 Set-077)

- (a) common salt
- (b) ammonium chloride
- (c) both (a) and (b)
- (d) sand

Q. 39. Neeta observed that a precipitate is formed when she adds :

(Board Term I, 2012 Set-065)

- (a) barium chloride to sodium sulphate
- (b) barium chloride to sodium chloride
- (c) sodium sulphate to sodium chloride
- (d) hydrochloric acid to barium chloride

Q. 40. Raghav added dilute hydrochloric acid to granulated zinc in a test-tube. The observation made is :

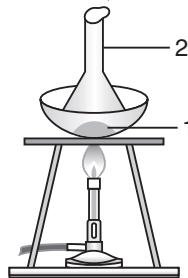
(Board Term I, 2012 Set-048)

- (a) the surface of the metal turns shining
- (b) the reaction mixture turns milky
- (c) greenish yellow gas is evolved
- (d) a colourless and odourless gas evolved with bubbles

Q. 41. The following diagram illustrates the method of separation of mixture of sand, ammonium chloride

and common salt. In this diagram the component 1 and 2 after heating will respectively be :

(Board Term I, 2012 Set-051)



- (a) (common salt + sand) and ammonium chloride
- (b) ammonium chloride and (common salt + sand)
- (c) (ammonium chloride + sand) and common salt
- (d) (ammonium chloride + common salt) and sand

Q. 42. To prepare iron sulphide in the school laboratory we heat the mixture of iron filings and sulphur powder in :

(Board Term I, 2012 Set-051)

- (a) petri dish
- (b) copper dish
- (c) china dish
- (d) watch glass

Q. 43. We will observe precipitation to occur in the solution when :

(Board Term I, 2012 Set-020)

- (a) barium chloride is added to sodium chloride
- (b) barium chloride is added to sodium sulphate
- (c) sodium sulphate is added to sodium chloride
- (d) sodium sulphate is added to barium sulphate

Answers with Explanation

1. (a) I
2. (c) a homogeneous mixture is formed.
3. (d) reddish brown coloured copper is formed.
4. (b) II is a mixture i.e. formed of two or more components.
5. (c) Both are homogeneous.
6. (c) White precipitate is barium sulphate.

$$\text{BaCl}_2 \text{ (aq)} + \text{Na}_2\text{SO}_4 \text{ (aq)} \longrightarrow \text{BaSO}_4 \text{ (s)}$$

$$+ 2 \text{ NaCl (aq)}$$
7. (c) Correct observation.
8. (c) Size of zinc, granules keep on decreasing.
9. (b) B
10. (b) Iron particle.
11. (c) Because in a mixture iron & sulphur are in their independent form.
12. (b) It is soluble in water
13. (c) Copper sulphate
14. (b) Sample 'A' mixture of Iron and sulphur glows.
15. (c) (sodium chloride is left as other two sublime)
16. (a) (sugar does not sublime)
17. (a) A mixture of common salt and ammonium chloride can be separated by sublimation.
18. (b) When Zn reacts with dilute H_2SO_4 , zinc sulphate is formed and H_2 gas is evolved. It is a chemical change as a new substance is formed.
19. (d) Milk shows Tyndall effect.
20. (d) Zinc sulphate solution is colourless.
21. (c) Dry Ice, Camphor and Iodine are sublimates.
22. (c) Magnesium oxide appears to be as wood ash.
23. (a) In a mixture, the components are not in a definite ratio.
24. (c) FeS should be taken in the form of powder.
25. (d) Ammonium chloride is a sublime substance.
26. (a) Sulphur is not a magnetic material.
27. (a) Hydrogen gas is evolved.
28. (d) On heating a compound insoluble in carbon disulphide is formed.
29. (d) Mg ribbon burns to form magnesium oxide.
30. (b) Sublimation, dissolving in water, filtration and evaporation.
31. (a) Sugar and water form homogeneous solution.
32. (a) China dish should be used to heat the chemicals.
33. (a) Experimental precaution.
34. (d) Iron is a magnetic material.

35. (a) Higher temperature will be shown due to displacement by iron nail.
 36. (a) Ammonium chloride vapours may cause irritation to eyes and nose.
 37. (a) Sugar and water form homogeneous mixture.
 38. (b) Ammonium chloride is a sublime substance.
 39. (a) When barium chloride is added to sodium sulphate white precipitate of barium sulphate is formed.
40. (d) Hydrogen gas is evolved.
 41. (a) (Common salt + sand) and ammonium chloride.
 42. (c) China dish will not show any reaction with iron filings and sulphur powder.
 43. (b) When barium chloride is added to sodium sulphate white precipitate of barium sulphate is formed.

Short Answer Type Questions (2 marks each)

Q. 1. The particles can be seen distinctly in a dispersion medium by the naked eye. What conclusion would you draw about the type of solution and its stability? Justify your conclusion.

(Board 2015, Set-LOV7LN7)

Ans. Particles of a suspension are visible to the naked eye. Suspension is a heterogeneous mixture in which the solute particles do not dissolve but remain suspended throughout the bulk of medium. It is unstable as the solute particles settle down when it is left undisturbed. 2

Q. 2. You are given three white powders one is of sodium chloride, second is of starch and third is of chalk. You are also provided with three beakers and distilled water. Using these materials identify the three powders. (Board 2015, Set-K34UQKW)

Ans. When the sodium chloride is dissolved in a beaker with distilled water, a true transparent solution is obtained. When starch is dissolved in dissolved water, a translucent colloid is formed. Lastly, when chalk powder is dissolved, an opaque suspension is formed. 2

Q. 3. How are solution, suspension and colloid different from each other in terms of transparency and scattering of beam of light. Explain in tabular form. (Board Term I, 2015, 3GS246G)

Ans.

	Solution	Suspension	Colloid
Transparency	Transparent	Opaque	Translucent
Scatter of beam of light	X	Tyndall effect	Tyndall effect

(CBSE Marking Scheme, 2015) 2

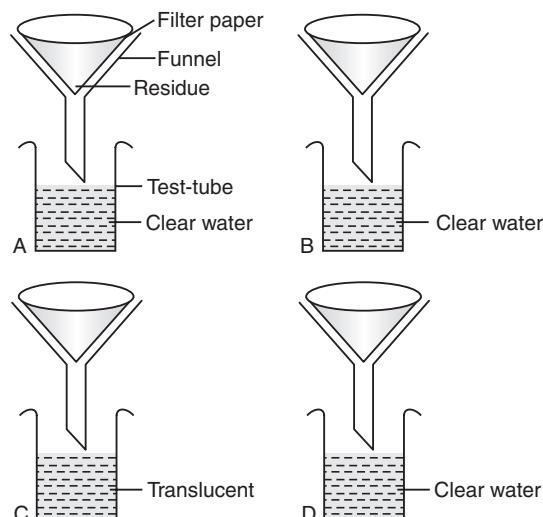
Q. 4. Identify two clear and transparent solutions from the following mixtures :

- (a) milk and water
- (b) sugar and water
- (c) chalk powder and water
- (d) starch powder and water
- (e) glucose and water

(DDE 2014; Board Term I 2013, MNM9GZH)

Ans. (a) sugar and water (b) Glucose and water
 (CBSE Marking Scheme, 2014) 1 + 1

Q. 5. Four students A, B, C and D were given funnels, filter paper, test-tubes, test-tube stands, common salt, chalk powder, starch and glucose powder. They prepared the true solution, suspension and colloidal solutions. Test tubes were arranged as shown in the figure. Observe the filtrate obtained in the test tubes and residue on filter paper. Conclude about filtrate, residue and type of solution. (Board 2014, set-LFS3I7K; DDE 2014)



Ans. Test-tube A has residue on filter paper and filtrate is clear solution. It is suspension. Test-tube B has no residue on filter paper and filtrate is clear solution. It is true solution. Test-tube C has no residue on filter paper and filtrate is translucent. It is colloidal solution. Test tube D has no residue on filter paper and filtrate is clear solution. It is true solution. [Board Marking Scheme, 2014] 2

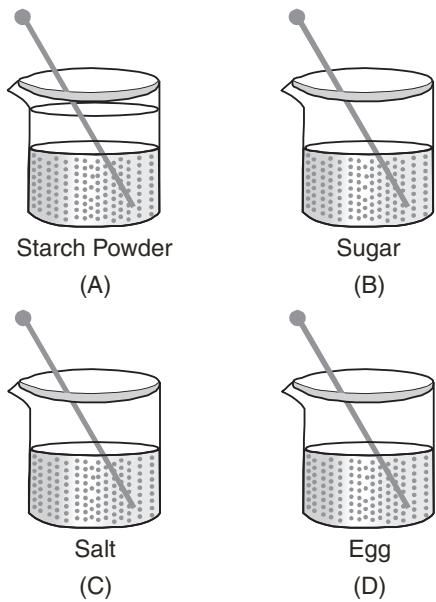
Q. 6. Four students were asked to add water to glucose powder, milk, sand and soil separately in four beakers. Classify the mixtures as true solution, colloid and suspension.

(Board Term I 2013, OAHJD6N)

Ans. True solution : glucose powder with water
 Colloidal solution : milk with water
 Suspension : sand with water, soil with water.
 (CBSE Marking Scheme, 2013) 2

Q. 7. Four students A, B, C and D are asked to prepare colloidal solutions. The following diagrams show the preparation done by them. Name the student, who will be able to prepare colloidal solutions. Write two properties of colloidal solution.

(Board Term I 2013, 7ZTHA8G)



- Ans.** Student D will be able to prepare the colloidal solution as egg is not completely miscible in water.
Two properties of colloidal solution are :
1. Particles of colloidal solutions cannot be separated.
 2. A colloidal solution appears to be homogeneous but actually it is a heterogeneous mixture of solute and solvent.

(CBSE Marking Scheme, 2014) 2

- Q. 8.** In an experiment to separate the components of a mixture of sand, common salt and ammonium chloride, which component will be removed by filtration ?

Ans. Sand as it is insoluble in water. 2

- Q. 9.** A mixture of ammonium chloride and sodium chloride heated in the apparatus of sublimation. After the experiment, at which place ammonium chloride will be obtained ?

Ans. It is obtained on the walls of the inverted funnel. 2

- Q. 10.** While heating the mixture of sand, common salt and ammonium chloride in the experiment mention the residue left behind in the china dish ?

Ans. On heating the mixture, ammonium chloride will be obtained on the walls of the inverted funnel. The left behind in the china dish contains sand and common salt. 2

- Q. 11.** How does sand and common salt get separated in the experiment ?

Ans. Common salt gets dissolved in water but the sand does not dissolve and settles down in water. Sand is filtered from the mixture by using filter paper. Sand is separated as residue and on heating the mixture, water evaporates and common salt is obtained. 2

- Q. 12.** Name other two substances which undergo sublimation .

Ans. Camphor, Iodine. 2



KNOW THE LINKS

- www.excellup.com
- www.gradestack.com
- www.purematter.com
- www.ausecute.com
- www.wikipedia.com



UNIT - II**Organization in the Living World****CHAPTER****3****CELL—A BASIC UNIT OF LIFE****SYLLABUS**

- *Cell as a basic unit of life; prokaryotic and eukaryotic cell; multicellular organisms; cell wall and cell membrane; cell organelles and cell inclusions; chloroplast, mitochondria, vacuoles, endoplasmic reticulum. Golgi apparatus, nucleus, chromosomes-basic structure and number.*

**TOPIC-1****Cell as a basic unit of life, Prokaryotic and Eukaryotic cell, Multicellular organisms****QUICK REVIEW**

- In 1665, Robert Hooke first discovered and named the cells.
- Cell is the structural and functional unit of all living organisms.
- Organisms may be unicellular or multicellular. A single cell constitutes the unicellular organism whereas many cells coordinately function in case of multicellular organism.
- The size, shape and volume of the cell are related to the specific function that they perform.
- A cell generally shows plasma membrane, nucleus and cytoplasm.
- In 1674, Leeuwenhoek observed the cells in a cork slice with the help of primitive microscope.
- In 1831, Robert Brown discovered the nucleus in the cell.
- Cell theory given by Schleiden and Schwann stated that all the plants and animals are composed of cells and cell is the basic unit of life.
- Virchow (1855) expanded the cell theory by suggesting that all cells arise from pre-existing cells.

TOPIC - I

Cell as a basic unit of life, Prokaryotic and Eukaryotic cell, Multicellular organisms **P. 47**

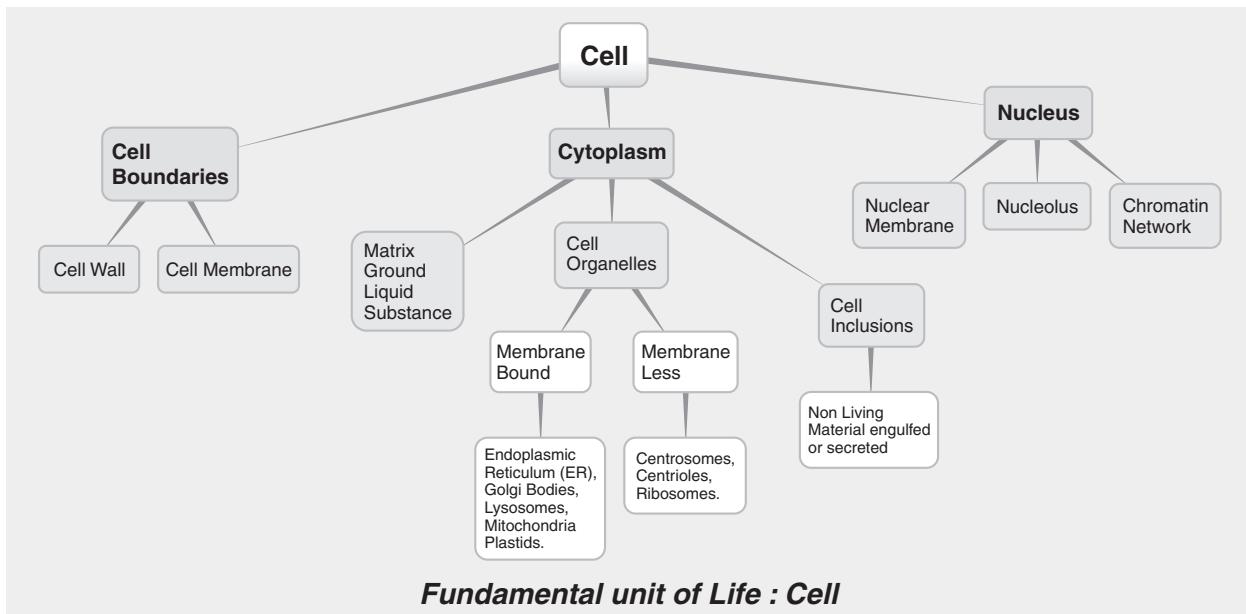
TOPIC - II

Cell wall, Cell membrane, Cell organelles – Structure and Functions, Chromosomes – basic structure and number **P. 51**

**KNOW THE TERMS**

- **Cell** : An autonomous self-replicating structure that forms the structural, functional and biological unit of all living organisms.
- **Prokaryotic cell** : A cell characterized by the absence of a distinct, membrane-bound nucleus or membrane-bound organelles, and by DNA that is not organized into chromosomes.
- **Nucleoid** : An undefined nuclear region of the prokaryotic cell, containing the genetic material (nucleic acids).
- **Eukaryotic cell** : A cell containing a membrane-bounded nucleus and membrane-bounded organelles.
- **Unicellular organism** : Organism having only one cell.
- **Multicellular organism** : Organism consisting of more than one cell, where in the differentiated cells perform specialized functions in the organism.
- **Plasmolysis** : When a plant cell loses water through osmosis there is shrinkage or contraction of contents of the cell away from cell wall. This phenomenon is known as plasmolysis.

FLOWCHART



Very Short Answer Type Questions

1 Mark each

- Q. 1. Name the cell organelles which is generally small sized in animal cells and large in plant cells.
(Board 2014, Set-SO1QHX3)

Ans. Vacuoles. 1

- Q. 2. List any two single celled (unicellular) organisms.
(Board Term I, 2012; Set-028)

Ans. *Amoeba* and *Euglena*. ½ + ½

- Q. 3. Mention the difference between Prokaryotes and Eukaryotes in terms of nuclear region present in them.
(Board Term I, 2012 Set-041,70)

Ans. Prokaryotic cells do not have a well defined nuclear region known as nucleoid whereas Eukaryotic cells have a well defined nucleus. ½ + ½

Short Answer Type Questions-I

2 Marks each

- Q. 1. Cell size may range from a few micro metre to a metre. Support this statement with the help of examples. (Board 2014, Set-LFS3I7K; DDE-2014)

Ans. Many cells are visible only under a microscope e.g., Mycoplasma is the smallest cell and longest cell in human body is nerve cell or neuron. 2
(CBSE Marking Scheme, 2014)

- Q. 2. Why is it said that "a cell without nucleus is without any future"? (NCERT based)

Ans. Nucleus is called the control centre of the cell as it controls all the metabolic activities going in the cell directly or indirectly and also in formation of various cell organelles by controlling the synthesis of proteins. 2

Short Answer Type Questions-II

3 Marks each

- Q. 1. (a) Write two points of difference between nuclear region of a bacterial cell and nuclear region of an animal cell.
(b) Which structure present in the nuclear region of a living cell bear genes?
(Board Term I, 2012, Set-021)

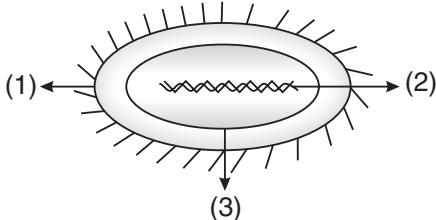
Ans. (a)

S. No.	Nuclear region of bacterial cell	Nuclear region of an animal cell
(i)	Poorly defined and lacks any covering.	Well defined and membrane bound.
(ii)	Has single chromosome.	Has more than one chromosome.

(iii)	Lacks organelles.	true	Well defined membrane bound cell organelles present.
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(b) Chromosomes bear 'genes'. 2 + 1

- Q. 2. (a) Label the parts marked 1, 2, 3 in a prokaryotic cell.
 (b) Mention any three features of prokaryotic cells. (Board Term I, 2012, Set-031)



Ans. (a) 1 – Cell wall, plasma membrane,
 2 – Nucleoid,
 3 – Cell wall

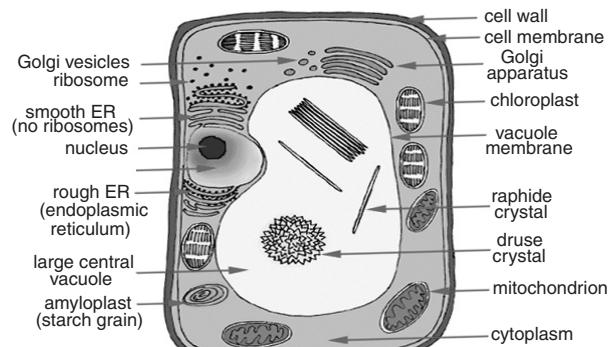
- (b) (i) Lack nuclear membrane.
 (ii) Lack cytoplasmic organelles.

(iii) Chlorophyll is associated with membranous vesicles. $\frac{1}{2} \times 6$

(CBSE Marking Scheme, 2012)

- Q. 3. Draw a diagram of a plant cell and label its any four parts. (Board Term I, 2012 Set-028; 35)

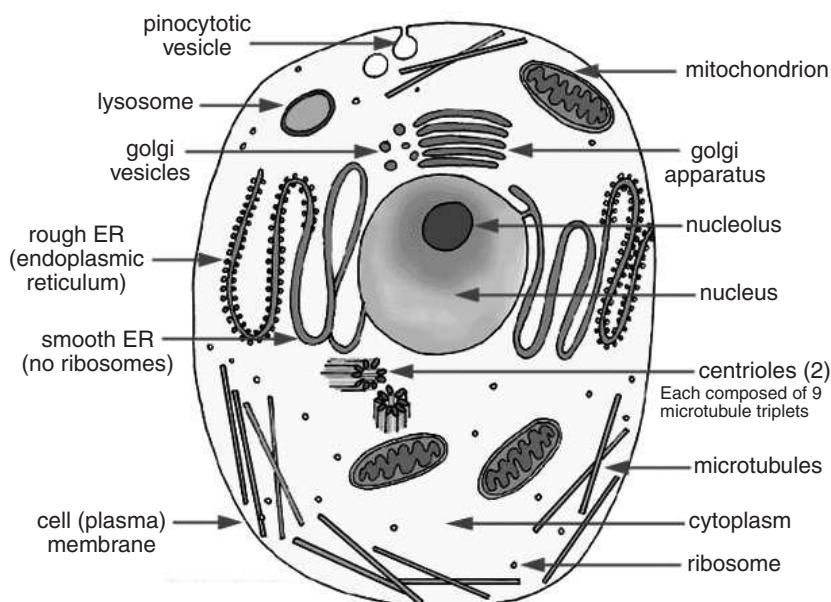
Ans.



(any 4 labelling) 1 + $\frac{1}{2} \times 4$

- Q. 4. Draw a neat diagram of an animal cell and label any four parts of it. (Board Term I, 2012 Set-051)

Ans.



(any 4 labelings) 1 + $\frac{1}{2} \times 4$

- Q. 5. Write three differences between Prokaryotic and Eukaryotic cells. (Board Term I, 2012 Set-045)

Ans. Difference between Prokaryotic and Eukaryotic cell:

S. No.	Prokaryotic cell	Eukaryotic cell
1.	Size : generally small (1-10 μm) 1 $\mu\text{m} = 10^{-6}$ m.	Size : generally large (5-100 μm)
2.	Nuclear region : containing only nucleic acid and is undefined due to the absence of nuclear membrane and known as nucleoid.	Nuclear region : well defined and surrounded by a nuclear membrane.

3.	Chromosome : single.	Chromosome : more than one chromosome
4.	Membrane-bound cell organelles absent.	Membrane bound cell organelles (e.g., chloroplasts, golgi bodies etc.) present.

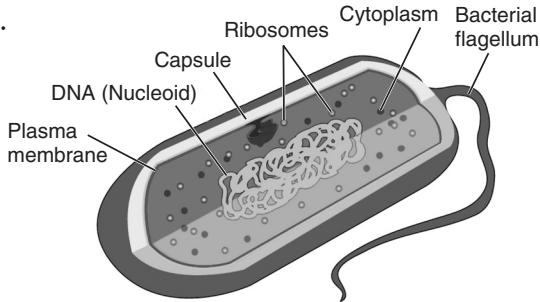
(any 3) 1 \times 3

(CBSE Marking Scheme, 2012)

- Q. 6. Draw and label the parts of prokaryotic cell.

(Board Term I, 2012 Set-076)

Ans.



(any 4 labeling) 1 + 2

Q. 7. (a) Why is the cell called the structural and functional unit of life ?

- (b) Why is the plasma membrane called a selectively permeable membrane ?
 (c) Name the factor which decides the movement of water across the plasma membrane.

(Board Term I, 2012 Set-056)

Ans. (a) Because shape and size of cells are related to specific functions they perform. Cells constitute various components of plants and animals.

- (b) Because it permits exit and entry of some selected materials in and out of the cells.
 (c) Amount of substance dissolved in water or solute concentration.

1 + 1 + 1

[CBSE Marking Scheme, 2012]

Long Answer Type Questions

5 Marks each

Q. 1. Make a comparison and write down ways in which plant cells are different from animal cell.

(Board 2010; 11)

Ans. Differences between plant cells and animal cells :

S. No.	Plant Cells	Animal Cells
1.	Plant cells are larger in size.	Animal cells are comparatively smaller in size.
2.	They contain cell wall made of cellulose, which is present outside the plasma membrane.	Cell wall is absent.
3.	They contain plastids, i.e., chloroplast, leucoplast and chromoplast.	Plastids are absent.
4.	Centrosome is absent.	Centrosome is present.
5.	Larger vacuoles are present.	Vacuoles either absent or very small in size.
6.	Food is stored in the form of starch.	Food is stored in the form of glycogen.
7.	Lysosomes either absent or very few in number.	More number of prominent lysosomes are present.

(any 5) 1 × 5

Q. 2. Describe the structure of the plant cell.

(NCERT based)

Ans. A plant cell consists of :

1. **Cell wall** : The outermost covering made mainly of non-living cellulose which gives distinct shape to the cell.
2. **Plasma membrane** : It is also called cell membrane. It is a thin, delicate and elastic covering lying inner to the cell wall. It controls the entry and exit of selected molecules and ions, and is selectively permeable.

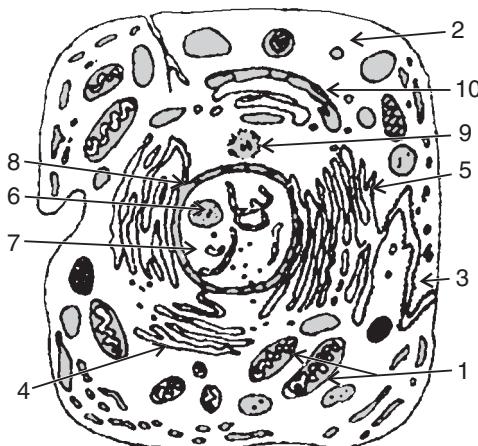
3. **Cytoplasm** : It is a viscous, homogeneous colloidal liquid and consists of a number of living and non-living structures. The living structures are the cell organelles and include structures like mitochondria, endoplasmic reticulum, Golgi apparatus, lysosomes, vacuoles etc. Cytoplasm keeps the cell fully expanded and provides turgidity to the cell. Chloroplasts are present only in the cytoplasm of plant cell.

4. **Nucleus** : It is dense spherical body bounded by a membrane which is called nuclear membrane. A number of thread-like structures called chromosomes with genes on them are embedded within the nuclear sap. The nucleus controls the various metabolic activities of the cell and so is called the control centre of the cell.

1 × 4 + 1

For diagram See Q. No. 2 SAQ (3 marks) 4 + 1

Q. 3. In the given figure of an animal cell as observed under an electron microscope.



- i) Name the parts labelled as 1 to 10.
- ii) Which parts are concerned with the following functions :
 - a) Release of energy,
 - b) Protein synthesis,

<p>(c) Transmission of hereditary characters from parents to their offsprings.</p> <p>(iii) Mention any two structures, found only in plant cell not in animal cell.</p> <p style="text-align: right;">(Board Term I, 2010)</p> <p>Ans. (i) 1. Mitochondria, 2. Cytoplasm, 3. Ribosome, 4. Smooth Endoplasmic reticulum, 5. Rough</p>	<p>Endoplasmic reticulum, 6. Nucleolus, 7. Nucleoplasm, 8. Nuclear membrane, 9. Centrosome, 10. Golgi apparatus</p> <p>(ii) (a) Mitochondria, (b) Ribosome, (c) Nucleus,</p> <p>(iii) 1. Cell wall and 2. Plastids</p>	<p>$\frac{1}{4} \times 10 + \frac{1}{2} \times 5$</p>
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TOPIC-2

Cell wall, Cell membrane, Cell organelles – Structure and Functions, Chromosomes – basic structure and number

QUICK REVIEW

- Plasma membrane is a thin, selectively permeable membrane, covering the cell and is made up of lipids and proteins.
- **Functions of plasma membrane :**
 - (i) It separates the contents of a cell from its outside environment.
 - (ii) It regulates the flow of substances to and from the cell through diffusion, facilitated diffusion, active transport and endocytosis.
- Osmosis is diffusion of water through a selectively permeable membrane.
- A cell placed in different solutions :
 - (i) **Hypotonic solution** : A cell placed in it will gain water.
 - (ii) **Hypertonic solution** : A cell placed in it will lose water, also known as plasmolysis.
 - (iii) **Isotonic solution** : A cell placed in it will neither gain nor lose water.
- **Cells of plants, fungi & bacteria** : Contain both plasma membrane & cell wall. Cell wall is rigid, non-living & outer most covering, composed mainly of cellulose.
- When placed in hypertonic solution, a living plant cell shows plasmolysis.
- Cell wall provides mechanical strength to the cell. It permits the cell to withstand huge changes in the surrounding medium.
- Nucleus is an important, spherical, usually centrally located constituent of the cell and is bounded by double layered nuclear envelope.
- The nucleus of a dividing cell shows rod-shaped chromosomes, made up of DNA and proteins. In a non-dividing cell, the chromosomes elongate and take the form of thread-like chromatin.
- DNA molecules are responsible for transmitting hereditary information from one generation to the next.
- Nucleus controls all metabolic activities of the cell.
- Depending on the presence or absence of nucleus, cells may be prokaryotic or eukaryotic.
 - (i) Prokaryotic cells lack a well-defined nucleus and instead show nucleoid, an undefined nuclear region containing the genetic material.
 - (ii) Eukaryotic cells possess a proper nucleus with nuclear membrane.
- Cytoplasm is the fluid content of the cell, occurring between nucleus and plasma membrane. It stores several vital chemicals and is the site of certain important metabolic pathways.
- Several specialized cell organelles are present in the cytoplasm. These organelles perform different kinds of metabolic activities and are kept separate from each other.
- The various cell organelles include endoplasmic reticulum, golgi apparatus, lysosomes, mitochondria, plastids, vacuoles and centrosome.
- Endoplasmic reticulum (ER) is an extensive, interconnected, membrane bound network of tubes and sheets.
- Ribosomes are attached to the surface of Rough Endoplasmic Reticulum (RER) and are absent in Smooth Endoplasmic Reticulum (SER).
- **Functions of Endoplasmic Reticulum (ER) :**
 - (i) It synthesizes important proteins (RER) and lipids (SER).
 - (ii) It provides a pathway for intracellular transport of materials.
 - (iii) SER of liver cells is important for detoxification.
- Golgi apparatus is a network of stacked, flattened, membrane bound sacs and vesicles.

- Golgi apparatus carries out the storage, modification and packaging of substances manufactured in the cell and is also involved in lysosome formation.
- The spherical, sac-like lysosomes contain powerful digestive enzymes and form the waste disposal system of the cell. They are also known as ‘suicide bags’.
- Mitochondria and plastids are covered by two membranes and possess their own DNA and ribosomes.
- Mitochondria are the ‘power houses of the cell’, providing energy for various metabolic activities.
- Chromoplasts and leucoplasts are the two types of plastids present in plant cells.
- Chloroplasts are chromoplasts containing chlorophyll and carry out photosynthesis in plants.
- Leucoplasts store starch, oil and protein granules.
- The large central vacuole of mature plant cells provides turgidity to the cell and also stores important substances.
- In unicellular organisms, vacuoles play important roles in nutrition and osmo-regulation.
- Ribosomes are sites of protein synthesis.
- Centrosome is found only in animal cells and consists of 2 centrioles. Centrosome helps in cell division.
- The membrane-bound cell organelles are absent in prokaryotic cells.
- The basic structural organization of the cell helps it to perform important functions like respiration, nutrition, excretion and protein synthesis.



KNOW THE TERMS

- **Diffusion** : The spontaneous movement of a substance from a region of its higher concentration to a region of its lower concentration.
- **Osmosis** : The movement of water through a semi-permeable membrane from a region of high water concentration to a region of low water concentration.
- **Hypertonic solution** : A solution that has a higher solute concentration than the one to which it is compared (e.g., some kind of cell).
- **Hypotonic solution** : A solution that has a lower solute concentration than the one to which it is compared (e.g., some kind of cell).
- **Isotonic solution** : A solution that has the same tonicity as another solution with which it is compared.
- **Plasmolysis** : Shrinkage or contraction of the protoplasm away from the wall of a living plant or bacterial cell, caused by loss of water through osmosis.
- **Cell organelle** : A specialized subunit within a cell that has a specific function, and is usually enclosed within its own membrane.
- **Genes** : A hereditary unit consisting of a sequence of DNA that occupies a specific location on a chromosome and determines a particular characteristic in an organism.
- **Membrane biogenesis** : The process of synthesizing the biological membranes.
- **Plasma membrane** : The thin, selectively permeable membrane composed of lipids and proteins which surrounds an entire cell and regulates the flow of substances to and from the cell.
- **Cell wall** : The rigid, non-living, outer covering of certain cells (like plant and bacteria), composed mainly of cellulose and providing the cell with structural support and protection.
- **Cytoplasm** : The jelly like material of a cell that is enclosed within the plasma membrane, except the nucleus and contains the cell organelles.

Very Short Answer Type Questions

1 Mark each

Q. 1. Name the plastid which gives red colour to tomato and purple colour to brinjal.
 (Board Term 2015, Set-LOVILN7)

Ans. Chromoplast.

Ans. Adenosine Triphosphate. It is produced in mitochondria. (CBSE Marking Scheme, 2014) $\frac{1}{2} + \frac{1}{2}$

Q. 2. What is the primary function of leucoplasts ?
 (Board Term I, 2015, 3GS246G)

Ans. They store starch, oils, protein granules.
 (CBSE Marking Scheme, 2015) 1

Q. 5. Name the process through which an amoeba acquires its food from the external environment.
 (Board Term I 2013, OAHJD6N; DDE 2014)

Q. 3. Who discovered cell ? (NCT 2014)

Ans. Rober Hooke. (CBSE Marking Scheme, 2014) 1

Ans. The process through which an amoeba acquires its food from the external environment is endocytosis. (CBSE Marking Scheme, 2014) 1

Q. 4. Expand ATP. Where it is produced ? (NCT 2014)

Q. 6. State the significance of membrane biogenesis.
 (Board Term I, 2012 Set-054) (DDE 2014)

Ans. The smooth endoplasmic reticulum helps in the manufacture of fats or lipids important for cell function and building cell membrane. 1

Q. 7. Identify the cell organelle which is known as the power house of the cell. State reason.

(Board Term I, 2012 Set-071) (NCT 2014)

Ans. Mitochondria; as energy is released from it. $\frac{1}{2} + \frac{1}{2}$

Q. 8. Name the cell organelle that is commonly termed as suicidal bags of the cell.

(Board Term I 2013, AGRO-94) (NCT 2014)

Ans. Lysosomes. 1

Q. 9. State the function of chromosome in a cell.

(Board Term I, 2012 Set-015)

Ans. Chromosome is the carrier of genetic information. (CBSE Marking Scheme, 2012) 1

Q. 10. Name the cell organelle which you would associate with elimination of old and worn out cells.

(Board Term I, 2012 Set-016; 64; 77)

Ans. Lysosomes. (CBSE Marking Scheme, 2012) 1

Q. 11. Name two cell organelles that contain their own genetic material.

(Board Term I, 2012 Set-019; 034; 51; 60; 73; 75)

Ans. Mitochondria and chloroplast. $\frac{1}{2} + \frac{1}{2}$ (CBSE Marking Scheme, 2012)

Q. 12. Identify and name the following cell structures :

(a) The undefined nuclear region of prokaryotic cell.

(b) Site of energy release inside the cell.

(Board Term I, 2012 Set-020)

Ans. (a) Nucleoid (b) Mitochondria. $\frac{1}{2} + \frac{1}{2}$ (CBSE Marking Scheme, 2012)

Q. 13. When a living plant cell loses water through osmosis, there is contraction of the contents of the cell away from the cell wall. What is this phenomenon called ?

(Board Term I, 2012 Set-021, 56)

Ans. Plasmolysis. (CBSE Marking Scheme, 2012) 1

Q. 14. Mention the change in human red blood cells when they are placed in hypotonic salt / sugar solution. (Board Term I, 2012 Set-031)

Ans. They will respectively shrink or burst. 1 (CBSE Marking Scheme, 2012)

Q. 15. Name the main constituent substance present in plant cell wall and state its function.

(Board Term I, 2012 Set-033)

Ans. Cellulose. It provides structural strength to plant. (CBSE Marking Scheme, 2012) $\frac{1}{2} + \frac{1}{2}$

Q. 16. Name the kind of plastid which is important for photosynthesis in leaves of the plants.

(Board Term I, 2012 Set-035)

Ans. Chloroplast. (CBSE Marking Scheme, 2012) 1

Q. 17. Name the cell organelle that detoxifies poisons and drugs into liver of vertebrates.

(Board Term I, 2012 Set-040)

Ans. Smooth Endoplasmic Reticulum. 1 (CBSE Marking Scheme, 2012)

Q. 18. Name two cell organelles having double-membrane envelope.

(Board Term I, 2012 Set-042,58)

Ans. Chloroplast and mitochondria. $\frac{1}{2} + \frac{1}{2}$ (CBSE Marking Scheme, 2012)

Q. 19. Name any two materials stored in leucoplasts.

(Board Term I, 2012 Set-045)

Ans. Starch/oils/protein granule. (any two) $\frac{1}{2} + \frac{1}{2}$ (CBSE Marking Scheme, 2012)

Q. 20. A de-shelled egg is placed in a concentrated salt solution and observed after five minutes. What change takes place ? (Board Term I, 2012 Set-046)

Ans. The egg shrinks. 1 (CBSE Marking Scheme, 2012)

Q. 21. Name the cell organelle which is associated with protein synthesis. (Board Term I, 2012 Set-069;76)

Ans. Ribosomes. (CBSE Marking Scheme, 2012) 1

Q. 22. Name two components of chromosomes. (Board Term I, 2012 Set-049)

Ans. Proteins and DNA. $\frac{1}{2} + \frac{1}{2}$ (CBSE Marking Scheme, 2012)

Q. 23. List the constituents of plasma membrane. (Board Term I, 2012 Set-052)

Ans. Lipids and Proteins. $\frac{1}{2} + \frac{1}{2}$ (CBSE Marking Scheme, 2012)

Q. 24. Name the organelle which has membrane bound sac filled with powerful digestive enzymes.

(Board Term I, 2012 Set-059)

Ans. Lysosomes. (CBSE Marking Scheme, 2012) 1

Q. 25. Identify the single celled organisms from the following :

Cockroach, *Chlamydomonas*, snake, mosquito, bacteria. (Board Term I, 2012 Set-061)

Ans. *Chlamydomonas* and bacteria. 1 (CBSE Marking Scheme, 2012)

Q. 26. Name : (i) the cells which have changing shape, (ii) the cells which have a typical shape.

(Board Term I, 2012 Set-062)

Ans. (i) *Amoeba*, (ii) Nerve cell. $\frac{1}{2} + \frac{1}{2}$ (CBSE Marking Scheme, 2012)

Q. 27. Name the plastid involved in conversion of a green brinjal to violet. (Board Term I, 2012 Set-067)

Ans. Chromoplast. (CBSE Marking Scheme, 2012) 1

Q. 28. Name the process through which an *Amoeba* acquires its food from the external environment.

(Board Term I, 2012 Set-072)

Ans. Endocytosis. (CBSE Marking Scheme, 2012) 1

Q. 29. Name the cell organelle responsible for intracellular transport. (Board Term I, 2012 Set-074)

Ans. Endoplasmic Reticulum. 1 (CBSE Marking Scheme, 2012)

Q. 30. Name the functional unit of DNA that carries genetic information. (Board Term I, 2012 Set-078)

Ans. Genes. (CBSE Marking Scheme, 2012) 1

Q. 31. What will happen if chloroplast is taken out of the cell and illuminated ? (HOTS)

Ans. Chloroplast is a semiautonomous cell organelle which on illumination can perform its function of photosynthesis and release oxygen even outside the cell provided it is kept in isotonic medium and receive raw material of carbon dioxide. 1

Q. 32. Is there any animal cell that lacks lysosomes ?

(HOTS)

Ans. Mammalian RBCs (Red Blood Corpuscles) lack lysosomes. 1

Q. 33. Plant cells have large vacuoles each surrounded by a membrane. What is the name of this membrane?

(HOTS)

Ans. The membrane that surrounds the vacuole is called tonoplast. The vacuole contains cell sap in it. 1

Short Answer Type Questions-I

Q. 1. What is endoplasmic reticulum ? Name the two types of endoplasmic reticulum. Write its main functions. (NCT 2014; Board 2010, 11)

Ans. Endoplasmic reticulum is a membranous network enclosing a fluid-filled lumen. The two types of endoplasmic reticulum are Rough Endoplasmic Reticulum (RER) and Smooth Endoplasmic Reticulum (SER). RER has ribosomes attached to its surface. The ribosomes take part in protein synthesis.

SER does not have any ribosomes on it and secretes lipids. Some proteins and lipids synthesised in ER are used for producing new cellular parts, specially the cell membrane, by biogenesis.

(CBSE Marking Scheme, 2014) $\frac{1}{2} + 1 + \frac{1}{2}$

Q. 2. Name a cell organelle which lacks membrane. Where is it prepared ?

(Board Term I 2013, 7ZTHA8G)

Ans. Ribosomes is a cell organelle that lacks membrane. It is prepared in the nucleolus. 1 + 1

(CBSE Marking Scheme, 2014)

Q. 3. What is plasmolysis ? What happens to a plasmolysed cell when it is placed in water ?

(Board Term I 2013, AGRO 94)

Ans. Shrinkage of protoplast from the cell wall in presence of hypertonic solution due to exosmosis is known as plasmolysis.

When a plasmolysed cell is placed in water, the concentration of water in the outside medium is more than the concentration in the cell. Hence, water moves inside the cell leading to its swelling.

1 + 1

Q. 4. What is plasma membrane ? What are its functions ? (Board 2010, 11)

Ans. Plasma membrane also called as cell membrane, is the outer covering of a cell that separates its contents from the surrounding medium. It is made up of lipids and proteins, and provides a mechanical barrier to protect the inner contents of the cell. It encloses the nucleus and cytoplasm of the cell.

1 + $\frac{1}{2} \times 2$

Q. 5. What are cell organelles ? (NCERT based)

Ans. The different parts found inside the cell are called cell organelles. They perform specific functions and together carry out the various metabolic activities of the cell. 2

Q. 6. What is cellulose and its function ? (NCERT based)

2 Marks each

Ans. Cellulose is the main component of a plant cell. It is a polysaccharide and is responsible for providing structural strength to the plants. 1 + 1

Q. 7. How are vacuoles in plant cells different from those in animal cells ? (NCERT based)

Ans.

S. No.	Vacuoles in plant cells	Vacuoles in animal cell
1.	They are comparatively very large in size.	They are comparatively smaller in size.
2.	They are few in number.	They are comparatively more in number.
3.	They contain cell sap and provide turgidity and rigidity to the cell.	They may contain food and are called food vacuoles. In some cases they become specialised to expell out excess of water and wastes, like in amoeba.

(any 2) 1 + 1

Q. 8. What do you mean by a nucleoid ? (Board 2010, 11)

Ans. In prokaryotes and lower organisms like bacteria, the nuclear region of the cell may be poorly defined because of the absence of a nuclear membrane. Such an undefined and incipient nucleic region containing only naked nucleic acids without any membrane covering them is called a nucleoid. 2

Q. 9. What are vacuoles ? What are their functions ? (NCERT based)

Ans. Vacuoles are clear fluid filled or gas filled spaces in the cytoplasm. A vacuole is covered by a covering called tonoplast. In plant cells, the vacuoles are larger and less in number as compared to the animal cells.

Vacuoles help in the storage of water, food and other waste substances. 1 + 1

Q. 10. What is a centrosome and what function does it perform ? (NCERT based)

Ans. A centrosome contains micro cylindrical bodies called centrioles. It is located near the nucleus and is present in animal cell only. It initiates and regulates cell division. It is involved in spindle formation during the cell division. 1 + 1

Q. 11. Write the function of chromatin material.

(Board 2010; 11)

Ans. The chromatin material mainly consists of deoxyribonucleic acid (DNA) which stores and transmit the hereditary information from one generation to another. 1 + 1

Q. 12. Describe in short the chief components of a nucleus. (NCERT based)

- Ans.** (i) Nucleoplasm, a liquid ground substance.
(ii) Chromatin material, which is a network of DNA protein fibres which carry genes, that carry the genetic information from one generation to the next.
(iii) Nucleolus, which lies in the centre and helps in the formation & storage of RNAs as well as in the formation of ribosomes. 2

Q. 13. Why are mitochondria also referred to as 'strange organelles' ? (NCERT based)

Ans. Mitochondria have their own DNA and ribosomes, due to which they are able to make some of their own proteins and are semi-autonomous. 2

Q. 14. What role does a nucleus play in cellular reproduction ? (NCERT based)

Ans. The nucleus plays the central role in Cellular reproduction. Cellular reproduction is the process by which a single cell divides and forms two new cells. Apart from that, the nucleus also plays a vital role in determining the way the cell will develop and what form it will at maturity, (by directing the chemical activities of the cell) attain. 2

Q. 15. Distinguish between cell wall and cell membrane. (Board 2010; 11)

Ans. Differences between cell wall and cell membrane :

S. No.	Cell wall	Cell membrane
1.	It is present only in plant cell.	It occurs both in animal cells and plant cells.
2.	It is dead in nature and permeable.	It is a living membrane and is semi-permeable.
3.	It is composed of cellulose.	It is composed of lipids and proteins.

(any 2) 1 + 1

Q. 16. Give differences between cytoplasm and nucleoplasm. (Board 2010; 2011)

Ans. Differences between cytoplasm and nucleoplasm :

S.No.	Cytoplasm	Nucleoplasm
1.	Cytoplasm is the protoplasm which lies outside the nucleus. i.e., between the nucleus and the cell membrane.	It is the part of protoplasm that lies inside the nucleus.
2.	It is a semi-fluid jelly-like substance.	It is transparent.

3.	It contains various organelles and inclusions.	It is a colloidal substance having similar composition to cytoplasm, but contains more of nucleotides. It contains chromatin material.
4.	It contains a number of inorganic substances forming clear true solution as well as organic substances lipids, protein and carbohydrates.	

 $\frac{1}{2} \times 4$ **Q. 17. Write the main functions of cell wall.**

(Board 2010; 11)

- Ans.** (i) Cell wall provides shape as well as rigidity to the cell.
(ii) It protects the protoplasm.
(iii) It is involved in the movement of materials in and out of the cell.
(iv) Growth of cell wall determines the growth of cell. 2

Q. 18. Give any two functions of plastids.

(Board 2010; 11)

- Ans.** (i) Chloroplast is the site of photosynthesis and helps in preparing the food (in case of plants).
(ii) Leucoplasts are the site of storage of food.
(iii) Chromoplast provide colour to various flowers and fruits. (any two) 1 + 1

Q. 19. What will happen if -

- (a) Excess amount of fertilisers are added to green grass lawn. (HOTS)
(b) Salt is added to cut pieces of raw mango ?

- Ans.** (a) It will kill grass plants due to exosmosis and plasmolysis.
(b) Salt protects the cut pieces from bacterial and fungal attack. 1 + 1

Q. 20. Differentiate between chromatin and chromosome. (HOTS)

Ans. Chromatin is the nucleoprotein fibrous mass which stains strongly with basic dyes and is present inside the nucleus. Chromosomes are the thread-like, stainable, condensed chromatin unit, visible at cell division and contains hereditary information in the form of genes. 1 + 1

Q. 21. Why is endocytosis found in animals only ? (HOTS)

Ans. Endocytosis is engulfment of food and other substances from external medium by plasma membrane. This is possible only when plasma membrane is in direct contact with external medium. It occurs only in animal cells. In plant cells, a cell wall is present over the plasma membrane. Therefore, their plasma membranes cannot perform endocytosis. 1 + 1

Short Answer Type Questions-II

3 Marks each

Q. 1. What happens when :

- (a) methylene blue stain is added to human cheek cell.
- (b) rheo leaves are boiled in water and a drop of sugar added to it.
- (c) RBCs are kept in concentrated solution.

(Board 2015, LOV7LN7)

- Ans.** (a) Because of its affinity for DNA and RNA, methylene blue will produce a darker stain leading the DNA in the nucleus to stand out so that nucleus can be clearly seen.
 (b) On boiling, all the cells of rheo leaves become dead. On adding sugar syrup nothing will happen as liquid cannot pass through dead cell membrane.
 (c) On placing RBCs in concentrated solution, the water will come out and the cell will shrink as the concentration of solution outside is higher than inside the cell. As a result of osmosis, water comes out of the cell to maintain equilibrium.

1 + 1 + 1

Q. 2. (i) Where are chromosomes present in the cell? What is their chemical composition?

- (ii) How many pairs of chromosomes are present in humans ? (Board 2015, Set-K34UQKW)

- Ans.** (i) Chromosomes are present in the nucleus of a cell. Their chemical composition is of DNA, RNA and proteins.

- (ii) Humans have 23 pairs of chromosomes.

Q. 3. What is the energy currency of the cell ? Write it in expanded form. Which cell organelle is related to the currency ? (Board Term I, 2015, 3GS246G)

Ans. ATP; Adenosine Tri Phosphate

Mitochondria (CBSE Marking Scheme, 2012) 3

Detailed Answer :

ATP is the energy currency of the cell. Its expanded form is Adenosine Triphosphate.

Mitochondria.

Q. 4. Discuss the role of :

- (i) Cellulose in cell wall
- (ii) Presence of deeply folded membrane in mitochondria
- (iii) Digestive enzymes in lysosomes.

(Board 2014, Set-LFS3I7K)

- Ans.** (i) Cellulose provides rigidity to the plant cell and helps it to withstand in dilute medium.
 (ii) Folds in mitochondria increase the surface area to help in ATP generating reactions.
 (iii) Digestive enzymes in lysosomes help in removal of viruses, worn out organelles, damaged cell.

1 + 1 + 1

Q. 5. How are the following related to each other ?

- (i) Chromatin network and chromosomes
- (ii) Chloroplast and chlorophyll
- (iii) Genes and DNA.

(Board 2014, Set-MNM9GZH)

- Ans.** (i) On cell division, chromatin network organise themselves into chromosomes.

- (ii) Chloroplast is a plastid which contains a green pigment called chlorophyll which is responsible for photosynthesis.
- (iii) The segments of DNA are called genes.

(CBSE Marking Scheme, 2014) 1 + 1 + 1

Q. 6. Define Osmosis. In what two ways it is different from diffusion ?

(DDE 2014), (Board Term I 2013; OAHJD6N)

- Ans.** Osmosis is the process in which there is a movement of solvent (usually water) from a region of high water concentration to a region of low water concentration.

Difference between osmosis and diffusion :

S.No.	Osmosis	Diffusion
1.	It takes place through semi-permeable membrane.	The diffusion does not require any membrane.
2.	Movement of solvent is involved.	Movement of solid, liquid and gases are involved.

1½ + 1½

OR

- Ans.** Movement of solvent (usually water) from a region of high water concentration to a region of low water concentration; it takes place through semi-permeable membrane whereas the diffusion does not require any membrane, in osmosis movement of solvent is involved whereas in diffusion movement of solid, liquid and gases are involved. (CBSE Marking Scheme, 2014) 3

Q. 7. Write one function each of – Ribosomes, Vacuole, Plasma membrane.(Board Term-I 2013; AGRO 94)

- Ans.** (1) **Ribosomes** : It helps in protein synthesis.
 (2) **Vacuole** : Vacuoles are full of cell sap and provide turgidity and rigidity to the cell in plants.
 (3) **Plasma membrane** : It allows or permits the entry and exit of some materials in and out of the cell. It prevents movement of some other materials not required or harmful for cells.

1 + 1 + 1

Q. 8. Write two similarities and one dissimilarity between mitochondria and plastid.

(Board Term I, 2012 Set-015)

- Ans.** (i) (a) Both are double membrane structures.
 (b) Both of them have their own genetic material.
 (ii) Mitochondria is the site of production of energy whereas plastid is the site of production of food.

2 + 1

Q. 9. Division of labour exists even at intra cellular level. Justify the statement.

(Board Term I, 2012 Set-019)

Ans. Each cell has got certain specific components within it known as cell organelles. Each cell organelle performs a special function. A cell is able to live and perform all its functions perfectly because of these organelles. This is called division of labour. All cells are found to have the same organelles, no matter what their function is or in which organism they are found. (CBSE Marking Scheme, 2012) 3

Q. 10. Differentiate between rough and smooth endoplasmic reticulum. How is endoplasmic reticulum important for membrane biogenesis ?
(Board Term I, 2012 Set-033)

Ans. Rough endoplasmic reticulum looks rough under a microscope because it has particles called ribosomes attached to its surface and smooth endoplasmic reticulum do not have ribosomes attached to it. It helps in the manufacture of fat molecules or lipids important for cell function. Some of these proteins and lipids help in the building of cell membrane, the process called membrane biogenesis. (CBSE Marking Scheme, 2012) 2 + 1

Q. 11. Describe the role played by the Lysosomes in a cell. Why these are termed as suicidal bags ? How do they perform their function ?

(Board Term I, 2012 Set-034)

Ans. Lysosomes are a kind of waste disposal system of cell. They help to keep the cell clean by digesting any foreign material as well as worn out cell organelles. Foreign material entering the cell such as bacteria or food ends up in lysosomes. During the disturbance in cellular metabolism lysosomes may burst and the enzymes digest their own cell. Therefore, lysosomes are also known as suicidal bags. Lysosomes are able to do this because they contain powerful enzymes capable of breaking down all organic material. 1 + 1 + 1
(CBSE Marking Scheme, 2012)

Q. 12. Distinguish leucoplast from chromoplast based on one feature. Give an example of chromoplast present in plant cell. What is the function of chromoplast in the plant cell ?

(Board Term I, 2012 Set-040)

Ans. Leucoplasts are colourless plastids. They store starch, oil, proteins. Chromoplasts are coloured plastids. They contain pigments.
e.g. Chloroplasts contain green pigment present in the plant cell. Chromoplasts provide colour to various flowers and fruits. 1 + 1 + ½ + ½
(CBSE Marking Scheme, 2012)

Q. 13. Who gave the term Golgi apparatus? Name one cell organelle that is formed by Golgi apparatus. Write any two functions of Golgi apparatus.
(Board Term I, 2012 Set-042)

Ans. Camillo Golgi.
Lysosomes.

Functions :

- (i) Packages and dispatches materials synthesised by ER.

(ii) Complex sugar made from simple sugars.

(iii) Involved in formation of Lysosomes.

(any two) 1 + 1 + 1

Q. 14. Two beakers A and B contain plain water and concentrated sugar solution respectively. Equal number of dry raisins are kept in them for a few hours and then taken out.

- (i) Explain the reason for the difference in the physical appearance of raisins which were taken out of the two beakers.
- (ii) On the basis of above observation, categorise the two solutions as hypotonic and hypertonic.
(Board Term I, 2012 Set-062)

Ans. (i) In beaker A, the raisins would swell because water concentration is higher outside the cell membrane. So more water enters the membrane than leaves it.

In beaker B, raisins will shrink because water concentration is less outside the cell membrane. So more water comes out of the membrane than enters.

- (ii) A – hypotonic. B – hypertonic. 1 + 1 + 1
(CBSE Marking Scheme, 2012)

Q. 15. (a) Which cell organelle would you associate with ATP production ? How is this organelle able to make its own proteins ?

- (b) A student performed an experiment by placing the de-shelled egg in a concentrated salt solution for five minutes. What changes did he observe in the egg ? Give reason for the same.
(Board Term I, 2012 Set-072)

Ans. (a) Mitochondria is associated with ATP production. It has own DNA and ribosomes to make proteins.

- (b) The egg shrinks because water passes out of the egg solution, into the salt solution due to osmosis. 1½ + 1½

(CBSE Marking Scheme, 2012)

Q. 16. State reason for the following :

- (a) Mention the use of deep folding in the inner membrane of mitochondria.
(Board Term I, 2012 Set-077)

- (b) Plastids are able to make their own protein.
(c) Plant cells shrink when kept in hypertonic solution.
(Board Term I, 2012 Set-059)

Ans. (a) These folds create a large surface area for ATP generating chemical reactions.

- (b) Because plastids have their own ribosome hence they can form their own proteins.

- (c) Plant cells shrink as it loses water by the process of osmosis. 1 + 1 + 1

(CBSE Marking Scheme, 2012)

Q. 17. Name three types of plastids found in plant cells and give one function of each.
(Board Term I, 2012 Set-069)

Ans. **Chloroplast** : involved in the photosynthesis in plants.

Chromoplast : impart attractive colours to flowers and fruits.

Leucoplast : stores starch, oil and protein granules.
1 × 3

Q. 18. (a) What is membrane biogenesis ?

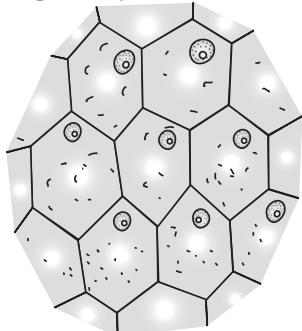
- (b) Explain what happens when a drop of concentrated sugar solution is placed on a rheo leaf peel mounted on a glass slide. Name this phenomenon. Would the same happen if the rheo leaf was boiled before mounting ? Give reason for your answer. (Board Term I, 2012 Set-075)

Ans. (a) Some of the proteins and lipids manufactured by the RER and SER help in building the cell membrane. This process is known as membrane biogenesis.

- (b) There is a shrinkage or contraction of the contents of the cell away from the cell wall. This phenomenon is known as Plasmolysis.

No, because dead cells are not able to lose water by osmosis (plasmolysis in this case). $1 + \frac{1}{2} \times 4$

Q. 19.



Long Answer Type Questions

5 Marks each

Q. 1. (a) What are the consequences of the following conditions ?

- (i) A cell having higher water concentration than the surrounding medium.
- (ii) A cell having lower water concentration than the surrounding medium.
- (iii) A cell having equal water concentration to its surrounding medium.

(b) Name the materials of, which the cell membrane and cell wall are composed of. (Board 2015, Set-K34UQKW)

Ans. (A) (i) When a cell possess higher water concentration than the surrounding medium then exosmosis occurs in the cell due to difference in concentration and cell shrinks.

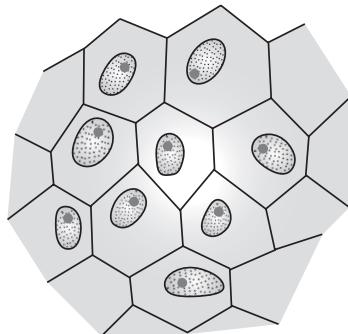
- (ii) When a cell has low water concentration than surrounding medium then endosmosis occurs that results in the swelling of the cell.
- (iii) A cell having equal water concentration to its surrounding medium will not show any changes.

(b) Cell wall is composed of cellulose and cell membrane is composed of lipids and proteins.

$3 + 2$

Q. 2. (i) Explain the terms : (a) Endocytosis, (b) Plasmolysis.

- (ii) What will happen if the organisation of a cell is damaged due to certain physical or chemical reasons ?



B - Cells

(i) Identify A and B cells.

(ii) What will happen if B cells are kept in hypotonic solution ?

(iii) What will happen if A cells are kept in hypertonic solution ? (HOTS)

Ans. (i) A cells – Turgid cells, B cells – Plasmolysed cells

(ii) B cells kept in hypotonic solution will become deplasmolysed if done so immediately after plasmolysis.

(iii) A cells kept in hypertonic solution will become plasmolysed. $1 + 1 + 1$

(iii) How do substances like CO_2 and water move in and out of the cell ? (Board Term I, 2010, 11)

Ans. (i) (a) **Endocytosis :** The flexibility of the cell membrane enables the cell to engulf food and other materials from its external environment. Such process is known as endocytosis.

(b) **Plasmolysis :** When a living plant cell loses water through osmosis, there is shrinkage or contraction of the contents of the cell away from the cell wall. This phenomenon is known as plasmolysis.

(ii) When the organisation of a cell gets damaged, lysosomes will burst and their enzymes will eat up their own cell organelles. Therefore, lysosomes are also known as the suicidal bags of the cell.

(iii) Gases like CO_2 and O_2 move in and out of the cell by diffusion from their higher concentration to lower concentration. Water enters the cell by endosmosis through semi-permeable plasma membrane from its higher concentration to lower concentration.

Similarly, water moves out of the cell by exosmosis when a cell is placed in a hypertonic solution.

$1 + 1 + 1 + 2$

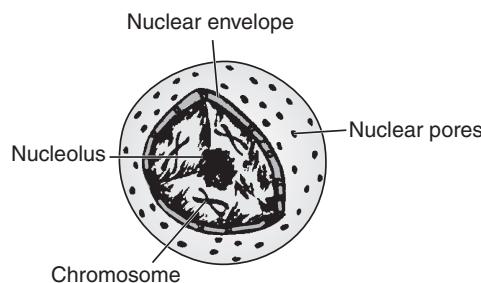
Q. 3. (a) What is the name given to the thread shaped structures in the nucleus ? Why is it important?

(b) Draw a diagram of the nucleus to show the given parts : (Board 2010)

(i) nucleolus, (ii) nuclear pore, (iii) nuclear envelope.

Ans. (a) The thread shaped structures in the nucleus are known as chromosomes. These are important because they contain information for inheritance of features from parents to the next generation.

(b)



1 + 1 + 3

Q. 4. (a) What would happen if the plasma membrane ruptures or breaks down?

(b) What would happen to the life of a cell if there were no Golgi apparatus? (NCERT based)

Ans. (a) Plasma membrane is the selectively permeable membrane that surrounds the cell and allows the entry and exit of selected materials into and out of the cell. If it ruptures, the contents of the cell will come in direct contact with the surrounding medium and not only unwanted material will be able to enter freely into the cell, but useful material will also find its way out of the cell easily. This will seriously disrupt the various metabolic activities of the cell and will result in its eminent death.

(b) If there were no Golgi apparatus, the material synthesized by Endoplasmic reticulum would not be carried to the various parts inside and outside the cell. Also as the Golgi apparatus performs the function of storage and modification of the material synthesized in the cell, these material could not be stored and modified further.

Moreover, there will be no production of lysosomes which will cause the accumulation of waste material, viz. worn out and dead cell organelles within the cell which will ultimately lead to cell death.

2½ + 2½

Q. 5. Carry out the following osmosis experiment:

Take four peeled potato halves and scoop each one out to make potato cups. One of these potato cups should be made from a boiled potato. Put each potato cup in a trough containing water.

Now,

(a) Keep cup A empty.

(b) Put one teaspoon sugar in cup B.

(c) Put one teaspoon salt in cup C.

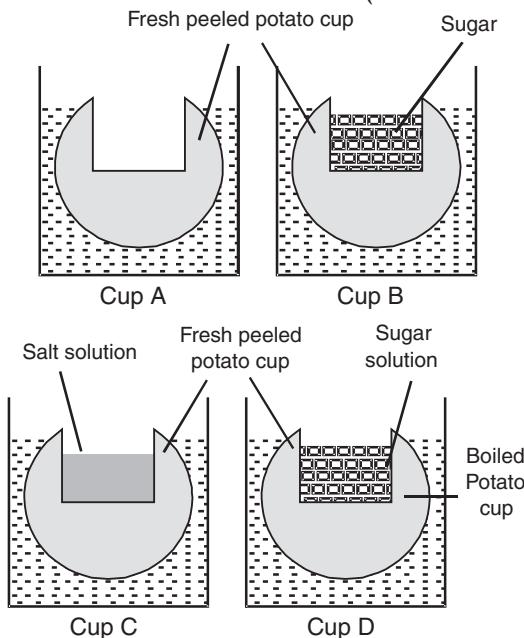
(d) Put one teaspoon sugar in the boiled potato cup D. Keep this setup for two hours. Then observe the four potato cups and answer the following :

(i) Explain why water gathers in the hollowed portion of B and C.

(ii) Why is potato A necessary for this experiment?

(iii) Explain why water does not gather in the hollowed out portions of A and D.

(NCERT based)



Ans. (i) Water gathers in the hollowed portion of B and C because of the process of endosmosis (moving in of the solvent). A potato is made up of several cells, and the cell membranes are selectively permeable. As the cups B and C are filled with sugar and salt respectively and their outer part is in contact with the water, the concentration of water outside the cups is higher than inside the cups, so water moves from its higher concentration towards the lower concentration, i.e., inside the cup.

(ii) Potato A acts as a control of the experiment. It is very necessary for comparing the results of the experiment and shows that if the conc. of water is same on both sides, there will be no movement of water.

(iii) Water does not gather in the hollowed out portions of A as it does not contain hypertonic solution so there is no concentration difference. Water does not gather in the cup D as the cells of boiled potato are dead and hence no osmosis occurs.

2 + 1 + 2

Value Based Questions

Q. 1. Ravi's mother was preparing sweets at home. She put some raisins in the water. Ravi saw the raisins and asked his mother that why the raisins had swelled up in water. His mother replied him scientifically and told that this is due to endosmosis.

(i) What is Endosmosis?

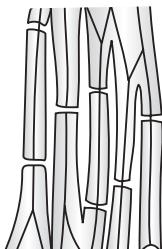
(ii) Why is plasma membrane called selectively permeable membrane?

(iii) What values were shown by Ravi?

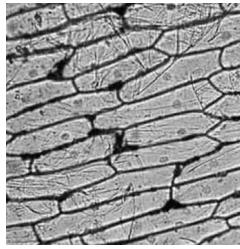
Q. 5. While preparing temporary mount of substance straining is carried out to : (Board 2014, Set-MNM9GZH), (Board 2012; Term 1; Sc-045)

- (a) highlight cell components
- (b) clean cells
- (c) increase transparency of cells
- (d) prevent drying up of cells

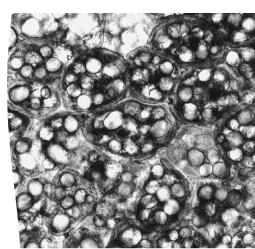
Q. 7. Four slides were observed under the microscope for spot test as shown below. The correct identification of four spots is :



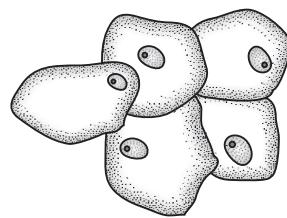
(A)



(B)



(C)



(D)

	A	B	C	D
(a)	onion peel	cheek peels	sclerenchyma	parenchyma
(b)	cheek peels	parenchyma	sclerenchyma	onion peel
(c)	parenchyma	cheek peels	onion peel	sclerenchyma
(d)	sclerenchyma	onion peel	parenchyma	cheek peels

(Board Term I 2013, OAHJD6N)

Q. 8. The stained parts of the onion peel cells are :

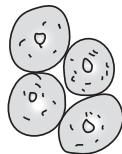
- (a) cell membrane, nucleolus, cytoplasm
- (b) cell membrane, nucleolus, vacuoles
- (c) cell wall, nucleus, cytoplasm
- (d) cell wall, nucleus, vacuoles.

Q. 9. Animal cells are commonly stained with :

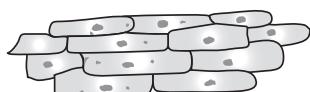
- (a) methylene blue (b) acetocarmine
- (c) safranin (d) iodine solution.

Q. 10. Raman prepared a temporary mount of onion peel and observed it under a microscope. His teacher asked him to draw the diagram. The correct diagram of the cells found in onion peel is :

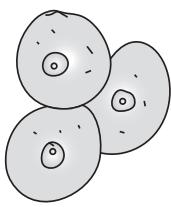
(Board Term I, 2012 Set-015)



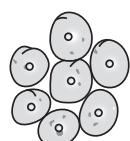
(A)



(B)



(C)



(D)

- (a) A
- (b) B
- (c) C
- (d) D

Q. 11. The correct step, in the procedure for making a temporary slide of human cheek cells is :

(Board Term I, 2012 Set-016)

Q. 6. While observing a stained mount of onion peel under high power compound microscope, the part of the cell that takes very little stain is :

- (a) Nucleus
- (b) Cytoplasm
- (c) Vacuole
- (d) Cell wall

(Board Term I 2013, OAHJD6N)

- (a) place the cheek cell scrapings in a watch glass containing water
- (b) place cheek cell scrapings in the centre of a clean slide
- (c) dip the tooth pick containing cheek cell scrapings in the stain and then transfer to a clean slide.
- (d) obtain cheek cells directly in the slide using its edge to scrap the inside of the cheek.

Q. 12. To take out the peel from onion for preparation of temporary mount of it we should use :

(Board Term I, 2012 Set-023)

- (a) needle
- (b) brush
- (c) forceps
- (d) knife

Q. 13. Human cheek cells as observed under the microscope are : (Board Term I, 2012 Set-035)

- (a) irregular in shape with a nucleus in the centre
- (b) circular in shape with a nucleus in the centre
- (c) rectangular in shape with a nucleus towards the periphery
- (d) spindle shaped with a nucleus in the centre

Q. 14. The correct method of obtaining an onion peel is to : (Board Term I, 2012 Set-028)

- (a) take the thinnest bit after meshing an onion leaf
- (b) make thin section of a thick scale leaf using a blade
- (c) use of forceps to pull out a thin transparent peel from a concave surface of a scale leaf.
- (d) use a needle and forceps to remove a thin transparent peel from convex surface of a scale leaf.

Q. 15. Which of the following liquid is not used in the preparation of stained temporary mount of onion peel ?
 (Board Term I, 2012 Set-041)

- (a) Water
- (b) Glycerine
- (c) Safranin
- (d) Methyl alcohol

Q. 16. Glycerine is used to prepare a temporary mount of a tissue due to the following reason :
 (Board Term I, 2012 Set-031)

- (a) To colour the specimen
- (b) To avoid drying up of the specimen quickly
- (c) To avoid entry of air bubbles
- (d) Not to allow dust to stick to specimen

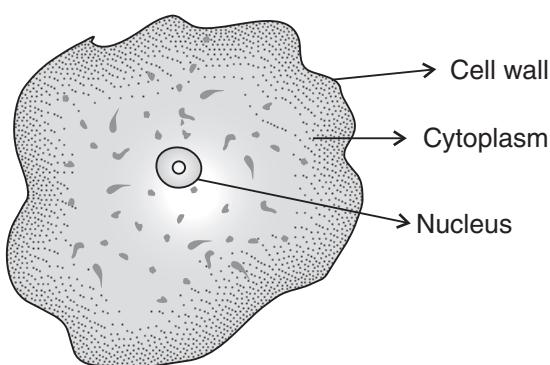
Q. 17. Rahul was observing an onion peel stained with safranin under a microscope. The colour of the cell wall appeared :
 (Board Term I, 2012 Set-061)

- (a) deep blue
- (b) black
- (c) pinkish red
- (d) yellow

Q. 18. Rohan examined the onion peel and made observations. The incorrect observation is :
 (Board Term I, 2012 Set-065)

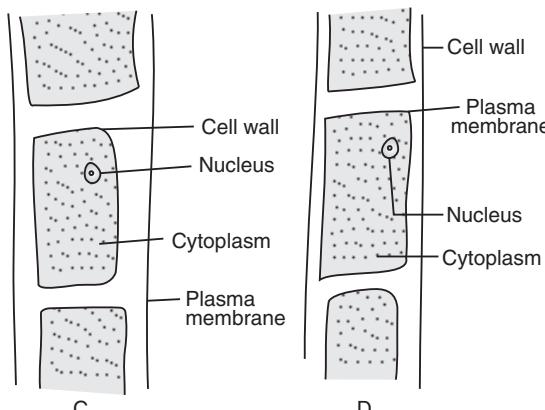
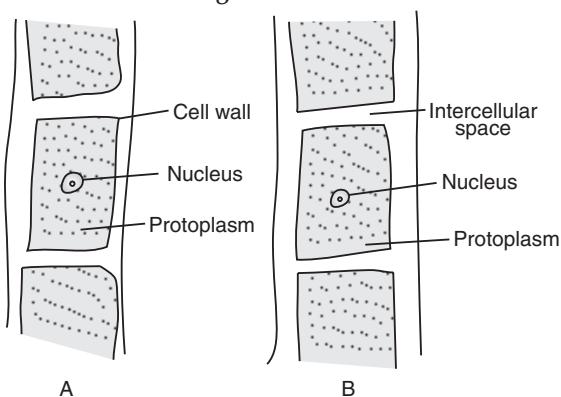
- (a) Intercellular space is absent
- (b) Cytoplasm and cell wall is present
- (c) Nucleus is present
- (d) Cell wall is absent

Q. 19. Identify the wrong labelling in the following diagram of human cheek cell.
 (Board Term I, 2012 Set-069)



- (a) Cell wall
- (b) Nucleus
- (c) Nucleolus
- (d) Cytoplasm

Q. 20. Diagrams of cells of an onion peel were labelled by few students as given below.



The correctly labelled diagram is :

(Board Term I, 2012 Set-077)

- (a) A
- (b) B
- (c) C
- (d) D

Q. 21. Given below are four operations for preparing a temporary mount of human cheek cells :

- (i) Taking scraping from inner side of the cheek and spreading it on a clean slide.
- (ii) Putting a drop of glycerine on the material.
- (iii) Adding two or three drops of methylene blue
- (iv) Rinsing the mouth with fresh water and disinfectant solution. Correct sequence of those steps is :
 (Board Term I, 2012 Set-051)

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

Q. 22. The formula used to calculate the percentage of water absorbed by raisins is $\frac{W_2 - W_1}{W_1} \times 100$. Here

W_2 in the formula refers to :

- (a) mass of raisins before absorption of water
- (b) mass of raisins after absorption of water
- (c) mass of water left in beaker at the end
- (d) mass of water absorbed by raisins.

(Board Term I 2013, AGRO 94)

Q. 23. A student soaked 5 grams of raisins in water. Weight of soaked raisins was found to be 7 g. The percentage of water absorbed by raisins is :
 (Board Term I, 2012 Set-075)

- (a) 50%
- (b) 70%
- (c) 20%
- (d) 40%

Q. 24. Ram soaked 6 raisins in 40 ml of water in a beaker labelled 'A' and another 6 raisins in 40 ml of water in a beaker labelled 'B'. He maintained the temperature of beaker 'A' at 37°C and beaker 'B' at 90°C. After an hour he calculated the water absorbed by the raisins in beaker 'A' and 'B' and found that the percentage of water absorbed is :
 (Board Term I, 2012 Set-072)

- (a) more in A and less in B
- (b) the same in both A and B
- (c) more in B and less in A
- (d) water is not absorbed in both A and B

Q. 25. In an experiment performed to determine percentage of water absorbed by raisins, the initial

Ans.
$$\frac{3g - 2g}{2g} \times 100 \\ = 50\%$$

(CBSE Marking Scheme, 2014) 2

- Q. 5. 5 g of raisins were placed in distilled water for 24 hours. The mass of soaked raisins was found to be 7 g. Calculate the percentage of water absorbed by raisins. (Board Term I 2013, 7ZTHA8G)

Ans. From formula =
$$\frac{W_2 - W_1}{W_1} \times 100 \\ = \frac{7 - 5}{5} \times 100 \\ = \frac{2}{5} \times 100 = 2 \times 20 = 40\%$$

(CBSE Marking Scheme, 2013) 2

- Q. 6. A teacher soaked 10 g raisins in 35 ml of distilled water in a beaker A and similar amount in beaker B. She maintained the temperature of beaker A at 20° C and beaker B at 40° C. After an hour compare the percentage of water absorbed by the raisins in beakers A and B. (Board Term I 2013, OAHJD6N)

Ans. Percentage of water absorbed by the raisins is more in B and less in beaker A. It is because absorption of water in raisins increases with the increase in temperature. (CBSE Marking Scheme, 2013) 2

- Q. 7. In an experiment, to prepare a temporary mount of onion peel, which stain is used for the peel and why peel is kept in water after staining ?

Ans. Small quantity of Safranin is used to stain onion peel. Peel is dipped in water after staining to remove the excess stain from the peel. 1 + 1

- Q. 8. Name any other stain used for staining Onion peel. How excess glycerine can be removed from the cover slips ?

Ans. Methylene blue is the other stain used to stain Onion peel. Excess glycerine can be removed from the cover slip by using a piece of blotting paper.

1 + 1

- Q. 9. Mention the features of the cells of Onion peel when it is seen under microscope.

Ans. The cells are rectangular in shape, compactly arranged and without any intercellular spaces. Each cell has a distinct cell wall, a prominent nucleus and vacuole. 2

- Q. 10. In the experiment, to prepare a temporary mount of human cheek cells, which two materials are required to scrap cheek cell from the mouth.

Ans. (i) A clear spatula
(ii) A toothpick. 1 + 1

- Q. 11. In the experiment, to prepare a temporary mount of human cheek cells, list any two precautions.

Ans. (i) Cheeks should be scrapped gently to prevent injury.
(ii) While mounting the cover slip, avoid entry of air bubbles. 2



KNOW THE LINKS

- www.cell.com
- en.wikipedia.org
- www.sciencedirect.com
- www.cellsalive.com



CHAPTER

4

TISSUES, ORGANS, ORGAN SYSTEM, ORGANISM

SYLLABUS

- *Tissue; Structure and functions of animal and plant tissue (Four types of tissue in animals; Meristematic and Permanent tissue in plants).*



TOPIC-1

Tissue; Structure and functions of Plant Tissues

QUICK REVIEW

- Tissues ensure division of labour in multi-cellular organisms.
- The tissues present in plants and animals are different owing to variations in their body organization and mode of living.
- Plants show two main types of tissues – meristematic tissues and permanent tissues.
- Meristematic tissues may be apical, lateral or intercalary, depending on their location in the plant.
- Permanent tissues are classified into simple and complex tissues. Simple tissue shows only one type of cells whereas complex tissues consist of more than one type of cells, functioning as a unit.
- Three types of simple permanent tissues are parenchyma, collenchyma and sclerenchyma.
- Parenchyma is a supporting and storing tissue, composed of unspecialized, thin-walled cells with large intercellular spaces.
- Collenchyma cells are elongated, with irregularly thickened cell walls. It provides mechanical support and elasticity to the plant.
- The main supporting tissue, sclerenchyma, consists of long and narrow cells with thick, lignified cell walls.
- Parenchyma and collenchyma are living tissues whereas sclerenchyma is a dead tissue.
- Epidermis is the outer protective covering of the plant and is usually layered by cuticle.
- Stomatal pores, present in the epidermis, are essential for transpiration and gaseous exchange.
- In older plants, many layered cork is seen, made up of dead and compactly arranged cells.
- Xylem and phloem are important types of complex tissues in plants.
- Xylem is composed of tracheids, vessels, xylem parenchyma and xylem fibres. It conducts water and minerals from roots to aerial parts of the plant.
- Phloem consists of sieve tubes, companion cells, phloem fibres and phloem parenchyma. It transports food from leaves and storage organs to all other parts of the plant.

TOPIC - I

Tissue; Structure and functions of Plant Tissues P. 65

TOPIC - II

Structure and functions of Animal Tissues P. 71

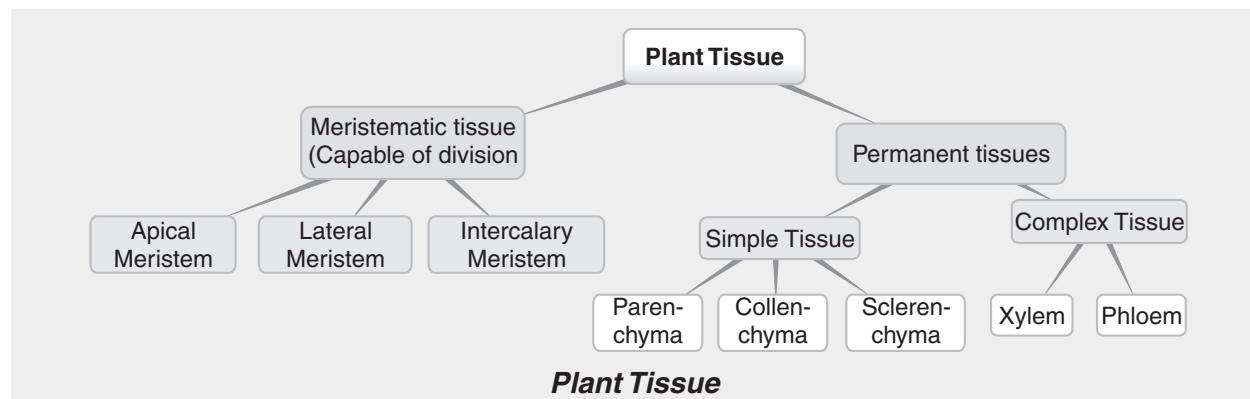


KNOW THE TERMS

- **Tissues** : A group of specialized cells with similar structure, working together to perform a common function.

- **Meristematic tissue :** Tissue made up of actively dividing cells, present in the growing areas of the plant body.
- **Apical meristem :** Meristem present at the growing tips of stem and root that cause the stem and root to increase in length.
- **Lateral meristem :** Meristem located on the lateral portion of the plant and responsible for increasing the girth of its stem and root.
- **Intercalary meristem :** Meristem found between already differentiated tissues, in locations such as the base of leaves or internode.
- **Permanent tissue :** A well-differentiated plant tissue derived from meristematic tissue, which has lost its ability to divide.
- **Differentiation :** The process by which a cell attains a permanent shape, size and function.
- **Simple permanent tissue :** A permanent tissue composed of only one cell type.
- **Complex permanent tissue :** A permanent tissue composed of more than one type of cells which coordinates to perform a common function.
- **Chlorenchyma :** Parenchyma whose cells contain chloroplasts and hence performs photosynthesis.
- **Aerenchyma :** Parenchyma containing large air cavities, providing buoyancy to aquatic plants and allowing the circulation of gases.
- **Xylem :** The complex tissue that conducts water and minerals in vascular plants and composed of tracheids, vessels, fibres, and parenchyma.
- **Phloem :** The food-conducting tissue of vascular plants, consisting of sieve tubes, companion cells, fibres and parenchyma.
- **Epidermis :** The outermost, protective layer of cells covering the surface of a plant.

FLOWCHART



Very Short Answer Type Questions

1 Mark each

Q. 1. Name the tissue which is responsible for increase in length of stem and root.

(Board 2014, Set-MNM9GZH)

Ans. Apical meristem. (CBSE Marking Scheme, 2014) 1

Q. 2. Name the four elements of phloem. (DDE-2014)

Ans. Sieve tubes, companion cells, phloem parenchyma and phloem fibres. 1

Q. 3. What are the types of complex permanent tissues ?

(Boart Term 1 Set AGRO 94, 2013)

Ans. Xylem and phloem. ½ + ½

Q. 4. Name the two types of plant tissues.

Ans. Meristematic tissue and permanent tissue. 1

Q. 5. What is meristematic tissue ?

Ans. Meristematic tissue is capable of dividing and is found in the developing regions of the plant. 1

Q. 6. How many types of meristematic tissues are there on the basis of their presence ?

Ans. Three namely—apical, lateral (cambium) and intercalary. 1

Q. 7. What do you understand by differentiation ?

Ans. When meristematic tissues lose their ability to divide and become permanent in shape, size and function, the process is called differentiation. 1

Q. 8. How is permanent tissue formed from meristematic tissue ?

Ans. When the cells take up a specific role and lose their ability to divide. 1

Q. 9. What is source of cork ?

Ans. Cork is obtained from the bark of a tree i.e., oak plant's stem. 1

Q. 10. What are stomata ?

Ans. Stomata are the small pores present in the epidermis of leaf. 1

Q. 11. What do you mean by guard cells ?

Ans. Stomata are enclosed by two kidney-shaped cells which are called guard cells. 1

Q. 12. Name the complex plant tissues.

Ans. Xylem and phloem. 1

Q. 13. What are vascular bundles ?

Ans. Vascular bundles consist of xylem and phloem. 1

Q. 14. What is the function of cutin, the waxy substance present in epidermis of desert plants ?

Ans. Cutin checks loss of water in desert plants. 1

Q. 15. Water Hyacinth floats on water surface. Explain.

Ans. Water Hyacinth has spongy petioles which enclose a lot of air in its aerenchyma. Air makes the plant

lighter than water and so it is able to float on the surface of water. 1

Q. 16. Why is cork impervious to gases and water ? (HOTS)

Ans. Cork is impervious due to a chemical called suberin. 1

Short Answer Type Questions-I

Q. 1. Explain the process of formation of cork.

Ans. Strip of secondary meristem replaces the epidermis of the stem. Cells on the outside are cut off from this layer which forms the cork.

(CBSE Marking Scheme, 2015) 2

Q. 2. (a) What is a tissue ? Justify that blood is a tissue.

(b) Identify the meristematic tissues which are located at :

- (i) growing tips of roots and stems.
- (ii) the base of the leaves or internodes on twigs. (Board Term I 2013, OAHJD6N)

Ans. (a) A group of cells that are similar in structure and work together to achieve a particular function is called a tissue. Blood is a cluster of similar cells and they perform same function in the body, hence blood is a tissue. $\frac{1}{2} + \frac{1}{2}$

(b) (i) Apical meristem, (ii) Intercalary meristem.

(CBSE Marking Scheme, 2013) $\frac{1}{2} + \frac{1}{2}$

Q. 3. What is apical meristem ? What is its function ?

(Board Term I 2013, AGRO 94)

Ans. Apical meristems are the meristematic tissues which are found at the growing tips of stems and roots.

It increases the length of the stems and roots and is responsible for the growth of plant. $1 + 1$

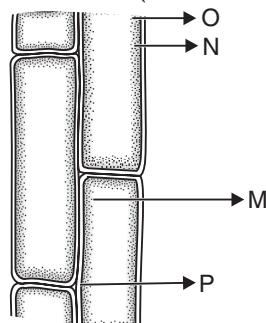
(CBSE Marking Scheme, 2013)

Q. 4. Why is epidermis present as a thick waxy coating of cutin in desert plants ? (Board Term I 2012, Set-021)

Ans. The main adaptation of desert plants is to minimise the water loss. Hence, layer of cutin is present on epidermis, which is a thick waxy coating. This waxy coating helps in minimising water loss by transpiration. (CBSE Marking Scheme, 2012) 2

Q. 5. Given diagram is showing a longitudinal section of collenchyma tissue. Label the parts 'M', 'N', 'O' and 'P' in the given diagram.

(Board Term I, 2012 Set-021)



Ans. M – Chloroplast, N – Nucleus, O – Cytoplasm, P – Intercellular space. $\frac{1}{2} \times 4$

(CBSE Marking Scheme, 2012)

2 Marks each

Q. 6. The epidermis in desert plants is covered by a waxy coating. Name the substance which constitutes the coating. State three advantages of this coating.

(Board Term I, 2012 Set-031)

Ans. Cutin.

Advantages : Waterproof quality and protection against loss of water, mechanical injury, invasion by parasitic fungi. (any three) $\frac{1}{2} \times 4$

Q. 7. Write the location and function of collenchyma tissue. (Board Term I, 2012 Set-033)

Ans. Collenchyma is located in leaf stalks below the epidermis.

It provides flexibility in plants and easy bending and mechanical support. $1 + 1$

Q. 8. Write any two characteristic features of parenchyma tissue. (Board Term I, 2012 Set-034; 41)

Ans. It consists of relatively unspecialized cells with thin cell walls. They are usually loosely packed so that large spaces are present between the cells.

(any two) $1 + 1$

(CBSE Marking Scheme, 2012)

Q. 9. List two characteristics of cork. Name the chemical present in them and mention its role.

(Board Term I, 2012 Set-035; 65)

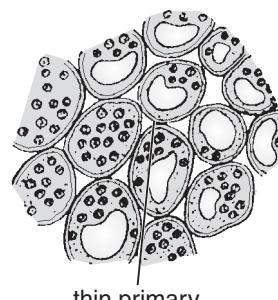
Ans. Cells of cork are dead and compactly arranged without intercellular spaces. They also have a chemical called suberin in their walls which make them impervious to gases and water. $1 + 1$

(CBSE Marking Scheme, 2012)

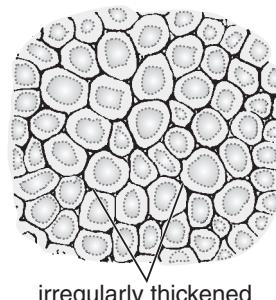
Q. 10. With the help of labelled diagrams differentiate parenchyma and collenchyma.

(Board Term I, 2012 Set-040)

Ans.



Parenchyma



Collenchyma $1 + 1$

Q. 11. List any two characteristic features of parenchyma tissue. (Board Term I, 2012 Set-041)

Ans. Characteristic features of parenchyma tissue :

- (1) Have isodiametric cells.
- (2) The cells are arranged in such a way that they possess intercellular space.
- (3) They have thin cell walls.

(any 2 features) 1 + 1

(CBSE Marking Scheme, 2012)

Q. 12. Name the living component common to both the complex permanent tissues found in plants. What is its function ? (Board Term I, 2012 Set-046)

Ans. Living component common to xylem and phloem tissues is parenchyma.

Its function is to store food and help in sideways conduction of water in xylem and food in phloem.

(CBSE Marking Scheme, 2012) 2

Q. 13. Name the tissue that makes husk of coconut. Write three characteristics of this tissue.

(Board Term I, 2012 Set-052)

Ans. Sclerenchymatous tissue.

The cells are dead with long and narrow walls thickened due to lignin.

1 + 1

(CBSE Marking Scheme, 2012)

Q. 14. List two points of differences between Parenchyma and Sclerenchyma. (Board Term I, 2012 Set-058)

Ans. **Parenchyma tissue :** In this, cells are found with thin cell walls and are usually loosely packed so that large intercellular spaces are found.

Sclerenchyma : Cells are dead and cell wall is thickened due to lignin. It provides strength to plants.

1 + 1

(CBSE Marking Scheme, 2012)

Q. 15. Name the simple permanent tissue which :

- (i) forms the basic packing tissue.
- (ii) provides flexibility in plants.

(Board Term I, 2012 Set-060)

Ans. (i) Parenchyma, (ii) Collenchyma. 1 + 1
(CBSE Marking Scheme, 2012)

Q. 16. Mention four characteristic features of the cells of meristematic tissue. (Board Term I, 2012 Set-061)

Ans. Cells of this tissue are :

- (i) very active.
- (ii) have dense cytoplasm.
- (iii) have thin cellulose walls and prominent nuclei.
- (iv) lack vacuoles.

½ × 4

(CBSE Marking Scheme, 2012)

Q. 17. What is apical meristem ? Where is it located ?

State its functions. (Board Term I, 2012 Set-067)

Ans. Apical meristem is a kind of meristematic tissue which is present at the growing tips of stems and roots. It increases the length of the stem and the root. These cells are responsible for linear growth of an organ. Example : Root apical meristem and Shoot apical meristem. 1 + ½ + ½

(CBSE Marking Scheme, 2012)

Q. 18. Write two points of difference between collenchyma and sclerenchyma tissues.

(Board Term I, 2012 Set-071)

Ans.

S. No.	Collenchyma	Sclerenchyma
1.	Consists of living cells.	Consists of dead cells.
2.	Contains cytoplasm.	Cytoplasm is absent.
3.	The thickening of the cell wall is not uniform.	Cell wall thickening is uniform.

(any two) 1 + 1

Q. 19. "Water hyacinth plant floats on water surface". Name the tissue and its type due to which it is possible and also explain the special feature of this tissue that helps in this.

(Board Term I, 2012 Set-073)

Ans. AerENCHYMA is a simple permanent tissue in aquatic plants. Large air cavities are present to give buoyancy to the plants to help them float.

½ + ½ + 1

(CBSE Marking Scheme, 2012)

Q. 20. Name the following tissues :

- (a) The connective tissue found between the skin and muscles.
- (b) The tissue which connects two bones.
- (c) The epithelial tissue which forms the lining of the kidney tubules.
- (d) The tissue which is present in the veins of leaves.

(Board Term I, 2012 Set-075)

Ans. (a) Aerolar, (b) Ligament, (c) Cuboidal epithelium, (d) Sclerenchyma. ½ × 4

(CBSE Marking Scheme, 2012)

Q. 21. Growth in plant is restricted to certain regions. Give reason for this fact. Mention two growth regions in plants. (Board Term I, 2012 Set-074)

Ans. The growth of plants occurs only in certain specific regions. This is because the dividing tissues, also known as meristematic tissues, are located only at these points.

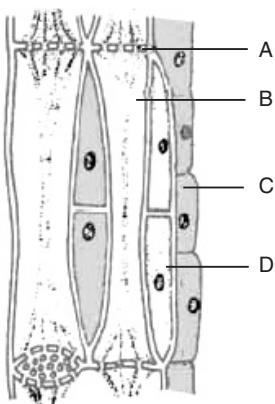
Root tip, Shoot tip, Cambium, base of the leaves (either side of node) (any two) ½ × 4

(CBSE Marking Scheme, 2012)

Short Answer Type Questions-II

3 Marks each

Q. 1. (a) Name the tissue in the following figure :



(b) Identify the parts 'A', 'B', 'C' and 'D'.
(Board 2015, Set-K3GUQKW)

Ans. (a) Phloem.

(b) 'A'-Sieve plate, 'B'-Sieve tube, 'C'-Phloem parenchyma, 'D'-Companion cell. 1 + 2

Q. 2. (a) Differentiate between epidermal and cork cells.

(b) Why are they called protective tissues ?
(Board 2014, Set-LFS3I7K)

Ans. (a)

Epidermal Cells	Cork cells
Single layered	Multi layered
Living	Non-living
Secrete cutin	Secrete suberin
Present in younger plants.	Present in older plants.

(b) They are called protective tissues because
 (i) they protect mechanical injury and infection.
 (ii) they prevent loss of water.

(CBSE Marking Scheme, 2014) 2 + 1

Q. 3. List two characteristics of cork. How is it formed ? Mention its role in trees.

(Board 2014, Set-MNM9GZH)

Ans. (i) Non-living
 (ii) Compactly arranged
 (iii) No intercellular spaces
 (iv) Multilayered
 (v) Contains suberin (any two)
 A strip of secondary meristem replaces the epidermis. Cells on the outside are cut forming cork.
 Protection, makes the plant impervious to gases prevents loss of water, prevents mechanical injury or infection. (CBSE Marking Scheme, 2014) 2 + 1

Q. 4. Write three distinguishing features between cells of meristematic and permanent plant tissues.

(Board 2014, Set SO1QHXJ),
(Board Term I, 2012 Set-021)

Ans.

S.No.	Meristematic tissue	Permanent tissue
1.	Cells possess dividing ability.	Cells generally do not divide.
2.	Cells are living.	Cells can be living or dead.
3.	Main function is to bring about growth.	Performs various type of functions.

1 × 3

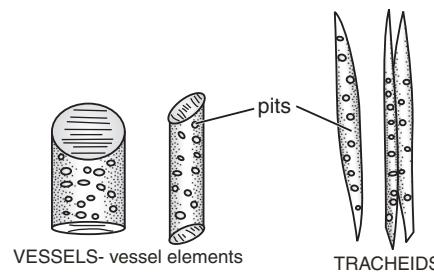
Q. 5. (a) State one point of difference between xylem and phloem.

(b) Draw a neat diagram of xylem vessel and a tracheid.

(Board Term I, 2012 Set-016) (DDE 2014)

Ans. (a) Xylem conducts water in the plant body.
 Phloem transports food in the plant body.

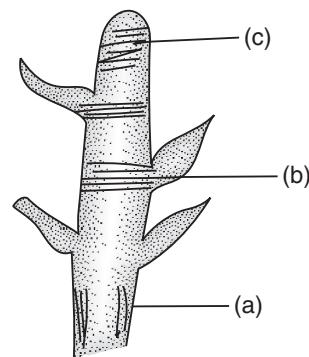
COMPONENTS OF XYLEM



1 + 1 + 1

Q. 6. Label the following and give one function of each part labelled (a), (b) and (c).

(Board Term I, 2012 Set-015)



Ans. (a) **Lateral meristem** : for increase in growth of plant parts.

(b) **Intercalary meristem** : for formation of leaves, branches etc.

(c) **Apical meristem** : increases length of the stem and the root. 1½ + 1½

(CBSE Marking Scheme, 2012)

Q. 7. Mention three characteristic features and three functions of xylem. (Board Term I, 2012 Set-031)

Ans. Consists of tracheids, vessels, parenchyma and xylem fibres.

- (i) Transport of water and minerals vertically.
 - (ii) Parenchyma stores food.
 - (iii) Fibres provide support. $1\frac{1}{2} + 1\frac{1}{2}$
- (CBSE Marking Scheme, 2012)

Q. 8. Explain in brief any three roles of epidermis in plants. (Board Term I, 2012 Set-035)

- Ans.** (i) The epidermis protects all parts of the plants.
(ii) Epidermal cells on the aerial part of the plant often secrete a waxy, water resistant layer which helps in protection against water loss and mechanical injury.
(iii) Protect against invasion of parasitic fungi.
- (CBSE Marking Scheme, 2012) 1×3

Q. 9. Explain how the bark of a tree is formed. How does it act as a protective tissue ?

(Board Term I, 2012 Set-060)

- Ans.** As plants grow older, the outer protective tissue undergoes certain changes. A strip of secondary meristem replaces the epidermis of stem. Cells on the outside are cut off from this layer. This forms the several layered thick cork or bark.
They also have a chemical called suberin in their wall which makes them impervious to gases and water. (CBSE Marking Scheme, 2012) $2 + 1$

Q. 10. What are the small pores observed in the epidermis of the leaf called ? Write its two main functions.

(Board Term I, 2012 Set-058)

- Ans.** Small pores are called stomata.
Function : Exchange of gases and transpiration.
- (CBSE Marking Scheme, 2012) $1 + 1 + 1$

Q. 11. Give reasons for the following :

- (a) Bark of a tree is impervious to gases and water.
- (b) In desert plants, epidermis has a thick waxy coating.
- (c) Epidermal cells of the roots generally have hair like parts. (Board Term I, 2012 Set-062)

- Ans.** (a) Cells of bark are dead and compactly arranged without intercellular spaces. They have a chemical called suberin in their walls that make them impervious to gases and water.
(b) The thick waxy coating on epidermis is of cutin on its outer surface which is a chemical substance with water-proof quality. This helps in protection against loss of water and parasitic fungi.
(c) Function of epidermal cells in roots is water absorption. Hair like parts greatly increase the total absorptive surface area. $1 + 1 + 1$
- (CBSE Marking Scheme, 2012)

Q. 12. Identify the simple permanent plant tissue with the following descriptions and also mention their location in the plant body :

- (a) Cells have irregular wall thickenings.
 - (b) Tissues with large intercellular spaces and cells having large air cavity.
 - (c) Cells are long, narrow and dead in nature.
- (Board Term I, 2012 Set-020)

- Ans.** (a) Collenchyma,
(b) Aerenchyma,
(c) Sclerenchyma.

Location : Collenchyma : leaf stalks below the epidermis.

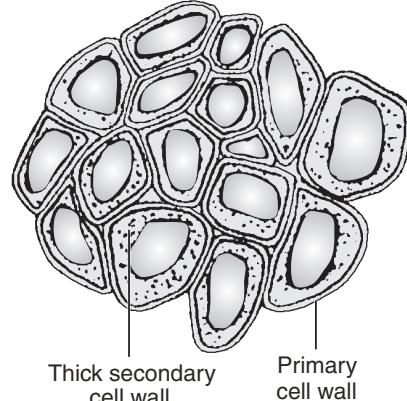
Aerenchyma : stem and leaves of aquatic plants.

Sclerenchyma : hard part of the plant (seed coat, mid rib etc.) (CBSE Marking Scheme, 2012) $\frac{1}{2} + \frac{1}{2}$

Q. 13. (i) Draw a labelled diagram of longitudinal section of sclerenchyma.

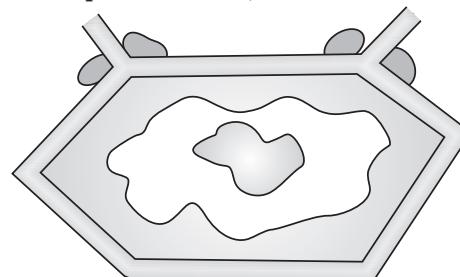
(ii) Name any two regions in the plant, where this tissue is present. (Board Term I, 2012 Set-046)

- Ans.** (i)



- (ii) Two regions :** Stems/Around vascular bundles/Veins of leaves/Hard covering of seeds and nuts. (any two) $1 + 2$

Q. 14. (a) Observe and identify the following plant cell.
(b) Explain two characteristic features of this cell.
(c) Suggest one part of the plant where such cells are present. (Board Term I, 2012 Set-056)



- Ans.** (a) Collenchyma,
(b) Flexibility and mechanical support,
(c) Leaf stalks, below epidermis. $1 + 1 + 1$
- (CBSE Marking Scheme, 2012)

Q. 15. Give reasons for the following :

- (a) Cells of sclerenchyma tissue have a narrow lumen.
 - (b) Branches of a tree move and bend freely in high wind velocity.
 - (c) It is difficult to pull out the husk of coconut.
- (Board Term I, 2012 Set-073)

- Ans.** (a) Sclerenchyma tissues have cell wall thickened due to lignin and hence have narrow lumen.
(b) Branches of a tree have collenchymas which provide flexibility.
(c) Husk of coconut is composed of sclerenchyma and these fibres are closely packed.

(CBSE Marking Scheme, 2012) 1×3

Long Answer Type Questions

5 Marks each

- Q. 1.** (a) Analyse the reason behind the following statements :
- Epidermis is thicker in desert plants though it is usually single layered.
 - Presence of waxy layer (secreted by epidermis) on the outer surface of plants.
- (b) Discuss the cell arrangement which supports the fact that epidermis is a protective tissue.

(Board Term I 2013, 7ZTHA8G)

- Ans.** (a) (i) In desert habitat, protection against water loss is essential.
- The waxy covering aids in protecting the plant against loss of water, mechanical injury and invasion by parasitic fungi.
- (b) Epidermis is the outermost covering of cells in plants. It is usually made up of a single layer of cells. On aerial parts of a plant epidermal cells often secrete a waxy, water resistant layer on their outer surface to prevent loss of water from plant. The cells of epidermis are present in a continuous layer without intercellular spaces. Small pores are present on the epidermis of leaf. These pores are called as stomata, which help in gaseous exchange and transpiration. As the plant grows older, a strip of secondary meristem replaces the epidermis of stem and forms a thick cork.

2 + 3

OR

- Ans.** (a) (i) In such habitat, protection against water loss is essential.
- Protecting against water loss, mechanical injury.
- (b) Cells are elongated, flattened, closely packed. No intercellular spaces and form a continuous layer.

(CBSE Marking Scheme, 2013) 5

- Q. 2.** The growth of plant occurs only in specific regions:
- Name the tissue which is responsible for this growth.
 - State the different types of this tissue.
 - Write one function of each of the above mentioned tissue.

(Board Term I 2013, OAHJD6N)

- Ans.** (i) Meristematic tissue.
- Apical meristem, lateral meristem, intercalary meristem.
 - Apical meristem increases the height of the plant.
 - Intercalary meristem increases the length of organs.
 - Lateral meristem increases the girth of stem.

(CBSE Marking Scheme, 2013) 1 + 1 + 3

- Q. 3.** (i) "Epidermal cells are protective in nature". Justify and support your answer with two examples.
- (ii) Name the structure that receives impulse in neuron.

- Ans.** (i) Epidermis plays a protective role. It protects all the external parts of a plant against loss of water.
- In some desert plants, the epidermis has a thick waxy coating of cutin that prevents water loss from the plants.
 - Epidermal cells on the aerial parts of the plant secrete a waxy, water resistant layer, on the outer surface that helps in protection against loss of water and mechanical injury.
- (ii) Dendrite receives impulses in neuron.

2 + 2 + 1



TOPIC-2 Structure and functions of Animal Tissues

QUICK REVIEW

- Animal tissues are grouped into 4 basic types – epithelial, connective, muscular and nervous tissue.
- Epithelial tissues are the covering or protective tissues which act as a barrier between the various systems of the body. It rests on a basement membrane and is composed of tightly packed cells.
- Connective tissue is the binding and supporting tissue of the animal body. Matrix forms the main bulk of this tissue, whereas the cells are loosely spaced and less in number.
- Blood, bone, ligament, tendon, cartilage, areolar tissue and adipose tissue are important connective tissues present in our body.
- Blood is a fluid connective tissue in which RBCs, WBCs and platelets are suspended and plays a significant role in the process of transportation.
- Functions of protection, providing skeletal framework and anchoring are carried out by the strong and hard bone tissue.
- Ligaments connect bones to bones whereas tendons connect bones to muscles.

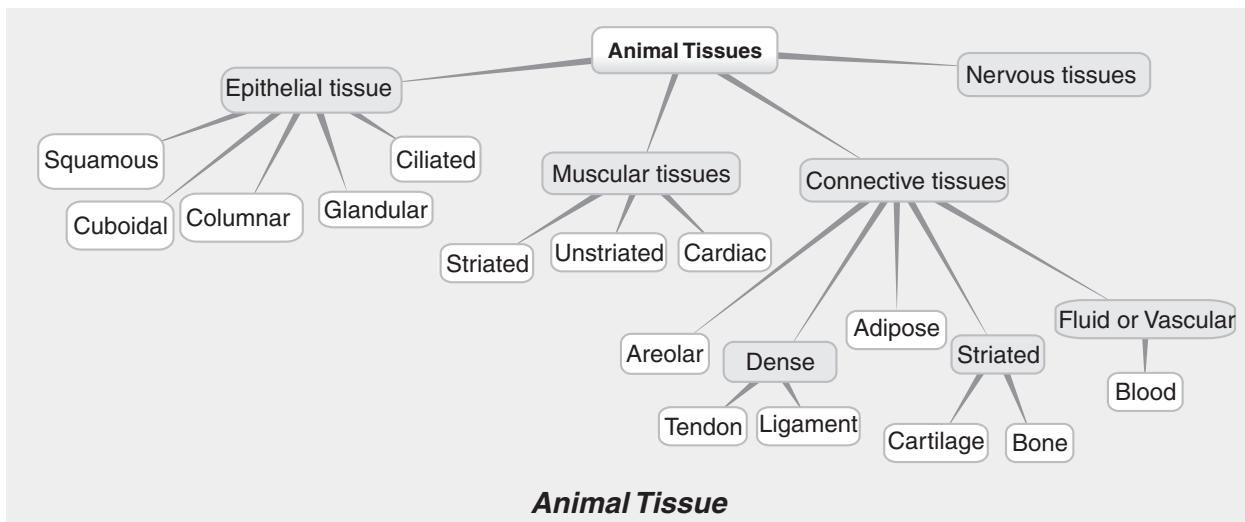
- Cartilage provides support and flexibility to the body parts.
- Areolar tissue repairs the injured tissues and fills spaces within organs. These are found between the skin and muscles, around blood vessels and nerves and in bone marrow.
- Adipose tissue serves as a fat reservoir and also carries out the function of insulation. It is found below the skin and between internal organs.
- All movements in our body are brought about by the muscular tissue through the contraction and relaxation of their contractile proteins.
- Striated, unstriated and cardiac are three types of muscle tissues.
- Nervous tissue is present in the brain, spinal cord and nerves.
- Neuron is made up of cell body, dendrites and axon.
- Neurons are specialized to receive and conduct impulses rapidly.



KNOW THE TERMS

- **Stratified epithelium :** An epithelium composed of multiple layers of cells, with only the basal layer being in contact with the basement membrane.
- **Ligament :** A fibrous connective tissue that connects (or binds) bones to bones.
- **Tendon :** A fibrous connective tissue that connects bones to muscles.
- **Voluntary muscles :** Muscles which can be controlled according to our will.
- **Involuntary muscles :** Muscles which are not under the control of the will.
- **Multinucleate cell :** Cell containing more than one nucleus.
- **Uninucleate cell :** Cell containing only one nucleus.
- **Neuron :** A cell of the nervous system specialized to conduct nerve impulses and made up of cell body, axon and dendrites.
- **Impulse :** An electrical signal transmitted along a nerve fibre in response to a stimulus.

FLOWCHART



Very Short Answer Type Questions

1 Mark each

Q. 1. Name the following tissues :

- that forms the inner lining of our mouth.
- present in the brain.

(Board 2015, Set-K34UQKW)

Ans. (i) Epithelial tissue-squamous epithelium
(ii) Nervous tissue

½ + ½

Q. 2. Name the following tissues :

(i) Found in the iris of the eye.

(ii) That connects two bones.

(Board 2014, Set-LFS3I7K)

Ans. (i) Involuntary muscles, (ii) Ligament

(CBSE Marking Scheme, 2014) ½ + ½

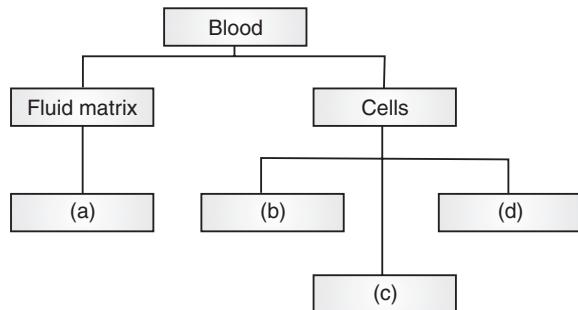
- Q. 3. State two functions of the adipose tissues.**
(DDE 2014) (Board Term 1 Set [7ZTHA8G], 2013)
- Ans.** (i) It helps in storage of fats. ½
(ii) It acts as an insulator. ½
- Q. 4. How are simple epithelial tissue and compound epithelial tissue different?**
- Ans.** Simple epithelial tissue is unilaminar while compound epithelial tissue is multilaminar. 1
- Q. 5. Which epithelial tissue is present on the tongue?**
- Ans.** Stratified squamous epithelium. 1
- Q. 6. Which tissue contains flat squamous cells arranged in many layers to prevent wear and tear of parts?**
- Ans.** Stratified squamous epithelium. 1

- Q. 7. Name an animal whose skeleton is made up of cartilage.** 1
- Ans.** Shark fish.
- Q. 8. What is the function of RBCs?**
- Ans.** Transportation of oxygen and carbon dioxide and pH constancy. 1
- Q. 9. What is the life span of human RBCs?**
- Ans.** About 120 days. 1
- Q. 10. What is the function of lymph?**
- Ans.** It helps in the exchange of materials between blood and body cells. 1
- Q. 11. A selectively permeable surface is composed of what type of tissue in animals? (HOTS)**
- Ans.** Simple squamous epithelium. 1

Short Answer Type Questions-I

2 Marks each

- Q. 1. Mention the different components of blood in the following diagram?**



(Board 2015, Set-LOV7LN7, K34UQKW)

- Ans.** (a) Plasma, (b) WBC, (c) Platelets, (d) RBC. ½ × 4
- Q. 2. Why are plants and animals made up of different tissues?** (Board 2014, Set-MNM9GZH)

Ans. Plants are stationary thus their supportive tissue is made up of dead cells.

Animals move, hence they possess living cells to provide energy for movement. Also, for the many more differences and functions in plants and animals, they are made up of different tissues.

(CBSE Marking Scheme, 2014) 2

- Q. 3. State the role of ligament and tendons in our skeletal system.** (Board Term I, 2012 Set-016; 028)

Ans. (a) Tendons : Connect bones to muscles.
(b) Ligaments : Connect two bones. 1 + 1

- Q. 4. A horse and a mango tree are both complex living organisms with specialised yet different tissue systems to perform the basic life processes. Give two reasons for possessing different tissues to perform similar functions.**

(Board Term I, 2012 Set-019)

Ans. Horse is an animal whereas mango tree is a plant. Plants and animals have different types of tissues because :

— Plants do not show locomotion while most of the animals move from one place to another.

— They have different patterns of growth : plant's growth is limited to certain regions while animal's growth is more or less uniform. 1 + 1

(CBSE Marking Scheme, 2012)

- Q. 5. (a) Voluntary muscles are also known as skeletal muscles. Justify.
(b) Give two structural characteristics of these voluntary muscles.** (Board Term I, 2012 Set-020)

Ans. (a) Attached to limb bones and helps in their movement.
(b) (i) Presence of light and dark bands.
(ii) Multinucleated.
(iii) Cylindrical and unbranched. (any two)

(CBSE Marking Scheme, 2012) 1 + 1

- Q. 6. List any two functions of epithelial tissue in human body.** (Board Term I, 2012 Set-042)

Ans. Functions of epithelial tissue in human body :
(i) Covering of the organs.
(ii) Regulates exchange of materials between the body and the external environment.
(iii) Glands present in them help in various secretions. e.g., sweat, oil etc. (any two) 1 + 1

(CBSE Marking Scheme, 2012)

- Q. 7. Name the tissue that : (a) connects muscle to bone in humans, (b) forms inner lining of alveoli (c) stores fat in our body (d) transports water and minerals in plants.** (Board Term I, 2012 Set-069)

Ans. (a) Tendon, (b) Squamous epithelium, (c) Adipose tissue, (d) Xylem. ½ × 4

(CBSE Marking Scheme, 2012)

- Q. 8. List four functions of blood.** (Board Term I, 2012 Set-048)

Ans. (i) It carries O₂ and CO₂ to various parts of the body and lungs.
(ii) It transports food to various body parts.
(iii) It transports hormones as well as metabolic wastes.
(iv) It has a major role to play in the regulation of body temperature. ½ × 4

(CBSE Marking Scheme, 2012)

Q. 9. Write two locations of the following animal tissues:

- Simple Squamous Epithelial cells.
- Cuboidal Epithelium.

(Board Term I, 2012 Set-051)

Ans. (i) Oesophagus, lining of mouth.

- Lining of kidney tubules, ducts of salivary glands.

1 + 1

Q. 10. (a) Name the connective tissue which connects two bones.

- (b) Name the connective tissue present in external ear.

(Board Term I, 2012 Set-054)

Ans. (a) Ligament (b) Cartilage.

1 + 1

(CBSE Marking Scheme, 2012)

Q. 11. Mention one region in the human body where adipose tissue is present and state one function of the tissue.

(Board Term I, 2012 Set-056)

Ans. It is found below the skin. It acts as an insulator.

(CBSE Marking Scheme, 2012) 1 + 1

Q. 12. How does the bone matrix differ from the matrix of cartilage?

(Board Term I, 2012 Set-072)

Ans. Bone matrix : Calcium and phosphorus.

Cartilage matrix : Sugar and proteins. 1 + 1
(CBSE Marking Scheme, 2012)

Q. 13. Name the tissue which helps in transportation of oxygen that we inhale to various parts of our body. Write the composition of this tissue.

(Board Term I, 2012 Set-078)

Ans. Blood.

Composition :

- RBC (red blood corpuscles),
- WBC (white blood corpuscles) and
- Platelets.

½ + 1½

(CBSE Marking Scheme, 2012)

Q. 14. Give two reasons, why is blood considered to be connective tissue ?

(HOTS)

Ans. (i) Like other connective tissues, blood consists of living cells scattered in an abundant matrix. The matrix is liquid or plasma in blood.

(ii) Blood circulates throughout the body, receiving and providing materials to all tissues and organs of the body. It thus connects all parts of the body.

1 + 1

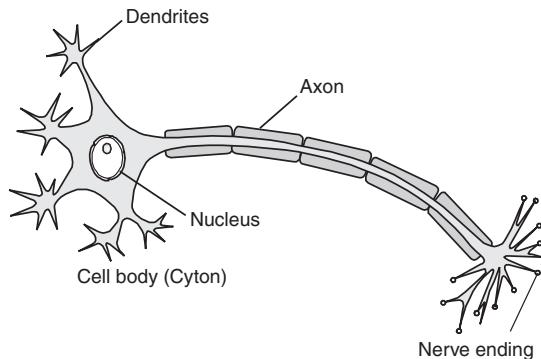
Short Answer Type Questions-II

3 Marks each

Q. 1. Describe the structure, function and location of the nervous tissue.

(Board 2015, Set-LOV7LN7, K34UQKW)

Ans. The nervous tissue is made up neurons which consists of a cell body with a nucleus and cytoplasm, from which long thin hair-like parts arise.



On stimulation, the nerve cells transmit the stimulus very rapidly from one place to another within the body.

Nervous tissues are located in the brain, spinal cord and nerves. 1 + 1 + 1

Q. 2. Identify the type of tissues in the following :

- Vascular bundle
- Inner lining of the intestine
- Lining of kidney tubule
- Iris of the eye

(e) Muscles of the heart

(f) Bronchi of lungs.

(DDE 2014; Board Term I 2013, 7ZTHA8G)

Ans. (a) Xylem and phloem tissues

(b) Columnar epithelium

(c) Cuboidal epithelium

(d) Involuntary muscular tissues

(e) Cardiac muscles

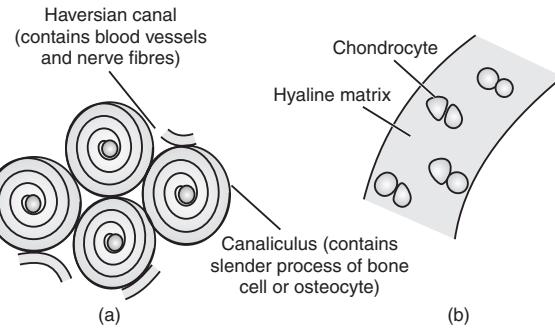
(f) Unstriated muscular tissues

½ × 6

(CBSE Marking Scheme, 2014)

Q. 3. Identify the two types of tissues given in the diagram. Write two distinguishing features each of the two.

(Board 2014, Set-SOIQHXS)



Ans. (a) Bone (Connective tissue)

(b) Cartilage (Connective tissue)

Bone :

- (i) It has a hard matrix.
- (ii) They are usually hollow.

Cartilage :

- (i) This tissue is elastic and harder but softer than bone.
- (ii) The matrix of cartilage is solid but elastic.

1 + 1 + 1

Q. 4. (a) State the differences between tendon and ligament. (Board Term I 2013, OAHJD6N)
 (b) Give the function of adipose tissues.

(Board Term I 2015, 3GS246G) (DDE 2014)

Ans. (a) Differences between tendon and ligament :

	Tendon	Ligament
1.	They join bone to muscles.	They join bone to bone.
2.	They have limited flexibility.	They have elasticity.
3.	They have more strength.	They have less strength.

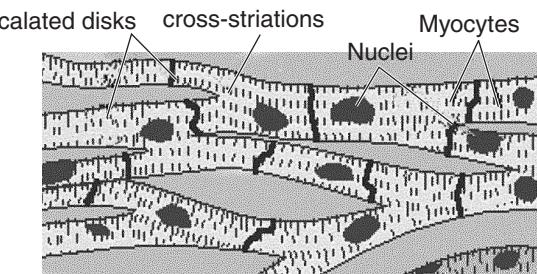
(any two)

- (b) Adipose tissue stores fat and provides insulation.

2 + 1

(CBSE Marking Scheme, 2015, 2014)

Q. 5. Draw a diagram of cardiac muscle and label any two parts. Write one main function of cardiac muscle. (DDE 2014) (Board Term I, 2012 Set-070)

Ans.

(label any two)

Function : Beating of heart.

1 + 1 + 1

Q. 6. (a) Draw a labelled diagram of the basic unit of nervous tissue.

- (b) State the role of epidermis in plants.

(Board Term I 2013, Set-7ZTHA8G)

Ans. (a) For labelled diagram see Q.1. in short Answer type question.

- (b) Epidermal cells of the plants are useful in protection against loss of water, mechanical injury or invasion by parasitic fungi.

2 + 1

Or

Ans. (a) Refer text book ncert diagram page no. 78 (fig. 6.12) Each correct labeling (Cell body, dendrite, axon and nerve ending) Diagram three labelling.

- (b) Epidermal cells of the plants are useful in protection against loss of water; mechanical injury or invasion by parasitic fungi.

(any two)

(CBSE Marking Scheme, 2013) 3

Q. 7. (i) Name the following :

- (a) Tissues that connect muscles to bone.
- (b) Tissues that store fat in our body.
- (c) Tissues that transport food in plants.
- (d) Tissues that provide flexibility in plants.

- (ii) List the role of cork in plants.

(Board Term I 2013, AGRO 94)

Ans. (i) (a) Tendon

- (b) Adipose tissues
- (c) Phloem
- (d) Collenchyma

- (ii) (a) It prevents loss of water by evaporation.

- (b) It protects plant from the invasion of parasites and harmful micro-organisms.

2 + 1

Q. 8. Identify the animal tissues from the given descriptions and also mention their location in the human body.

Tissue 'A' - cells are filled with fat globules and the tissue acts as an insulator.

Tissue 'B' – has cylindrical branched cells and the tissue shows rhythmic contraction and relaxation though outlife. (Board Term I, 2012 Set-021)

Ans. Tissue 'A' : Adipose tissue, Present just below epithelium.

Tissue 'B' : Cardiac muscle, Present in heart.

1½ + 1½

(CBSE Marking Scheme, 2012)

Q. 9. Name any three connective tissues. Give any one function of each. (Board Term I, 2012 Set-042)

Ans. (i) Blood : Transport of materials such as gases, waste, digested food etc.

(ii) Bone : Supporting framework of the body.

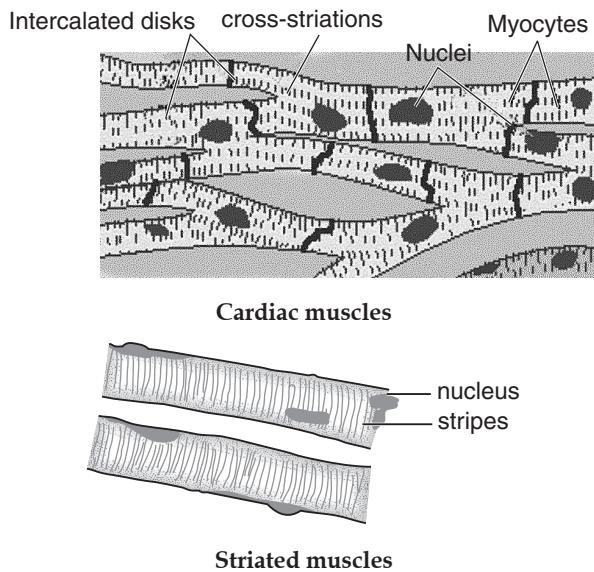
(iii) Ligament : Connects two bones together.

(iv) Tendon : Connects bones to muscle.

(any three) 1 × 3

(CBSE Marking Scheme, 2012)

Q. 10. Make a labelled diagram to highlight two differences between striated and cardiac muscles. Write one function of striated muscles in our body. (Board Term I, 2012 Set-040)

Ans.

Function : Striated muscles help in body movement. 1 + 1 + 1

Q. 11. Identify the type of muscular tissues having following characteristics :

- (i) cylindrical, branched and uninucleated.
- (ii) long with pointed ends and uninucleated.
- (iii) long cylindrical, unbranched and multinucleated. (Board Term I, 2012 Set-064)

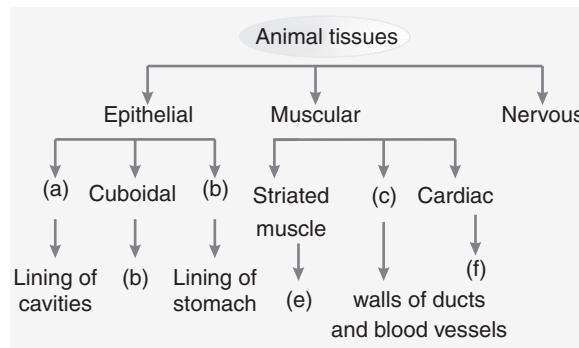
Ans. (i) Cardiac muscles.
(ii) Smooth muscles or unstriated muscles.
(iii) Striated muscles. 1 × 3
(CBSE Marking Scheme, 2012)

Q. 12. Name the type of epithelial tissue that lines the following :

- (i) Oesophagus
 - (ii) Respiratory tract
 - (iii) Kidney tubules
 - (iv) Inner lining of intestine
 - (v) Blood vessels
 - (vi) Ducts of salivary glands
- (Board Term I, 2012 Set-045)

Ans. (i) Squamous epithelium
(ii) Ciliated epithelium
(iii) Cuboidal epithelium
(iv) Columnar epithelium
(v) Squamous epithelium
(vi) Cuboidal epithelium ½ × 6
(CBSE Marking Scheme, 2012)

Q. 13. Complete the following flow chart :
(Board Term I, 2012 Set-041)



- Ans.** (a) Squamous
(b) Columnar
(c) Unstriated
(d) Lining of kidney tubules
(e) Limbs
(f) Heart

½ × 6
(CBSE Marking Scheme, 2012)

Q. 14. What will happen if : (HOTS)

- (i) Apical meristem is damaged or cut ?
- (ii) Cork is not formed in older stems and roots ?
- (iii) Lymph is not returned to blood ?

Ans. (i) If apical meristem is removed or damaged then growth in length of the plant will stop.
(ii) If cork is not formed in older stems and roots, the outer tissues will rupture with the increase in girth and expose the interior to desiccation and infection.
(iii) Blood volume will decrease during passage of materials from tissues to blood and vice versa.

1 + 1 + 1

Q. 15. What will happen if cells are not organised in tissues ? (HOTS)

Ans. Every organism be it unicellular or multicellular needs to perform a lot of functions like respiration, digestion, locomotion etc. Cells that are present in group and specialise in one particular function form tissues. Some tissues help in growth, some in locomotion, some in body movement. So if tissues are not present in bodies of living organism, then these kind of highly organised and specialised processes will become disorganised. There will be no co-ordination in the functioning of cells and body. 3

Q. 16. What will happen if — (HOTS)

- (i) Ligament gets overstretched ?
- (ii) Heparin is absent in blood ?
- (iii) Striated muscles contract rapidly for longer duration ?

Ans. (i) Overstretching of ligament causes sprain.
(ii) Absence of Heparin in blood causes coagulation of blood inside the blood vessels.

- (iii) Striated muscle contraction causes fatigue due to accumulation of lactic acid. 1 + 1 + 1

Q. 17. What is Synapse ? Explain. (HOTS)

Ans. It is a junction between two neurons without developing an organic union. The terminal branch end of an axon comes in near contact with

a dendrite terminal. A narrow fluid filled space occurs between the two. An activated axon end passes out a neurotransmitter like acetylcholine which provides sensation to dendrite terminal. This helps in transfer of impulse from one neuron to the next. 3

Long Answer Type Questions

5 Marks each

Q. 1. Do all cells of our body look like in terms of shape, size and structure? What similarities do they have? Illustrate by drawing diagrams of various cells present in human body.

(Board 2015, Set-LOV7LN7)

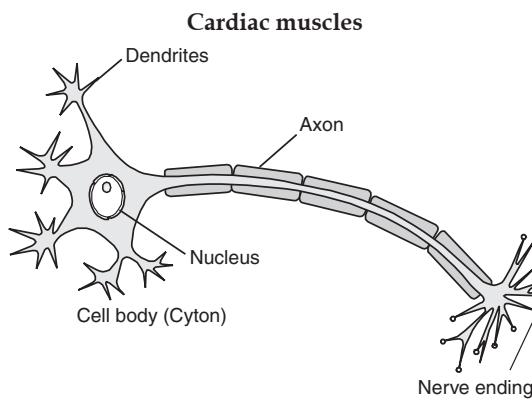
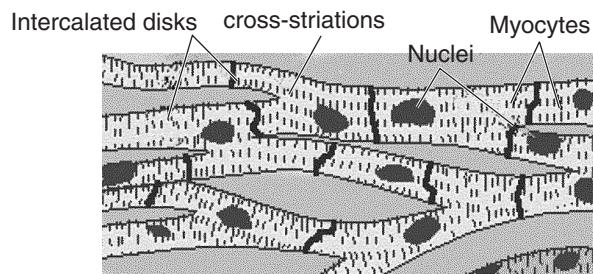
OR

Draw a labelled diagram of neuron. (NCT, 2014)

Ans. All cells of our body look different in terms of shape, size as well as structure as they are needed for different functions at different parts of the body.

Cells in our body have no demarcation on the basis of dividing and non-dividing tissue. Cells Specialised in one function are often grouped together in the body.

Example : Heart muscle cells show rhythmic contraction and relaxation are cylindrical and branched. Also, the nerve cell is a long 'string' shape in order to stretch to connect to other neurons.



Q. 2. Answer the followings :

5

- (a) Name the constituents of phloem tissues.
- (b) Write the specific function of cardiac muscle.
- (c) State two differences between tendon and ligament.
- (d) Name the tissue that :
 - (i) forms of inner lining of our mouth.
 - (ii) forms the soft parts of leaf, stem, roots and fruit.
- (e) Write two function of adipose tissues.

(Board Term I, 2015, 3GS246G)

Ans. (a) Sieve Tubes, companion cells, parenchyma, phloem fibre.

(b) Creates an efficient pumping action of heart.

(c)

Tendon	Ligament
(i) It connects muscles to bones.	It connects bone to bone.
(ii) It is tough and non elastic.	It is strong but elastic.

(Any one)

- (d) (i) Squamous epithelium
- (ii) Scleroid.
- (e) Adipose tissue stores fat and acts as an insulator.

(CBSE Marking Scheme, 2015) 1 × 5

Q. 3. Identify the following tissues :

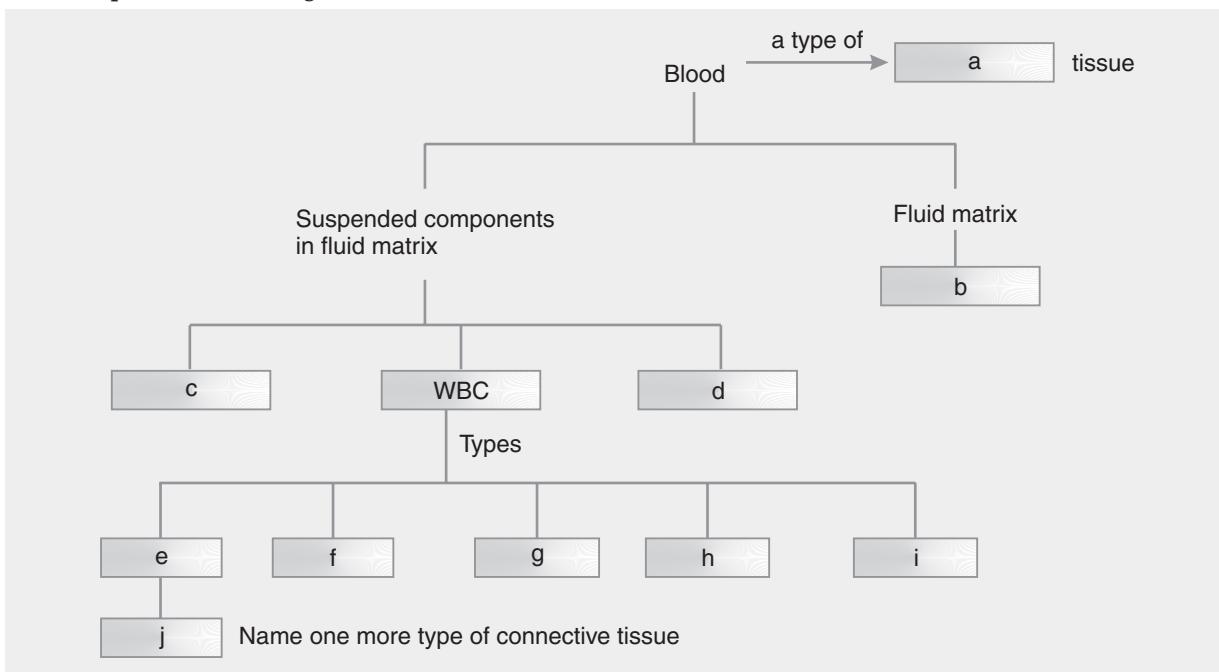
- (i) The epithelial tissue which has pillar like tall cells ?
- (ii) The cells of this tissue are filled with fat globules.
- (iii) The movement of this tissue pushes the mucus forward to clear respiratory tract.
- (iv) It gives buoyancy to lotus to help it afloat.
- (v) Tissue present in lung alveoli.

(Board 2014, Set-LFS3I7K)

Ans. (i) columnar (ii) adipose (iii) ciliated columnar
(iv) aerenchyma (v) squamous.

(CBSE Marking Scheme, 2014) 1 × 5

Q. 4. Complete the following flow chart :



(Board 2014, Set- MNM9GZH)

Ans. (a) Connective, (b) Plasma, (c) RBCs, (d) Platelets, (e) Neutrophil, (f) Eosinophil, (g) Lymphocyte, (i) Monocyte and (j) Bone or ligament or tendon. (CBSE Marking Scheme, 2014) $\frac{1}{2} \times 10$

Q. 5. What are the differences between striated, unstriated and cardiac muscles ? (DDE-2014; NCERT Based)

Ans. Differences between striated, unstriated and cardiac muscles :

S. No.	Striated muscles	Unstriated (Smooth) muscles	Cardiac muscles
1.	They are found in limbs, tongue, pharynx etc.	They are present in the wall of visceral organs.	They form the heart.
2.	Long, cylindrical with blunt ends.	Short, spindle shaped with pointed ends.	Short, branched and cylindrical with flat ends.
3.	Multinucleate, nuclei peripheral.	Uninucleate, nucleus in the centre.	One or two nuclei in the centre.
4.	They are voluntary in action.	They are involuntary in action.	They are involuntary in action.
5.	Dark and light bands are present.	No bands present.	Bands present.

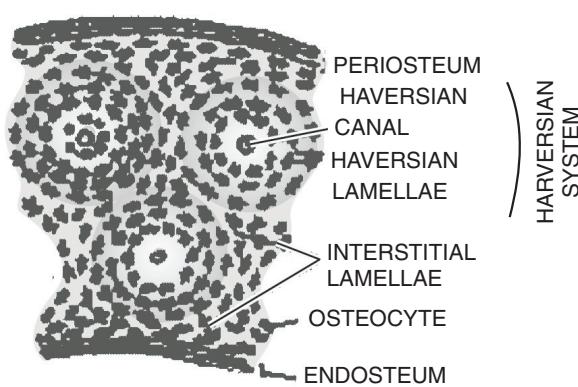
1×5

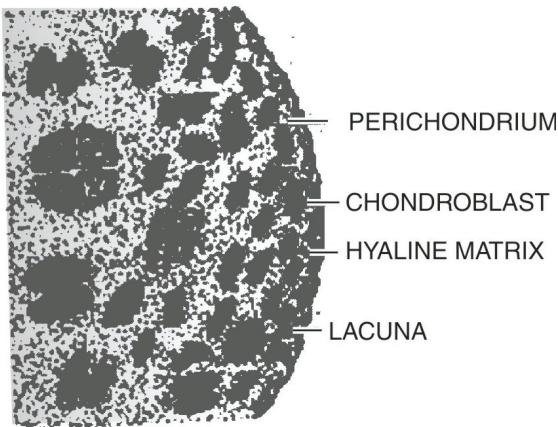
Q. 6. Describe the structure of bone and cartilage.

(DDE 2014; NCERT)

Ans. **Bone :** Bone is a solid, hard porous tissue. It is produced by osteocyte cells. It forms the natural skeleton and gives the body its basic structure and also supports the body. Its matrix is impregnated with phosphates and carbonates of calcium and magnesium which provides hardness to it. The matrix also contains ossein protein. The matrix is arranged in concentric rings which are called lamellae.

Bone cells lie between the lamellae in fluid-filled spaces called lacunae. Bone cells are also called osteocytes.





The bone is surrounded by a connective tissue called periosteum by which muscles and tendons are attached to the bone. A long bone has a hollow cavity filled with bone marrow which is richly supplied with blood vessels.

Cartilage : Cartilage has widely spaced cells. It is a solid but semi-rigid connective tissue. The solid matrix is composed of proteins and sugars. The cartilage cells are large and angular and they are called chondrocytes. They occur in clusters of 2 or 3 cells in the small spaces called lacunae scattered in the matrix. A sheath called perichondrium binds the cartilage.

3 + 2

Q. 7. What are the functions of connective tissue ?
(NCERT Based)

Ans. The functions of connective tissue are as follows :

- It has jelly-like ground substance, which acts as lubricant.
- Bones and cartilage form skeleton and protect the delicate organs of body.
- Adipose tissue, another kind of connective tissue, helps in storage of fats.
- Plasma cells make antibodies.
- Fluid connective tissue (blood and lymph) helps in transport of materials.

1 × 5

Q. 8. Answer each of the following in one word or one sentence :

- What makes the bone matrix hard ?
- Which tissue is responsible for moving our hands up and down ?
- Name the part of phloem that is nucleated.
- Give another term for striated muscles.
- Name the only living cell of xylem.

(NCERT Based)

- Calcium and phosphorus makes the bone matrix hard.
- Muscular tissue helps in the up and down movement of the hands.
- The part of the phloem that is nucleated is companion cells.
- Striated muscles are also called as Skeletal or Voluntary muscles.
- Xylem parenchyma are the only living cells found in xylem.

1 × 5

Q. 9. Give an account of the structure, position and functions of the various types of epithelium tissue.
(NCERT Based)

Ans. The structures, location and functions of the various types of epithelium tissue is shown in the table below :

S. No.	Type	Structure	Position	Function
1.	Squamous epithelium	The cells are flat, discoidal and polygonal and fit like the tiles in a floor.	Cells lining the blood vessels, alveoli of lung. Bowman's capsule of nephron.	Exchange between body cells and blood, Ex-change of gases, Ultra filtration.
2.	Cuboidal epithelium	Cells are cuboidal or isodiametric with centric and rounded nuclei.	Glands, ducts nephrons, gonads etc.	Selective re-absorption of useful materials. Secretion, divide by meiosis and form gametes.
3.	Columnar epithelium	Cells are polygonal and column-like or pillar-like with oval-shaped nuclei.	Fallopian tube, mucosa of small intestine, lining of stomach etc.	Move ovum/zygote. Increased absorption of nutrients.
4.	Ciliated epithelium	Cuboidal, columnar cells bear fine hair like cilia.	Lining of respiratory tract, uriniferous tubules, trachea and fallopian tubes.	Protection, spreading of mucus and flow of materials.
5.	Glandular epithelium	Cuboidal gland cells.	Lining of alimentary canal and digestive glands.	Secretion.

1 × 5

Q. 10. Describe the structure of blood. (NCERT Based)

Ans. Blood is a fluid connective tissue and consists of plasma and blood corpuscles.

Plasma is a fluid matrix. It contains 85-90% water, about 7% proteins, 0.9% salts, 0.1% glucose and very small amounts of hormones. The blood corpuscles are suspended in the plasma.

Blood corpuscles : Blood corpuscles or cells are of three types—RBCs, WBCs and Blood platelets.

- Red Blood Cells (RBCs)** are also called erythrocytes and are bi-concave disc-like structures devoid of nuclei in mammals. A network of protein and fat like compounds is present throughout the cells.

- (a) transverse section of collenchyma
- (b) longitudinal section of collenchyma
- (c) transverse section of sclerenchyma
- (d) longitudinal section of sclerenchyma

Q. 13. While observing a slide of animal tissue under a microscope, Reena observed light and dark bands. The slide can be of : (Board Term I, 2012 Set-021)

- (a) voluntary muscles
- (b) involuntary muscles
- (c) both 'a' and 'b'
- (d) none of these

Q. 14. A student was asked to write the characteristic features of nerve cell after viewing it under the microscope. The correct feature will be :

(Board Term I, 2012 Set-028)

- (a) oval shaped cells with lobed nucleus
- (b) spindle shaped cells with band
- (c) loosely packed cells floating in matrix
- (d) a cell body with branched cytoplasmic extensions at one end and a long projection at the other end.

Q. 15. The most common type of ground tissue is :

(Board Term I, 2012 Set-031)

- (a) collenchyma
- (b) sclerenchyma
- (c) parenchyma
- (d) epidermis

Q. 16. You are given 2 slides – parenchyma and sclerenchyma. Sclerenchyma can be identified by : (Board Term I, 2012 Set-033)

- (a) location of nucleus
- (b) size of cells
- (c) thickness of cell wall
- (d) position of vacuoles

Q. 17. A permanent plant tissue consisting of thin walled living cell is : (Board Term I, 2012 Set-034)

- (a) parenchyma
- (b) collenchyma
- (c) sclerenchyma
- (d) xylem

Q. 18. A girl was observing a slide of muscle under microscope. She identified the muscle as striated on the basis of : (Board Term I, 2012 Set-035)

- (a) cells are long, cylindrical, unbranched and uninucleate
- (b) cells are long, cylindrical, branched and uninucleate
- (c) cells are long, cylindrical, unbranched and multinucleated
- (d) cells are long with pointed ends and uninucleate

Q. 19. A student observed the slide of a nerve cell and labelled the branches around the cell body as :

(Board Term I, 2012 Set-040)

- (a) cyton
- (b) dendrite
- (c) axon
- (d) nerve ending

Q. 20. Meena observed a slide of transverse section of parenchyma tissue, she identified it on the basis of : (Board Term I, 2012 Set-041)

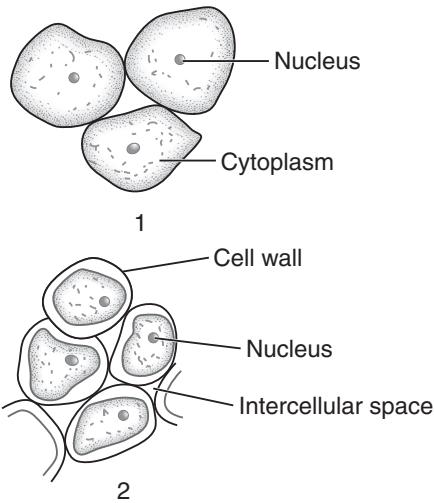
- (a) thickening of cell wall due to deposition of lignin
- (b) dead cells

- (c) living cells with thin cell walls and intercellular spaces
- (d) absence of intercellular spaces and vacuoles

Q. 21. Aditi observed following observation while looking into a permanent slide : (i) Cells are long and cylindrical, (ii) Light and dark bands are present giving striated appearance. It could be a slide of : (Board Term I, 2012 Set-042)

- (a) striated muscle fibre
- (b) smooth muscle fibre
- (c) neuron
- (d) parenchyma cells

Q. 22. After observing a permanent slide of parenchyma tissue, Amit drew the labelled diagram of parenchyma tissues. Complete and correct labelling is done in figure : (Board Term I, 2012 Set-046)



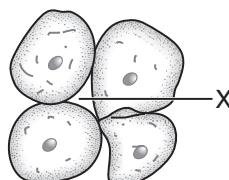
- (a) fig (1)
- (b) fig (2)
- (c) fig (1) and (2) under different magnifications.
- (d) none of these figures

Q. 23. Some students observed a permanent slide of striated muscles. The cells appeared to be :

(Board Term I, 2012 Set-048)

- (a) cylindrical
- (b) discoidal
- (c) spindle shape
- (d) square shape

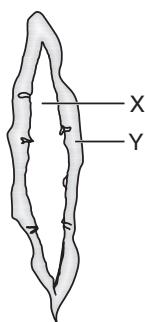
Q. 24. In the following diagram the part labelled by X shows : (Board Term I, 2012 Set-050)



- (a) intercellular space
- (b) intracellular space
- (c) cytoplasm
- (d) vacuole

Q. 25. After observing a slide of longitudinal section of sclerenchyma a student has drawn its diagram as given below. The parts marked X and Y should respectively be labelled as :

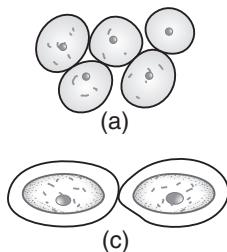
(Board Term I, 2012 Set-052)



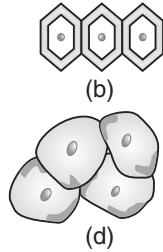
- (a) narrow lumen, simple pit pair
- (b) simple pit pair, narrow lumen
- (c) narrow lumen, lignified thick wall
- (d) lignified thick wall, narrow lumen

Q. 26. Four students observed parenchyma tissue and drew following diagrams. Which one is correct ?

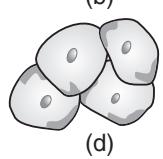
(Board Term I, 2012 Set-054)



(a) (a)



(b) (b)

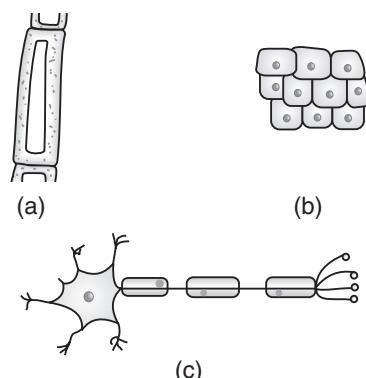


(c) (c)

(d) (d)

Q. 27. Identify the following slides in the correct order based on the features.

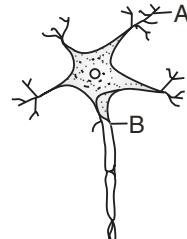
(Board Term I, 2012 Set-056)



- (a) nerve cell, parenchyma, sclerenchyma
- (b) sclerenchyma, nerve cell, parenchyma
- (c) sclerenchyma, parenchyma, nerve cell
- (d) parenchyma, sclerenchyma, nerve cell

Q. 28. In the following diagram; the correct labelling for A and B is :

(Board Term I, 2012 Set-059)



- (a) A - Nucleus B - Dendrite
- (b) A - Dendrite B - Axon
- (c) A - Axon B - Nucleus
- (d) A - Dendrite B - Nucleus

Answers with Explanation

1. (a) Striated.
2. (c) Living cells with thin wall and intercellular spaces.
3. (b) Thickness of cell wall.
4. (b) Striated muscle fibres are long and cylindrical and possess light and dark bands.
5. (a) Nucleus of the striated muscles is oval shaped.
6. (a) Thin walled living cells with cellulose cell wall and intercellular spaces.
7. (b) Collenchyma is present in leaf stalks below the epidermis, these cells are thickened at corners to reduce the intercellular spaces, making them compactly arranged.
8. (d) This is correct labelling.
9. (a) Sclerenchyma.
10. (a) Parenchyma has thin cell wall and spaces.
11. (d) Non-striated muscles.
12. (a) T. S. of collenchyma.
13. (a) Bands are present in voluntary muscles.
14. (d) Nerve cell has cytoplasmic projections.
15. (c) Parenchyma.
16. (c) Sclerenchyma has thick cell wall.
17. (a) Parenchymas.
18. (c) Characteristics of striated muscles.
19. (b) Dendrite.
20. (c) Characteristics of parenchyma.
21. (a) Striated muscles.
22. (c) Diagrammatic truth.
23. (a) Cylindrical.
24. (a) Diagrammatic truth.
25. (c) Diagrammatic truth.
26. (a) Diagrammatic truth.
27. (c) Diagrammatic truth.
28. (b) Diagrammatic truth.

Short Answer Type Questions

(2 marks each)

Q. 1. Parenchyma or Sclerenchyma, which cells are dead and why?

Ans. Sclerenchyma cells are dead, as their walls are thickened due to lignin, a chemical substance, which acts as cement and hardens them. 2

Q. 2. Mention two functions of the parenchyma tissues.

- Ans.** (i) The cells of the parenchyma tissue remain turgid and provide rigidity or support to softer parts.
(ii) Parenchyma present in xylem and phloem takes part in some lateral movement of materials.

1 + 1

Q. 3. Why Safranin is used for staining plant materials in the experiment?

- Ans.** Safranin is a reddish pink solution mostly used in laboratory for staining plant sections. Safranin makes the various parts of plant section appear very clearly.

2

Q. 4. Name the two types of processes present in neuron.

Ans. Two types of processes present in neuron are —

- (i) **Axon** : It carries impulses away from the cell body.
(ii) **Dendrite** : It carries impulses towards the cell body.

1 + 1

Q. 5. Why are smooth muscles called involuntary muscles and in what way they are different from striated muscles?

- Ans.** Unstriated or smooth muscles are called involuntary muscles because we cannot stop or move them according to our will. Smooth muscles are uninucleate whereas striated muscles are multinucleate.

1 + 1



KNOW THE LINKS

- en.wikipedia.org/wiki/Tissue
- www.britannica.com
- www.smm.org/tissues
- www.cellsalive.com



UNIT - III**Motion, Force and Work****CHAPTER****5****MOTION****SYLLABUS**

- *Motion : Distance and displacement, velocity; uniform and non-uniform motion along a straight line; acceleration, distance-time and velocity-time graphs for uniform motion and uniformly accelerated motion, derivation of equations of motion by graphical method; elementary idea of uniform circular motion.*

**TOPIC-1
Motion, Force and Work****QUICK REVIEW**

- If the position of an object does not change with time, it is said to be at rest.
- If the position of an object changes as time passes, it is said to be in motion.
- Reference point is a fixed point with respect to which a body is at rest or in motion.
- Rest and motion are relative terms.
- Distance is the length of actual path travelled by a body in a given time.
- Displacement is the shortest distance between the initial and final positions of the body in a known direction.
- A physical quantity which has both magnitude and direction is called as vector quantity. e.g., velocity, force.
- A physical quantity which has only magnitude is called as scalar quantity. e.g., time, speed.
- The S.I unit of distance and displacement is metre.
- A body is said to be in uniform motion, if it travels equal distances in equal intervals of time.
- A body is said to have non-uniform motion if it travels unequal distances in equal intervals of time.
- Speed is the ratio of distance travelled to the time taken to cover that distance.
- In non-uniform motion, speed of an object is not constant. The S.I. unit of speed is m/s.
- Average speed of a body is the total distance travelled divided by the total time taken.
- Velocity is displacement per unit time. The S.I. unit of velocity is metre per second.
- Average velocity is displacement divided by the time taken.
- Speed is a scalar quantity and velocity is a vector quantity.
- Time is independent variable, plotted along X-axis. Distance is dependent variable, plotted along Y-axis in distance time graph.
- Graphs are designed to make it easier for the reader to interpret and understand numerical data.
- The distance-time graph is a straight line parallel to time axis when the object is at rest.
- The nature of distance-time graph is a straight line when the object is in the state of uniform motion.
- Slope of the distance-time graph gives the speed of the object.
- A more steeply inclined distance-time graph indicates greater speed. The nature of distance-time graph is a curve having varying slope when the object has non-uniform motion.

TOPIC - 1
Motion, Force and Work P. 85

TOPIC - 2
Equations of Motion P. 101

- If the velocity of a body remains constant, the velocity-time graph is a horizontal line parallel to the time axis.
- If the velocity of the body changes uniformly at a constant rate, the velocity-time graph is a straight line.
- If the velocity of the object changes non-uniformly, the velocity-time graph is a curve having increasing slope.
- The area enclosed by the velocity-time graph and the time axis represents the displacement.
- The slope of the velocity-time graph gives the acceleration.
- When a body travels along a circular path of constant radius with a constant speed then its motion is uniform circular motion.
- In a uniform circular motion, velocity of a particle is not constant but its speed is constant, hence it is an accelerated motion.



KNOW THE TERMS

- **Distance** : The distance covered by a moving object is the actual length of the path followed by the object. Distance is a scalar quantity. SI unit of distance is Metre .
- **Displacement** is the shortest distance covered by a moving object from the point of reference (initial position of the body), in a specified direction. SI unit of displacement is metre. Displacement is a vector quantity, i.e., the displacement is given by a number with proper units and direction.
- **Uniform Speed** : An object is said to be moving with uniform speed if it covers equal distances in equal intervals of time.
- **Non-uniform** : An object is said to be moving with variable speed or non-uniform speed if it covers equal distances in unequal intervals of time or vice-versa.
- **Average speed** : The speed of a moving body at any particular instance of time, is called instantaneous speed. When we travel in a vehicle the speed of the vehicle changes from time to time depending upon the conditions existing on the road. In such a situation, the speed is calculated by taking the ratio of the total distance travelled by the vehicle to the total time taken for the journey. This is called the average speed.
- **Instantaneous Speed** : When we say that the car travels at an average speed of 60 km/h it does not mean that the car would be moving with the speed of 60 km/h throughout the journey. The actual speed of the car may be less than or greater than the average speed at a particular instance of time.
- **Velocity** : It is defined as the distance covered by a moving object in a particular direction in unit time or speed in a particular direction.

$$\text{Velocity} = \frac{\text{distance travelled in a specified direction}}{\text{time taken}}$$

$$v = \frac{s}{t} \quad [\text{where } s \text{ is the distance covered and } t \text{ is the time taken}]$$

- **Acceleration** is defined as the rate of change of velocity of a moving body with time.

$$\text{Acceleration} = \text{Rate of change of velocity with time}$$

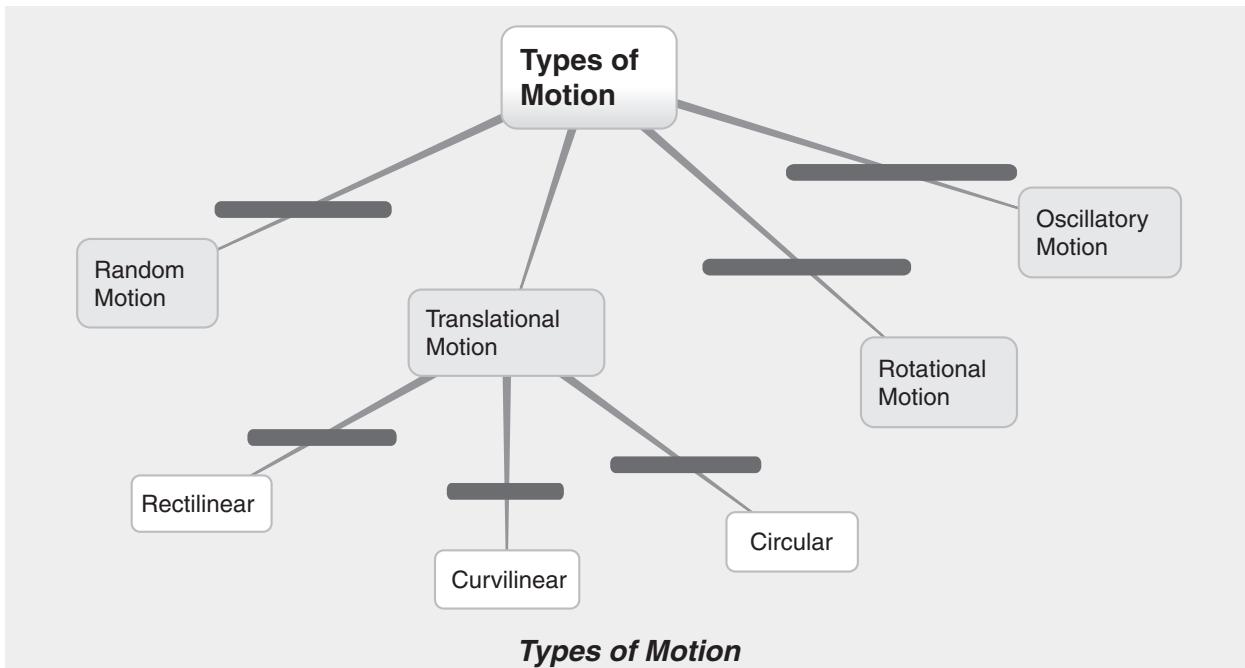
$$= \frac{\text{change in velocity}}{\text{time}}$$

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

- **Uniform Acceleration** : If the change in velocity in equal intervals of time is always the same, then the object is said to be moving with uniform acceleration. **Example** : a body falling from a height towards the surface of the earth.
- **Non-uniform or Variable Acceleration** : If the change in velocity in equal intervals of time is not the same, then the object is said to be moving with variable acceleration.
- **Uniform velocity** : A body is said to be moving with uniform velocity if it covers equal distances in equal intervals of time in a specified direction.

- **Variable velocity** : A body is said to be moving with variable velocity if it covers unequal distances in equal intervals of time and vice-versa in a specified direction or if it changes the direction of motion.
 - **Circular motion** : Motion along circular track is called circular motion. An object moving along a circular track with uniform speed is an example for a non-uniform motion because the direction of motion of the object goes on changing at every instant of time. **Example :** A car negotiating a curve with uniform speed. A circle can be considered as a polygon with infinite sides and hence motion along a circular path is classified as non-uniform motion.

FLOWCHART



Very Short Answer Type Questions

1 Mark each

- Q. 1.** Give an example where object is at rest and also in motion at the same time. (Board 2015, Set-LOV7LN7)

Ans. A passenger travelling in a bus is at rest with respect to fellow passengers but it is in motion with respect to the bus. 1

- Q. 2.** Give an example of a motion in which acceleration is non-uniform. (Board 2015, Set-K34UOKW)

Ans. A car travelling in a straight road increases its speed by unequal amounts in equal intervals of time. 1

- Q. 3.** Give an example of a motion in which acceleration is in the direction of motion of an object.

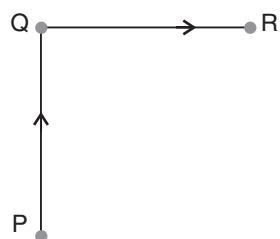
Ans. A freely falling object.
(CBSE Marking Scheme, 2015) 1

Ans. Average speed = $(16 + 16)/(4 + 2) = \frac{32}{6} = 5.33$ m/s

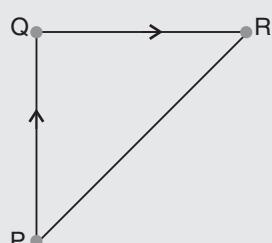
(CBSE Marking Scheme, 2014) 1

- Q. 5.** An ant travels from P to Q and then moves from Q to R (as shown in the diagram). Show its resultant displacement in the diagram.

(Board 2014, Set MNM9GZH)



Ans PR



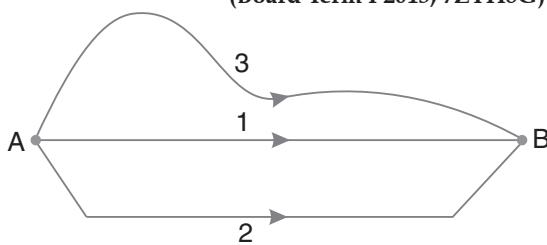
(CBSE Marking Scheme, 2014) 1

- Q. 6. Does the speedometer of a car measure its average speed ?** (NCT 2014)

Ans. No. It measures its instantaneous speed. 1

Q. 7. A person standing at A goes to B by following any of the paths 1, 2, or 3. Which path we can measure to find the average velocity ?

(Board Term I 2013, 7ZTH8G)



Ans. Path 1. (CBSE Marking Scheme, 2013) 1

Q. 8. What is motion ?

Ans. A body is said to be in motion if it changes its position with respect to a reference point. 1

Q. 9. How do we often perceive an object to be in motion ?

Ans. When its position changes with time. 1

Q. 10. Give an example when we infer the motion indirectly.

Ans. We infer the motion of air by observing the movement of dust particles or leaves and branches of trees, or simply by feeling the blowing air on our face. 1

Q. 11. What is essential to describe the position of an object ?

Ans. We need to specify a reference point, called the origin. 1

Q. 12. What is the simplest type of motion ?

Ans. Motion in a straight line. 1

Q. 13. Are rest and motion absolute or relative terms ?

Ans. They are relative terms. 1

Q. 14. Can an object be at rest as well as in motion at the same time ?

Ans. Yes. An object may be at rest related to one object and at the same time it may be in motion related to another object. 1

Q. 15. What indicates the motion of the earth ?

Ans. The phenomena like coming of day and night indicate the motion of the earth. 1

Q. 16. Is speed a scalar or vector quantity ?

Ans. It is a scalar quantity. 1

Q. 17. Give two examples of vector quantities.

Ans. Velocity and acceleration. 1

Q. 18. What do you mean by displacement ?

Ans. The shortest distance moved by a body in the direction from initial to final position is called displacement. 1

Q. 19. Is displacement a scalar quantity ?

Ans. No, it is a vector quantity as it has both magnitude and direction. 1

Q. 20. If the displacement of a body is zero, is it necessary that the distance covered by it is also zero ?

Ans. No. When the body comes back to the same position after travelling a distance, its displacement is zero though it has travelled some distance. 1

Q. 21. Can the displacement be greater than the distance travelled by an object ?

Ans. No, it is always either equal to or less than the distance travelled by the object. 1

Q. 22. When do the distance and displacement of a moving object have the same magnitude ?

Ans. The magnitude of distance and displacement of moving object are same when the object moves along the same straight line in the same fixed direction. 1

Q. 23. What is the duration of the time interval needed for uniform or non-uniform motion ?

Ans. It may be of any duration—small or large. 1

Q. 24. Give two examples of non-uniform motion.

Ans. A car moving in a crowded street and a person jogging in a park. 1

Q. 25. Give the technical term used for the rate of motion of a body.

Ans. Speed. 1

Q. 26. What is the S.I. unit of speed ?

Ans. Metre per sec i.e. ms^{-1} . 1

Q. 27. Is it true that to specify the speed of any object, we require only its magnitude ?

Ans. Yes. 1

Q. 28. How can the velocity of an object be changed ?

Ans. It can be changed by changing either :
(a) the object's speed, (b) direction of motion, or
(c) both. $\frac{1}{2} + \frac{1}{2}$

Q. 29. A body is moving with a velocity of 10 m/s. If the motion is uniform, what will be the velocity after 10 s ?

Ans. As the motion is uniform, the velocity will remain 10 m/s after 10 s. 1

Q. 30. Can a body have constant speed but variable velocity ?

Ans. Yes, e.g. a body in uniform circular motion has constant speed but due to the change in the direction of motion, its velocity changes at every point. 1

Q. 31. What is the rate of change of velocity called ?

Ans. Acceleration. 1

Q. 32. What is the S.I. unit of acceleration ?

Ans. metre per (second) 2 i.e. ms^{-2} . 1

Q. 33. When is the acceleration taken as negative ?

Ans. When a body in motion stops to rest its acceleration is taken *-ve*, i.e., when final velocity is less than initial velocity. 1

Q. 34. What is uniform acceleration ?

Ans. Acceleration of an object is said to be uniform if it travels in a straight line and its velocity increases or decreases (uniform retardation) by equal amounts in equal intervals of time. 1

Q. 35. Give an example of a uniformly accelerated motion.

Ans. Motion of a freely falling body. 1

Q. 36. Give an example of non-uniform acceleration.

Ans. A car travelling along a straight road increasing its speed by unequal amounts in equal intervals of time. 1

Q. 37. How can the change in position of an object with time be represented ?

Ans. It can be represented on the distance-time graph (adopting a convenient scale of choice). 1

Q. 38. On which axis are time and distance generally taken in a distance-time graph ?

Ans. On the x - and y - axis respectively. 1

Q. 39. How are the distance travelled by an object related to the time taken when an object travels equal distances in equal intervals of time ?

Ans. In this case, distance travelled by the object is directly proportional to the time taken i.e., $s \propto t$. 1

Q. 40. What type of distance-time graph will you get for uniform speed ?

Ans. It will be a straight line. 1

Q. 41. What would be acceleration of a body if its velocity-time graph is a line parallel to the time axis ?

Ans. Zero, as the body possesses uniform velocity. 1

Q. 42. What does the area under the velocity-time graph give ?

Ans. It gives the magnitude of displacement of the object. 1

Q. 43. What is the shape of velocity-time graph for non-uniformly accelerated motion ?

Ans. The velocity-time graph for non-uniformly accelerated motion can have any shape. 1

Q. 44. Is the motion of a body uniform or accelerated if it goes round the sun with constant speed in a circular orbit ?

Ans. It is accelerated, as its velocity changes due to change in direction. 1

Short Answer Type Questions-I

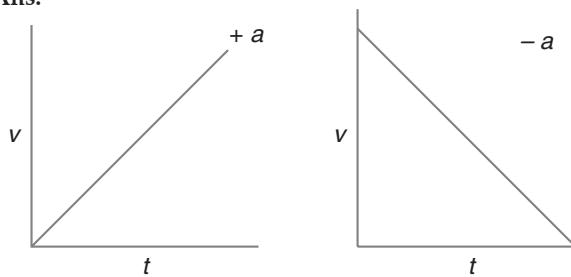
Q. 1. State the type of force-balanced or unbalanced, that acts on a rubber ball when we press it between our hands. Give reason for your answer and mention the effect produced in the ball by this force.

(Board Term I, 2015, 3GS246G)

Ans. Balanced, because when we press the ball, an equal and opposite force is developed changing the shape of ball. (CBSE Marking Scheme, 2015) 1

Q. 2. Plot the velocity - time graphs showing + a and - a. How is distance calculated from velocity - time graph ? (Board Term I 2013, 7ZTHA8G; NCT 2014; DDE 2014)

Ans.



Distance from velocity - time graph can be calculated by finding the area beneath the graph. 2

Q. 3. Enumerate the differences between speed and velocity in a tabular form.

(Board Term I, 2010; 11; NCT 2014)

Ans.

S. No.	Speed	Velocity
(i)	Speed is defined as the rate of change of distance.	Velocity is the rate of change of displacement.
(ii)	Speed is a scalar quantity.	It is a vector quantity.
(iii)	Speed may or may not be equal to velocity.	A body may possess different velocities but the same speed.
(iv)	Speed can never be negative or zero.	Velocity can be negative, zero or positive.

$\frac{1}{2} \times 4$

2 Marks each

Q. 4. What is the difference between uniform velocity and non-uniform velocity ? (Board Term I, 2010; 11)

Ans. **Uniform Velocity :** An object with uniform velocity covers equal distances in equal intervals of time in a specified direction e.g., an object moving with speed of 40 km h^{-1} towards west has uniform velocity. **Non-uniform Velocity :** When an object covers unequal distances in equal intervals of time in a specified direction, or if the direction of motion changes, it is said to be moving with a non-uniform or variable velocity. e.g., revolving fan at a constant speed has variable velocity. 1 + 1

Q. 5. What do you understand by instantaneous velocity? (Board Term I, 2010)

Ans. Instantaneous velocity is the velocity of a body at any particular instance during its motion. For example, the instantaneous velocity of a motorcycle at a particular instance is 40 kmh^{-1} if it is moving at 40 km h^{-1} at that particular instance. It is measured by the speedometers on the vehicles. 2

Q. 6. What is non-uniform or variable acceleration ? (Board Term I, 2010)

Ans. If the velocity of an object changes by unequal amounts in equal intervals of time, the object is said to be in non-uniform or variable acceleration e.g., if the speed of a bus travelling along a straight road increases by unequal amounts, then the bus is moving with non-uniform acceleration. 2

Q. 7. What is negative acceleration ? (Board Term I, 2010)

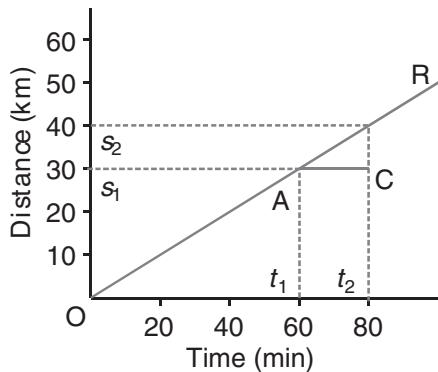
Ans. If the velocity of a body decreases with time, then its final velocity is less than the initial velocity and thus its acceleration is negative. Negative acceleration is called retardation or de-acceleration. For example, when brakes are applied to a moving truck, its velocity gradually decreases. In other words, it is under retardation. 1 + 1

Q. 8. What are the characteristics of the distance-time graph for an object moving at a uniform speed ?

(Board Term I, 2010; 11)

Ans. The characteristics of distance-time graph for an object moving with uniform speed are :

- (i) It is always a straight line.
- (ii) The uniform speed of the moving object is equal to the slope of the straight line plotted.



2

Q. 9. What are the uses of a distance-time graph ?
(Board Term I, 2010; 11)

Ans. The various uses of a distance-time graph are as follows :

- It tells us about the position of the body at any instance of time.
- From the graph, we can see the distance covered by the body during a particular interval of time.
- It also gives us information about the velocity of the body at any instance of time.

(any two) 1 + 1

Q. 10. Orbit of an artificial satellite at distance 42260 km from earth is circular. It completes one revolution around the earth in 24 hours. Calculate its linear speed. (NCERT Based)

Ans. Linear speed in uniform circular

$$\text{Motion} = \frac{\text{circumference}}{\text{time}} = \frac{2\pi r}{t}$$

Given: $r = 42,260 \text{ km}$, $t = 24 \text{ h}$

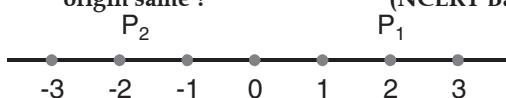
$$\Rightarrow v = 2 \times 3.14 \times 42260 \div 24 \\ = 11058.03 \text{ km/hr}$$

2

Q. 11. Consider the situation shown in fig. below :

The X-axis is in metres :

- What is the position of a particle when it is at P_1 and when it is at P_2 ?
 - Are the positions same ?
 - Are the two distances of the particle from the origin same ?
- (NCERT Based)



Ans. (a) The position of the particle is

$$x = 2 \text{ m} \quad [\text{when it is at } P_1]$$

$$x = -2 \text{ m} \quad [\text{when it is at } P_2], \frac{1}{2} + \frac{1}{2}$$

- The two positions are not same as they are in different directions.

½

- The distances of the particle from the origin in the two positions are same and is equal to 2 metres.

½

Q. 12. Study the table :

Time	Distance from origin point (km)
10 : 30 am	0
11 : 00 am	15

11 : 30 am	28
12 : 00 noon	40
12 : 30 pm	60

- Is the car moving with constant speed ?
 - What is the average speed ?
 - Which duration represents the maximum velocity ?
- (NCERT Based)

Ans. (1) As the distance travelled in equal time intervals are not equal so car is not moving with constant speed.

- Total distance covered = 60 km

Total time taken = 2 hr

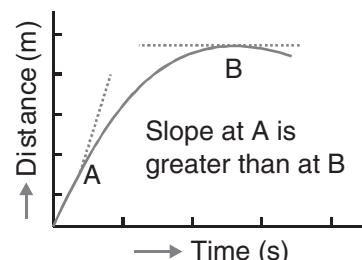
$$\text{Average speed} = \frac{\text{total distance travelled}}{\text{total time taken}}$$

$$= \frac{60}{2} = 30 \text{ km/h.} \quad 1$$

- Between 12 : 00 noon to 12 : 30 pm, velocity is maximum.

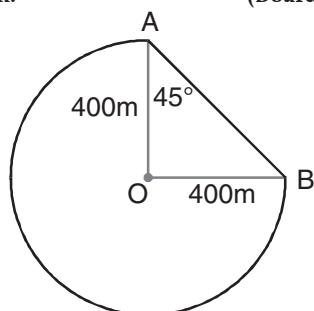
Q. 13. Name the motion when distance travelled by an object decreases with time. Also show the distance time variation. (NCERT Based)

Ans. If the distance decreases with time then motion is called non-uniform motion. Slope of the graph will be negative.



2

Q. 14. A cyclist travels 3/4 of a circular track from A to B as shown in figure. The radius of the circular track is 400 m. (Board Term I, 2011)



- What is the distance travelled by the cyclist ?
- What is the displacement ?

Ans. (i) Circumference = $2\pi r$

$$\text{Circumference of } \frac{3}{4} \text{ circle}$$

$$= \frac{3}{4} \times 2\pi r$$

$$= \frac{3}{4} \times 2 \times \frac{22}{7} \times 400$$

$$= 1885.71 \text{ m} \quad 1$$

- (ii) The displacement is the shortest path between A and B.

$$\begin{aligned} AB &= \sqrt{(AO)^2 + (OB)^2} = \sqrt{(400)^2 + (400)^2} \\ &= 400\sqrt{2} \text{ m} \end{aligned}$$

1

- Q. 15. State the reason, why velocity-time graph can never be a straight line parallel to velocity axis ?**

(Board 2010)

- Ans.** This is not possible because it would mean that velocity is increasing without increase in time i.e. acceleration is infinite and infinite acceleration is practically impossible.

2

Short Answer Type Questions-II

3 Marks each

- Q. 1. Define speed and velocity. Write their SI units. A body is moving with a velocity of 15 m/s. If the motion is uniform, what will be the velocity after 10 s ?** (Board 2015, Set-LOV7LN7)

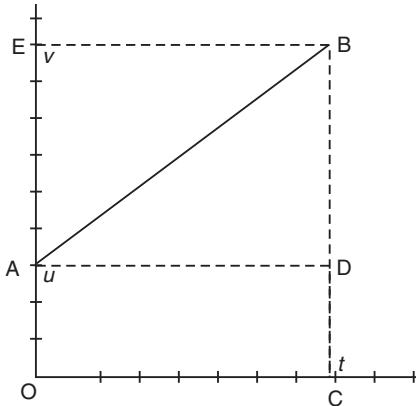
- Ans.** Speed is the distance travelled by an object in a given time. Its SI unit is m/s. Velocity is the speed of an object moving in a definite direction. SI unit of velocity is same as speed i.e. m/s. As the motion of the body is uniform the velocity remains constant i.e. 15 m/s even after 10 s (acceleration is also zero).

1 + 1 + 1

- Q. 2. Using velocity-time graph of uniformly accelerated motion along a straight line, derive the equation for position-velocity relation.**

(Board 2015, Set-K34UQKW)

- Ans.** Velocity-time graph of an object that moves under uniform acceleration.



Equation for position-velocity relation : From the graph, the distance travelled by the object in time t , moving under uniform acceleration a is given by the area enclosed within the trapezium OABC under the graph. That is,

$$\begin{aligned} S &= \text{Area of the trapezium OABC} \\ &= \frac{(OA + BC) \times OC}{2} \end{aligned}$$

Substituting $OA = u$, $BC = v$ and $OC = t$,

$$\text{we get } S = \frac{(v+u)t}{2} \quad \dots \text{(i)}$$

From velocity-time relation ($S = ut + \frac{1}{2}at^2$)

$$\text{we get } t = \frac{v-u}{a} \quad \dots \text{(ii)}$$

From equations (i) and (ii) we get

$$S = \frac{(v+u)(v-u)}{2a}$$

or, $2as = v^2 - u^2$ 3

- Q. 3. If you divide the total distance travelled on a car trip by the time for the trip, are you calculating the average speed or the magnitude of the average velocity ? Under what circumstance are these two quantities the same ? Illustrate with the help of an example.** (Board 2015, Set-K34UQKW)

- Ans.** If we divide the total distance travelled on a car trip by the time for the trip, we are calculating the average speed.

The average speed and the average velocity are same when the object travels in a straight line and in one direction.

Since, average speed = $\frac{\text{Total distance travelled}}{\text{Total time taken}}$

average velocity = $\frac{\text{Net Displacement}}{\text{Total time taken}}$

The magnitudes of both will be equal when the total distance travelled is equal to displacement. This happens when an object moves in straight line and in unidirectional motion.

3

- Q. 4. Name the physical quantities denoted by :**

- (a) the slope of the distance-time graph
 - (b) the area under velocity-time graph
 - (c) the slope of velocity-time graph
- (Board Term I, 2015, 3G5246G) (DDE 2014;
Board 2014, Set-LFS3I7K, Set-MNM9GZH)

- Ans. (a) Speed**

- (b) Displacement**

- (c) Acceleration**

1 + 1 + 1

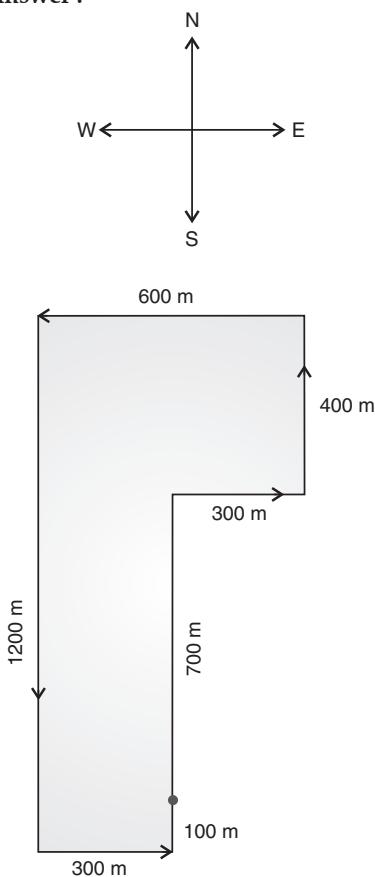
(CBSE Marking Scheme, 2014)

- Q. 5. A biker rides 700 m north, 300 m east, 400 m north, 600 m west, 1200 m south, 300 m east and finally 100 m north. Draw the path of motion of the biker. What distance did he cover ? What was his displacement ?** (Board Term I, 2015, 3GS246G)

- Ans.** 3600 m, 0 m, south

(CBSE Marking Scheme, 2014) 3

Detailed Answer :



Total distance he covered = 700 m + 300 m + 400 m + 600 m + 1200 m + 300 m + 100 m

His displacement was zero as he returned back to the point of start.

Q. 6. A body can have zero average velocity but not zero average speed. Justify giving an example.

(Board 2014, Set-MNM9GZH)

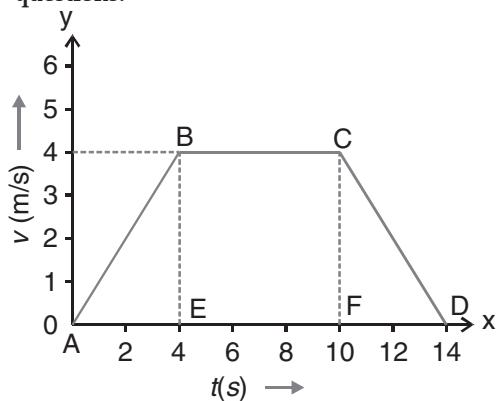
Ans. Average velocity = Net displacement/time taken

Average speed = Total distance/time taken

Net displacement can be zero but total distance cannot be zero.

So, average velocity can be zero but average speed cannot be zero. (CBSE Marking Scheme, 2014) 3

Q. 7. Study the given graph and answer the following questions.



(i) Which part of the graph shows accelerated motion?

(ii) Which part of the graph shows retarded motion?

(iii) Calculate the distance travelled by the body in first 4 seconds of journey graphically?

(DDE-2014; Board Term I, 2012 Set-015)

Ans. (i) Acceleration = AB

(ii) Retardation = CD

$$(iii) s = \text{Area of } \Delta AEB \\ = \frac{1}{2} \times 4 \times 4 = 8 \text{ m}^2 \quad 1+1+1$$

Q. 8. Define velocity and acceleration. Is it possible for a body to have zero velocity but constant acceleration? Justify your answer.

(Board Term I, 2012 Set-015; 045)

(Board 2014, Set-SO1QHXJ)

Ans. Velocity : Rate of displacement.

Acceleration : Rate of change of velocity.

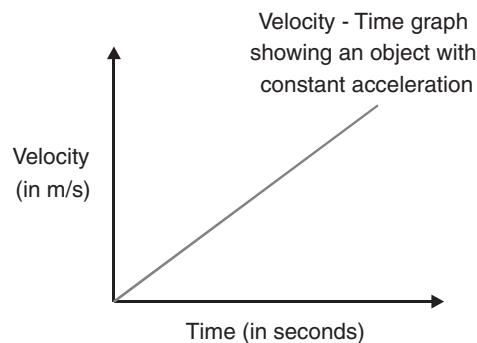
Yes, when the body is just released, $u = 0$

$$\text{but } g = 10 \text{ m/s}^2 \quad 1+1+1$$

Q. 9. Represent velocity-time graph. State two advantages of plotting this graph.

(Board 2012; Term I; Set-015; 054)

Ans.



From a velocity-time graph, we can find out :

(i) The velocity of a body at any instance of time.

(ii) The acceleration of the body, and

(iii) The total distance travelled by the body in a given time-interval. (any 2) 1+1+1

Q. 10. A cyclist goes once round a circular track of diameter 105 metres in 5 minutes. Calculate his speed. (Board Term I, 2012 Set-015; 058)

Ans. Here, diameter = 105 m, radius (r) = $\frac{105}{2}$ $\frac{1}{2}$

$$\text{Time taken } t = 5 \times 60 = 300 \text{ s} \quad \frac{1}{2}$$

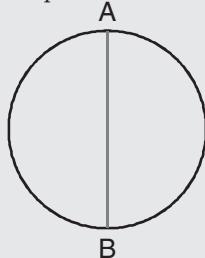
$$\text{Speed, } V = \frac{2\pi r}{t} = 2 \times \frac{22}{7} \times \frac{105}{2 \times 300} = 1.10 \text{ m/s}$$

(CBSE Marking Scheme, 2012) 2

Q. 11. Define distance and displacement. A body covers one complete revolution around a circular park of circumference 176 m in 4 minutes. Find the displacement of the body after 6 minutes.

(Board Term I, 2012 Set-015; 019)

Ans. The path travelled by a body is called distance. Displacement is the shortest distance between initial and final points.



$$2\pi r = 176$$

$$\Rightarrow 2 \times \frac{22}{7} \times r = 176$$

$$r = 28 \text{ m}$$

After 6 min, the body would have covered $1\frac{1}{2}$ rounds.

Hence if it begins its motion from A, it will reach till B after 6 min.

Total displacement after 6 min

$$= AB = 28 \times 2$$

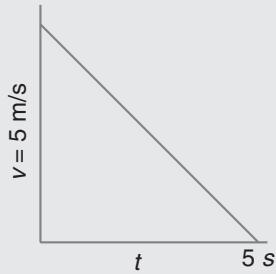
$$= 56 \text{ m} \quad 1 + 1 + 1$$

(CBSE Marking Scheme, 2012)

Q. 12. Plot velocity-time graph for a body whose initial velocity is 5 m/s and is moving with a retardation of 1 m/s^2 . Also calculate the distance covered by it.

(Board Term I, 2012 Set-015; 028)

Ans. Graph :



Distance $s = \text{area under the graph}$

$$= \frac{1}{2} \times 5 \times 5 = 12.5 \text{ m}^2 \quad 2 + 1$$

(CBSE Marking Scheme, 2012)

Q. 13. (a) Name the quantity which is measured by the area occupied below the velocity - time graph.

(b) A mechanic strikes a nail with hammer moving with a velocity of 20 m/s. The hammer comes to rest in 0.02 s after striking the nail. Calculate the acceleration of the nail.

(Board Term I, 2012 Set-015; 040)

Ans. (a) Displacement.

$$(b) u = 20 \text{ m/s}; \quad v = 0; \quad t = 0.02 \text{ s}$$

$$a = \frac{(v - u)}{t} = \frac{(0 - 20)}{0.02}$$

$$= -1000 \text{ m/s}^2$$

(CBSE Marking Scheme, 2012) 1 + 2

Q. 14. A train travels at a speed of 60 km/hr for 0.52 hr, at 30 km/h for the next 0.24 hr and then at 70 km/h for the next 0.71 h. What is the average speed of the train ? (Board Term I, 2012 Set-015; 050)

Ans. (i) In the first case, the train travels at a speed of 60 km/h for a time of 0.52 h.

$$\text{Now, Speed} = \frac{\text{distance}}{\text{time}} = 60 \text{ km/hr}$$

$$\text{Distance} = 60 \times 0.52 = 31.2 \text{ km} \quad ... (1)$$

(ii) In the second case, the train travels at a speed of 30 km/h for a time of 0.24 hr.

$$\text{Now, Speed} = \frac{\text{distance}}{\text{time}} = 30 \text{ km/hr}$$

$$\text{Distance} = 30 \times 0.24 = 7.2 \text{ km} \quad ... (2)$$

(iii) In the third case, the train travels at a speed of 70 km/h for a time of 0.71 hr.

$$\text{Now, Speed} = \frac{\text{distance}}{\text{time}} = 70 \text{ km/hr}$$

$$\text{Distance} = 70 \times 0.71 = 49.7 \text{ km} \quad ... (3)$$

From equation 1, 2 & 3 we get,

Total distance travelled

$$= (31.2 + 7.2 + 49.7) \text{ km} = 88.1 \text{ km.}$$

$$\text{Total time taken} = (0.52 + 0.24 + 0.71) \text{ hr} = 1.47 \text{ hr.}$$

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

$$= (88.1/1.47) \text{ km/hr}$$

$$\text{Hence, Average speed} = 59.9 \text{ km/hr}$$

$$\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + 1 \frac{1}{2}$$

(CBSE Marking Scheme, 2012)

Q. 15. (a) Identify the kind of motion in the following cases :

(i) A car moving with constant speed turning around a curve.

(ii) An electron orbiting around nucleus.

(b) An artificial satellite is moving in a circular orbit of radius 36,000 km. Calculate its speed if it takes 24 hours to revolve around the earth.

(Board Term I, 2012 Set-015; 052)

Ans. (a) (i) Uniform motion.

(ii) Uniform circular motion

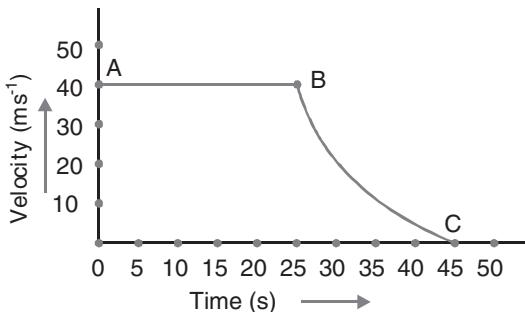
$$(b) V = \frac{2\pi r}{t}$$

$$= 2 \times \frac{22}{7} \times \frac{36000}{24 \times 60 \times 60}$$

$$= 2.62 \text{ km/s} \quad 1 + 1 + 1$$

(CBSE Marking Scheme, 2012)

Q. 16. The velocity-time graph of an object is shown in the following figure :

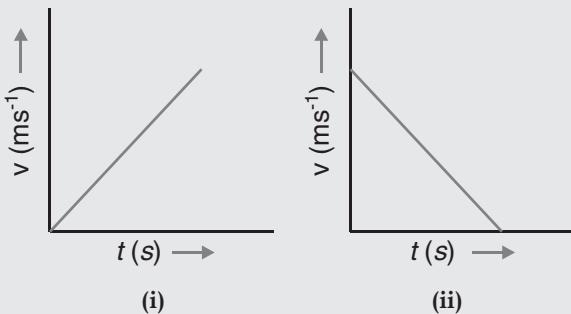


- (a) State the kind of motion that object has, from A to B and from B to C.
(b) Identify the part of graph where the object has zero acceleration. Give reasons for your answer.
(c) Identify the part of graph where the object has negative acceleration. Give reasons for your answer. (Board Term I, 2012 Set-015; 061)

Ans. (a) Uniform motion from A to B and non-uniform motion from B to C.
(b) AB because velocity remains constant from A to B.
(c) BC because velocity decreases from B to C.
(CBSE Marking Scheme, 2012) 1 + 1 + 1

- Q. 17. (a) Draw the velocity time graph to show :
(i) the change in velocity of a freely falling body.
(ii) the change in velocity of a body thrown vertically upwards.
(b) Comment on the kind of motion of the body while : (i) it comes down (ii) it goes up.
(Board Term I, 2012 Set-015; 035)

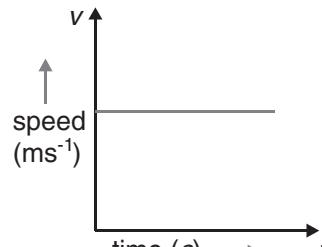
Ans. (a)



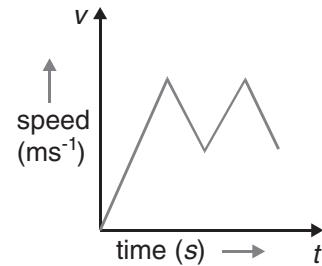
- (b) (i) Motion is uniformly accelerated when it goes vertically downwards.
(ii) Motion is with uniform negative acceleration when it goes up. 1 + 1 + 1
(CBSE Marking Scheme, 2012)

- Q. 18. Given below are few speed-time graphs for motion of objects moving along a straight line. Which of these graphs represent the motion of the body whose speed is :

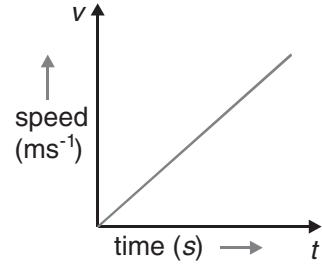
- (i) increasing with time, (ii) uniform, (iii) non-uniform. (Board Term I, 2012 Set-015; 076)



Graph 1



Graph 2



Graph 3

Ans. (i) Increasing with time (graph – 3)
(ii) Uniform (graph – 1)
(iii) Non-uniform (graph – 2) 1 + 1 + 1
(CBSE Marking Scheme, 2012)

- Q. 19. (a) State a condition under which a body moves in such a way that the magnitude of its average velocity is equal to its average speed.
(b) A train starting from rest moves with a uniform acceleration of 0.2 m/s^2 for 5 minutes. Calculate the final velocity and the distance travelled in this time.
(Board Term I, 2012 Set-015; 064)

Ans. (a) When a body moves along a straight line.
(b) Acceleration $a = 0.2 \text{ m/s}^2$, Initial velocity $u = 0$
Time $t = 5 \text{ minutes} = 300 \text{ s}$
Final velocity $v = ?$

$$a = \frac{(v - u)}{t}$$

$$0.2 = \frac{v}{300}$$

$$\text{or } v = 60 \text{ m/s}$$

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

(Second eqn. of motion)

$$= 0 + \frac{1}{2} \times 0.2 \times (300)^2$$

$$= 9000 \text{ m} = 9 \text{ km}$$

(CBSE Marking Scheme, 2012) 1 + 1 + 1

Q. 20. A cyclist moving along a circular path of radius 63 m completes three rounds in 3 minutes. Calculate :

- (a) The total distance covered by him during this time.
- (b) Net displacement of the cyclist.
- (c) The speed of the cyclist.

(Board Term I, 2012 Set-015; 069)

Ans. (a) Total distance covered

$$s = 2\pi r \times t$$

$$s = 2\pi r \times 3$$

$$= 2 \times \frac{22}{7} \times 63 \times 3$$

$$= 1188 \text{ m}$$

(b) Displacement = zero

$$(c) \text{ Speed} = \frac{\text{Distance covered}}{\text{Time taken}}$$

$$= \frac{1188}{180} = 6.6 \text{ m/s}$$

($\because 3 \text{ min} = 3 \times 60 = 180 \text{ sec}$) 1 + 1 + 1

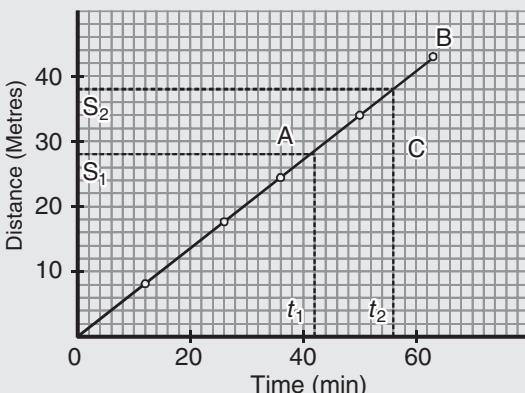
(CBSE Marking Scheme, 2012)

Q. 21. The distance moved by a student at different intervals of time, while walking to school, is given in the table below :

Time from the starting point (s)	0	10	20	30	40	50
Distance moved (m)	0	15	30	45	30	60

Draw the distance-time graph for the motion of the student indicating the scale chosen. What does the shape of the graph suggest about the type of motion ? (Board Term I, 2012 Set-015; 031)

Ans.



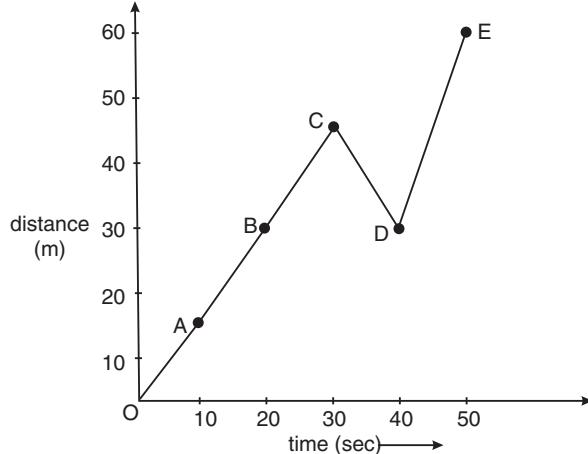
Motion type : Uniform motion.

2 + 1

(CBSE Marking Scheme, 2012)

Detailed Answer :

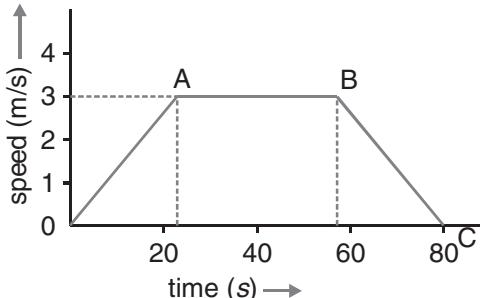
Time (s)	0	10	20	30	40	50
Distance (m)	0	15	30	45	30	60
Speed (m/s)	0	1.5	1.5	1.5	0.75	1.2



From point A to point C, the student moves with constant speed and from point O to A with positive acceleration.

2 + 1

Q. 22. Study the speed time graph of a car alongside and answer the following questions :



Scale :

1 cm = 20 m/s on Y axis

1 cm = 20 sec on X axis

- (a) What type of motion is represented by OA ?
- (b) Find acceleration from B to C.
- (c) Calculate the distance covered by the body from A to B. Give reasons for your answer.

(Board Term I, 2012 Set-015; 020)

Ans. (a) Uniform motion

$$(b) a = \frac{V-u}{t} = \frac{0-60}{20} = -3 \text{ m/s}^2$$

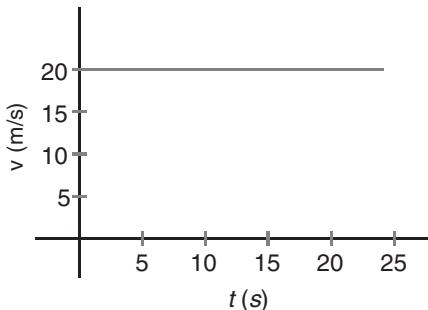
($\because V = 0; u = 60 \text{ m/s}$)

$$(c) D = s \times t = 60 \times (60 - 20) = 2400 \text{ m}$$

(It is the motion with constant speed) 1 + 1 + 1

(CBSE Marking Scheme, 2012)

Q. 23. The velocity – time graph shows the motion of a cyclist. Find (i) its acceleration, (ii) its velocity after 20 s and (iii) the distance covered by the cyclist in 15 seconds. Give reasons for your answers.



(Board Term I, 2012 Set-051)

Ans. (i) $a = 0$ because velocity is constant.(ii) $v = 20$ m/s

(iii) $s = v \times t$

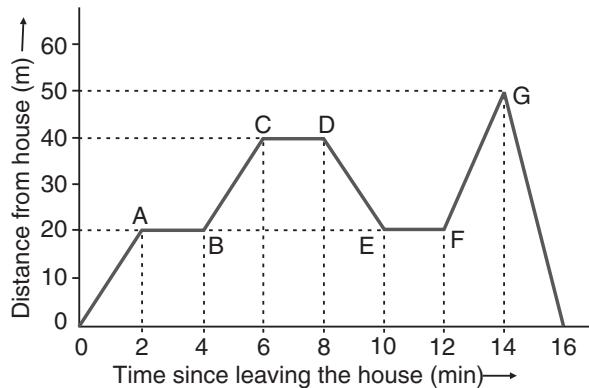
$= 20 \times 15$

$= 300$ m (area under the curve) $1 + 1 + 1$

(CBSE Marking Scheme, 2012)

Long Answer Type Questions**5 Marks each**

- Q. 1.** The following graph describes the motion of a girl going to meet her friend who stays 50 m from her house.



- (a) How much time she takes to reach her friend's house ?
- (b) What is the distance travelled by the girl during the time interval 0 to 12 min ?
- (c) During which time interval she is moving towards her house ?
- (d) For how many minutes she was at rest, during the entire journey ?
- (e) Calculate the speed by which she returned home.

(Board 2014, Set - LFS3I7K)

- Ans.** (a) 14 min
 (b) 60 m
 (c) 8 to 10 min or 12 or 14 min
 (d) 6 min
 (e) 25 m/min

(CBSE Marking Scheme, 2014) 1×5

- Q. 2.** State with reasons, if it is possible or impossible, for an object in motion to have :
- (a) Zero distance covered and may have non zero displacement.
 - (b) Zero speed at an instant but non zero acceleration at the same time.
 - (c) Zero speed and may have non zero velocity.
 - (d) Acceleration opposite to the direction of motion.
 - (e) Positive acceleration while speeding up.

(Board 2014, Set-MNM9GZH)

- Ans.** (a) Impossible,
 (b) Possible,

Reason : When an object is thrown upward, at the highest point its velocity becomes zero for a slice of time, but its acceleration (g) remains due to attraction of gravity.

- (c) Impossible,
 (d) Possible,

Reason : When a moving car applies the break its velocity decreases. The acceleration is against the direction of motion of the car.

- (e) Possible,

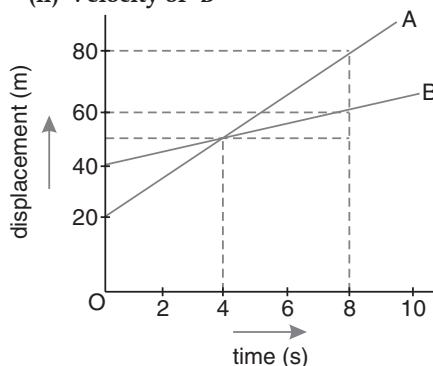
Reason : Acceleration has a negative value only when velocity and displacement are in opposite direction and acceleration has a positive value only when velocity and displacement are in same direction.

 1×5 **OR**

- (a) Impossible, reason
- (b) Possible, reason
- (c) Impossible, reason
- (d) Possible, reason
- (e) Possible, reason

(CBSE Marking Scheme, 2014)

- Q. 3.** (a) Define average speed and average velocity.
 (b) From displacement time graph shown in figure, find
 (i) Velocity of 'A'
 (ii) Velocity of 'B'



- (iii) Meeting point and time of 'A' and 'B'

(Board Term I 2013, OAHJD6N)

Ans. (a) Average speed is obtained by dividing total distance travelled by total time taken.
Average velocity is arithmetic mean of initial and final velocity.

$$(b) (i) \text{ Velocity of A} = \frac{60}{8} = 7.5 \text{ m/s}$$

$$(ii) \text{ Velocity of B} = \frac{20}{8} = 2.5 \text{ m/s}$$

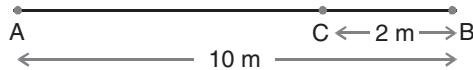
Position is 50 m and time is 4 sec. $2 + 2 + 1$
(CBSE Marking Scheme, 2013)

- Q. 4.** (a) State the relation between distance and time :
 (i) When a body is moving with uniform velocity.
 (ii) When a body is moving with variable velocity.
 (b) How is distance different from displacement ?
 (c) A train is travelling at a speed of 90 km/h. Brakes are applied in the train so as to produce a uniform acceleration of 0.5 m/s^2 . Find distance covered by train, before it is brought to rest ? (Board Term I, 2012 Set-070)

Ans. (a) (i) Distance covered by the body is directly proportional to time.
 (ii) Not directly proportional to time.
 (b) Distance is the length of actual path travelled between initial and final position whereas the displacement is the shortest path between the initial and final position of the particle.
 (c) Initial velocity $u = 90 \text{ km/h} = 25 \text{ m/s}$,
 Final velocity $v = 0$, acceleration $a = 0.5 \text{ m/s}^2$
 Distance travelled $s = ?$
 From $v^2 = u^2 + 2as$
 $s = \frac{(0 - 25 \times 25)}{(-2 \times 0.5)} = 625 \text{ m}$

(CBSE Marking Scheme, 2012) $2 + 1 + 2$

- Q. 5.** (a) Differentiate between distance and displacement.
 (b) After studying the motion of a ball rolling on a straight line as shown in figure :



- (i) Find its displacement and distance covered when it rolls from A to B, then to C [i.e., A to B to C] and
 (ii) Finally comes back to A (i.e., A to A) (Take A as the reference point)

(Board Term I, 2012 Set-033)

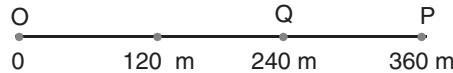
Ans. (a) See Q 15. (a) (LAQ)

(b) (i)	Distance	Displacement
A to B	10 m	10 m
A \rightarrow B \rightarrow C	$10 + 2 = 12 \text{ m}$	$10 - 2 = 8 \text{ m}$
(ii) A \rightarrow A	$10 + 10 = 20 \text{ m}$	0 m

(CBSE Marking Scheme, 2012) $2 + 3$

Q. 6. (a) Differentiate between average velocity and average speed.

- (b) A car is moving along a straight line OP as shown below. It moves from O to P in 18 s and returns from P to Q in 6 s. What are the average velocity and average speed of the car in going (i) from O to P (ii) from O to P and back to Q.



(Board Term I, 2012 Set-035)

Ans. (a) The average speed of an object is obtained by dividing the total distance travelled by the total time taken while average velocity is given by the arithmetic mean of initial velocity and final velocity for a given period of time.

$$(b) (i) \text{ Average velocity} = \frac{\text{total displacement}}{\text{total time}}$$

$$= \frac{360}{18} = 20 \text{ m/s}$$

$$\text{Average speed} = \frac{\text{total distance covered}}{\text{total time}}$$

$$= \frac{360}{18} = 20 \text{ m/s}$$

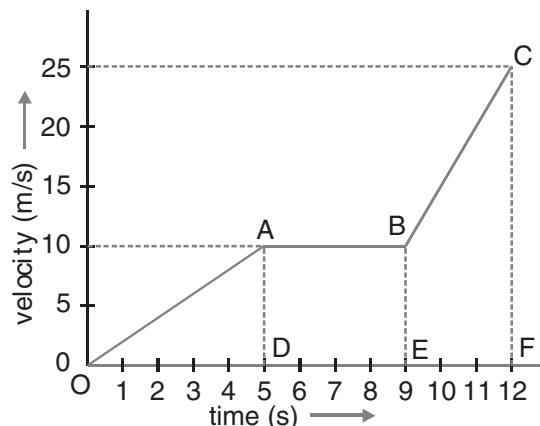
$$(ii) \text{ Average velocity} = 240 / 24 = 10 \text{ m/s}$$

$$\text{Average speed} = 480 / 24 = 20 \text{ m/s}$$

$1 + 1 + 1 + 1 + 1$

(CBSE Marking Scheme, 2012)

- Q. 7.** (a) Find out acceleration over each of the intervals OA, AB and BC.



- (b) Calculate distance covered in last 3 seconds.

(Board Term I, 2012 Set-045)

Ans. (a) Acceleration :

$$a (\text{OA}) = \frac{(10 - 0)}{5} = 2 \text{ m/s}^2$$

$$a (\text{AB}) = 0 \text{ (uniform motion)}$$

$$a (\text{BC}) = \frac{(25 - 10)}{3} = 5 \text{ m/s}^2$$

(b)

$$\begin{aligned} S &= \text{Area of trapezium BCEF} \\ &= \frac{1}{2} \times (\text{BE} + \text{CF}) \times \text{EF} \\ &= \frac{1}{2} \times (10 + 25) \times 3 \\ &= 52.5 \text{ m} \quad 3+2 \end{aligned}$$

(CBSE Marking Scheme, 2012)

- Q. 8. (a) Differentiate between distance and displacement.
 (b) Under what condition is distance and the magnitude of the displacement equal?
 (c) The minute hand of a wall clock is 10 cm long. Find its displacement and the distance covered from 10 am to 10.30 am.

(Board Term I, 2012 Set-074)

- Ans. (a) See Q. 15(a) (LAQ).
 (b) Distance and magnitude of displacement are equal if an object is travelling on a straight line in one direction.
 (c) Length of the minute hand (l) = 10 cm
 Distance covered by minute hand from 10 am to 10 : 30 am
 $= \frac{1}{2} \times \text{circumference of circle of radius } 10 \text{ cm}$
 $= \frac{1}{2} \times 2\pi r = \frac{22}{7} \times 10 = \frac{220}{7} = 31.43 \text{ cm}$

Displacement = Diameter of circle of radius 10 cm
 $= 2r = 20 \text{ cm}$ 2+3

- Q. 9. (i) Define circular motion. (ii) What is the difference between uniform motion in a straight line and circular motion? (iii) An athlete completes one round of a circular track of diameter 200 m in 40 sec. What will be the distance covered and the displacement at the end of 2 min and 20 sec?

(Board Term I, 2012 Set-077)

- Ans. (i) The motion of the body moving around a fixed point in a circular path.

S. No.	Uniform motion in straight line	Uniform in circular motion
(a)	The direction of motion of object does not change.	Direction changes continuously.
(b)	If an object moves with a constant speed its acceleration is zero.	Acceleration is not zero even on moving with constant speed.

(iii) Diameter of track = 200 m

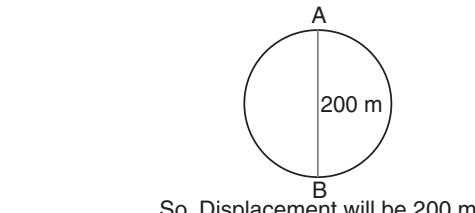
Radius = 100 m

The distance covered in

$$\begin{aligned} 40 \text{ sec} &= 2\pi r \\ &= 2\pi \times 100 = 200\pi \end{aligned}$$

The distance covered in 2 min 20 sec (140 sec)

$$= \frac{200}{40} \pi \times 140 = 700\pi \text{ m}$$



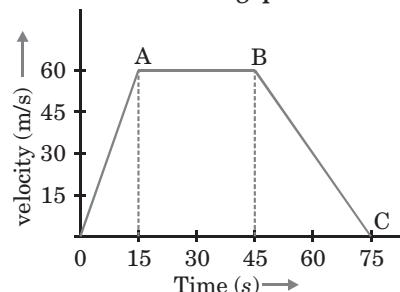
So, Displacement will be 200 m

No. of complete rounds covered by athlete

$$\frac{700\pi}{200\pi} = 3\frac{1}{2}$$

He covers $3\frac{1}{2}$ rounds. 1+2+2

- Q. 10. Study the velocity time graph of a car given below and answer the following questions.



- (a) State the type of motion represented by OA, AB, and BC.
 (b) Calculate the acceleration of car :
 (i) from O to A and (ii) from B to C.

(Board Term I, 2012 Set-065)

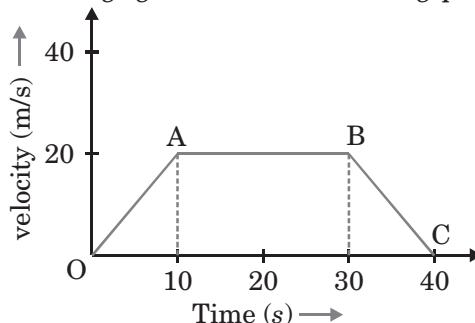
- Ans. (a) OA — uniformly accelerated motion.
 (b) AB — constant speed, hence uniform motion.
 (c) BC — motion with uniform (-) ve acceleration.
 (d) (i) Acceleration of car from O to A = $\frac{(60-0)}{(15-0)}$

$$= 4 \text{ m/s}^2$$

(ii) Negative acceleration of the car from B to C = $\frac{(60-0)}{(75-45)} = -2 \text{ m/s}^2$; Retardation :

$$2 \text{ m/s}^2$$
 (CBSE Marking Scheme, 2012) 3+2

- Q. 11. The velocity time graph of a body is shown in the following figure. Answer the following questions :



- (a) State the kind of motion represented by OA and AB
 (b) What is the velocity of the body after 10 s and after 40 s ?

- (c) Calculate the negative acceleration of the body.
 (d) Calculate the distance covered by the body between 10th and 30th second.

(Board Term I, 2012 Set-071)

- Ans.** (a) OA – Uniform acceleration, AB – zero acceleration/constant velocity.
 (b) 20m/s ; zero/body comes to rest
 (c) Retardation = $\frac{(0 - 20)}{(40 - 30)} = -2 \text{ ms}^{-2}$.
 (d) Distance between 10th and 30th second
 $= (30 - 10) \text{ s} \times 20 \text{ m/s} = 400 \text{ m}$ $1 + 2 + 1 + 1$
 (CBSE Marking Scheme, 2012)

- Q. 12.** Account for the following : (a) Name the quantity which is measured by the area occupied below the velocity-time graph. (b) An object is moving in a certain direction with an acceleration in the perpendicular directions. (c) Under what condition is the magnitude of average velocity of an object equal to its average speed ? (d) An example of uniformly accelerated motion. (e) A body is moving along a circular path of radius (R). What will be the distance and displacement of the body when it completes half revolution ?

(Board Term I, 2012 Set-016)

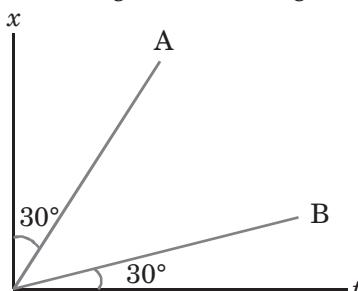
- Ans.** (a) Distance.
 (b) Motion of satellite.
 (c) When distance and displacement are equal.
 (d) The motion of a freely falling body.
 (e) Distance = Half the circumference
 $= \frac{2\pi R}{2} = \pi R$

$$\text{Displacement} = 2R. \quad 1 \times 5$$

(CBSE Marking Scheme, 2012)

- Q. 13.** Account for the following :

- (a) What is the shape of the path of a body when it is in uniform motion ?
 (b) Give one example of non-uniform motion.
 (c) Two cars A and B have their x-t graphs as shown in figure. Which has greater velocity ?



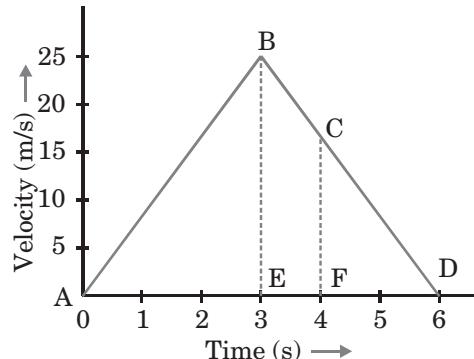
- (d) What is the quantity which is measured by the area occupied below the velocity-time graph ?
 (e) A body is moving with a velocity of 10 m/s. If the motion is uniform, what will be the velocity after 10 s ?

(Board Term I, 2012 Set-016)

- Ans.** (a) A straight line.
 (b) Bus moving on a hilly road.
 (c) 'A' since it is more steep, slope of velocity is more.
 (d) Magnitude of the displacement of a body.
 (e) Velocity = 10 m/s even after 10 s because motion is uniform. 1×5

(CBSE Marking Scheme, 2012)

- Q. 14.** Study the velocity-time graph and calculate :



- (a) The acceleration from A to B
 (b) The acceleration from B to C
 (c) The distance covered in the region ABE
 (d) The average velocity from C to D
 (e) The distance covered in the region BCFE

(Board Term I, 2012 Set-052)

$$\text{Ans. (a)} \quad a = \frac{(25 - 0)}{(3 - 0)} = 8.3 \text{ m/s}^2$$

$$\text{(b)} \quad a = \frac{(20 - 25)}{(4 - 3)} = -5 \text{ m/s}^2$$

$$\text{(c)} \quad \text{Distance} = \text{Area of triangle ABE} = \frac{1}{2} \times 3 \times 25 \\ = 37.5 \text{ m}$$

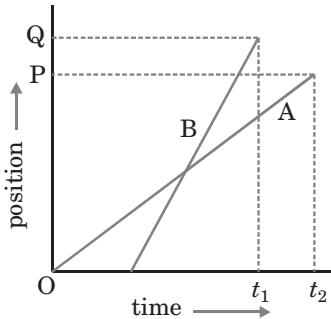
$$\text{(d)} \quad V = \frac{(20 - 0)}{2} = 10 \text{ m/s}$$

$$\text{(e)} \quad \text{This Distance} = \text{Area of trapezium BCFE} \\ = \frac{1}{2}(25 + 20) \times (4 - 3) = 22.5 \text{ m} \quad 1 \times 5$$

(CBSE Marking Scheme, 2012)

- Q. 15.** (a) Give two differences between distance and displacement. The position time graph for children 'A' and 'B' returning from their school 'O' to their homes 'P' and 'Q' returning are shown in fig. From the graph find :

- (i) Which of the two 'A' or 'B' lives closer to school ?
 (ii) Which of the two 'A' or 'B' starts earlier from school ?
 (iii) Which of the two 'A' or 'B' walks faster ?



- (b) The speed of a car increases from 18 km/h to 36 km/h in 10 seconds. Find its acceleration.
(Board Term I, 2012 Set-054)

Ans.

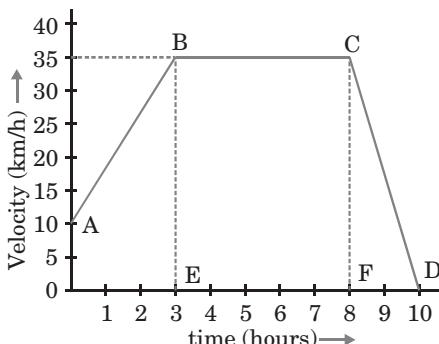
S. No.	Distance	Displacement
1.	Distance is the length of the actual path covered by an object, irrespective of its direction of motion.	Displacement is the shortest distance between the initial and final positions of an object in a given direction.
2.	Distance is a scalar quantity.	Displacement is a vector quantity.
3.	Distance covered can never be negative. It is always positive or zero.	Displacement may be positive, negative or zero.
4.	Distance between two given points may be same or different for different paths chosen.	Displacement between two given points is always the same.

(any 2)

- (i) A (ii) A (iii) B.
(b) $u = 18 \text{ km/h} = 5 \text{ m/s}$ $v = 36 \text{ km/h} = 10 \text{ m/s}$,
 $t = 10 \text{ s}$
 $a = (10 - 5)/10 = 0.5 \text{ m/s}^2$

(CBSE Marking Scheme, 2012)

Q. 16.



- (a) What is the initial speed of the car?
(b) What is the maximum speed attained by the car?
(c) Which part of the graph shows zero acceleration?

- (d) Which part of the graph shows varying negative acceleration?

- (e) Find the distance travelled by the car in first eight hours? (Board Term I, 2012 Set-064)

Ans. (a) 10 km/h

(b) 35 km/h

(c) BC

(d) CD

(e) Distance travelled in first eight hours = Area of trapezium OABE + area of rectangle EBCF

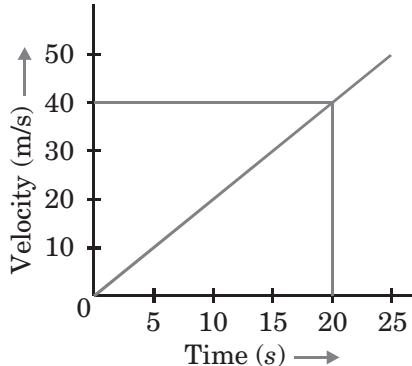
$$= \frac{1}{2} (10 + 35) \times 3 + 35 \times 5$$

$$= 242.5 \text{ km}$$

1 + 1 + 1 + 2

(CBSE Marking Scheme, 2012)

Q. 17.



Answer the following questions with reason :

- (a) State the kind of motion that the above graph represents.
(b) Which quantity is represented by the slope of the graph? Obtain it from graph.
(c) Which quantity is represented by the area under the graph?
(d) Calculate the distance travelled by the object in 15 seconds. (Board Term I, 2012 Set-073)

Ans. (a) Uniformly accelerated motion because velocity is increasing by equal amounts in equal intervals of time.

(b) Quantity is acceleration.

$$\text{Acceleration} = \frac{y - \text{axis}}{x - \text{axis}}$$

$$\text{Acceleration} = \frac{\text{velocity}}{\text{time}}$$

$$(c) \text{Area of triangle} = \frac{1}{2} \times \text{height} \times \text{base}$$

$$= \frac{1}{2} \times \text{velocity} \times \text{time}$$

$$(d) \text{Distance (s)} = \text{Area under the graph}$$

$$(s) = \frac{1}{2} \times 15 \times 30 = 225 \text{ m}$$

(CBSE Marking Scheme, 2012) 1 + 1 + 1 + 2

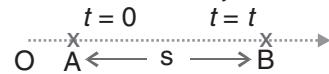


TOPIC-2 Equations of Motion

QUICK REVIEW

- **First Equation of Motion :**

Consider a particle moving along a straight line with uniform acceleration ' a '. At $t = 0$, let the particle be at A and u be its initial velocity and when $t = t$, v be its final velocity.



$$\text{Acceleration} = \frac{\text{change in velocity}}{\text{time}} = \frac{v-u}{t}$$

$$\Rightarrow a = \frac{v-u}{t}$$

$$v-u = at$$

$$v = u + at$$

(Ist equation of motion)

- **Second Equation of Motion :**

$$\text{Average velocity} = \frac{\text{total distance travelled}}{\text{total time taken}}$$

$$\text{Average velocity} = \frac{s}{t} \quad \dots(1)$$

$$\text{Average velocity can also be written as } \frac{u+v}{2} \quad \dots(2)$$

$$\text{From equations (1) and (2)} \quad \frac{s}{t} = \frac{u+v}{2} \quad \dots(3)$$

The first equation of motion is $v = u + at$. Substituting the value of v in equation (3), we get

$$\frac{s}{t} = \frac{u+u+at}{2}$$

$$\text{or} \quad s = \frac{(u+u+at)t}{2}$$

$$\text{or} \quad s = ut + \frac{1}{2} at^2 \quad \text{(II equation of motion)}$$

- **Third Equation of Motion :**

The first equation of motion is $v = u + at$

$$v-u = at \quad \dots(1)$$

$$\text{Average velocity} = \frac{s}{t} \quad \dots(2)$$

$$\text{Average velocity} = \frac{u+v}{2} \quad \dots(3)$$

From equation (2) and equation (3) we get,

$$\frac{u+v}{2} = \frac{s}{t} \quad \dots(4)$$

Multiplying equation (1) and equation (4) we get,

$$(v-u)(v+u) = at \times \frac{2s}{t}$$

$$(v-u)(v+u) = 2as$$

$$v^2 - u^2 = 2as$$

$$[a^2 - b^2 = (a+b)(a-b)]$$

(III equation of motion)

Very Short Answer Type Questions

1 Mark each

Q. 1. Why is the motion of a circulating fan non-uniform?

Ans. The motion of a circulating fan is non-uniform because the direction of motion changes at every point. 1

Q. 2. Give one example of a body whose average velocity is zero.

Ans. When the body returns back to initial point, e.g., when an athlete returns back to starting point, his average velocity is zero. 1

Q. 3. Give one example of a body whose average speed is zero.

Ans. Average speed of a moving body can never be zero. 1

Short Answer Type Questions-I

2 Marks each

Q. 1. A bridge is 500 m long. A 100 m long train crosses the bridge at a speed of 30 m/s. Find the time taken by train to cross it.

Ans. Total length of path covered by train

$$= 500 \text{ m} + 100 \text{ m}$$

$$= 600 \text{ m}$$

$$\text{Speed of train} = 30 \text{ m/s.}$$

Time taken by train to cover the bridge

$$= \frac{\text{distance}}{\text{speed}}$$

$$= \frac{600}{30} = 20 \text{ sec.}$$

Ans. From the graph,

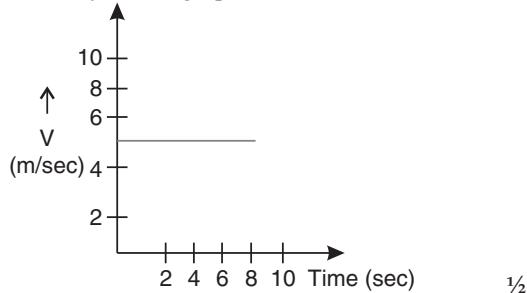
$$\text{Velocity after } 2\text{s} = \frac{10}{2} = 5 \text{ m/s}$$

$$\text{Velocity after } 4\text{s} = \frac{20}{4} = 5 \text{ m/s}$$

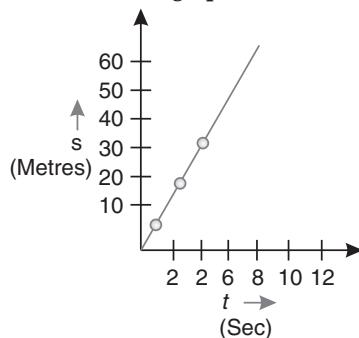
$$\text{Velocity after } 6\text{s} = \frac{30}{6} = 5 \text{ m/s}$$

e.g. Velocity is constant, acceleration = 0

So velocity – time graph will be drawn as : 1½



Q. 2. Make a velocity – time graph from the following displacement – time graph.



Q. 3. Why is the motion of satellites around their planets considered an accelerated motion?

Ans. Satellites revolve around their planets in almost circular orbits with constant speed. Thus, during their motion, the speed remains constant, while the direction of motion changes continuously. As a result, there is a change in their velocity. Therefore, the motion of satellites around their planets is considered as accelerated motion. 2

Short Answer Type Questions-II

3 Marks each

Q. 1. A motor cycle moving with a speed of 5 m/s obtains an acceleration of 0.2 m/s^2 . Calculate the speed of the motor cycle after 10 seconds, and the distance travelled by it in this time.

(Board 2014, Set MNM9GZH)

Ans. Here, $u = 5 \text{ m/s}$, $a = 0.2 \text{ m/s}^2$, $t = 10 \text{ s}$, $s = ?$, $v = ?$

From,

$$v = u + at$$

$$= 5 + 0.2 \times 10$$

$$= 7 \text{ m/s}$$

From,

$$v^2 = u^2 + 2as$$

$$7^2 = 5^2 + 2 \times 0.2 \times s$$

$$49 = 25 + 0.4s$$

$$49 - 25 = 0.4s$$

$$0.4s = 24$$

$$s = 24 / 0.4$$

$$s = 60 \text{ m}$$

(CBSE Marking Scheme, 2014) 3

Q. 2. (a) Define weight of a body. Mention the direction in which it acts.

(b) A stone is thrown vertically upwards with an initial velocity of 40 ms^{-1} . Find the maximum height reached by the stone. What is the net displacement and the total distance covered by the stone? (Given g = 10 ms^{-2})

(DDE 2014; Board 2013, Set-OAJHD6N)

Ans. (a) Weight of an object is the force with which a body is attracted towards the earth. Its direction is vertically downwards. **1**

(b) Final velocity = 0, Initial velocity = 40 ms^{-1}

$$\begin{aligned} v^2 &= u^2 + 2gh \\ v^2 - u^2 &= 2gh \\ \frac{v^2 - u^2}{2g} &= h \\ \therefore h &= \frac{(0)^2 - (40)^2}{2 \times 10} \\ &= \frac{+40 \times 40}{+2 \times 10} = 80 \text{ m.} \quad \mathbf{1} \end{aligned}$$

As the directions are opposite and the stone returns back to origin, displacement is Zero. **½**

Total distance covered = $80 + 80 = 160 \text{ m.}$ **½**

(CBSE Marking Scheme, 2014)

Q. 3. A cheetah can accelerate from rest at the rate of 4 m/s^2 .

(a) What will be the velocity attained by it in $10 \text{ s}?$

(b) How far will it travel in this duration ?

(7ZTHA8G, 2013)

Ans. (a) Initial velocity (u) = 0, acceleration (a) = 4 m/s^2

$$\begin{aligned} v &= u + at \\ &= 0 + 4 \times 10 \quad \mathbf{1\frac{1}{2}} \\ v &= 40 \text{ m/s.} \end{aligned}$$

$$\begin{aligned} (b) \quad v^2 &= u^2 + 2as \\ v^2 &= (0)^2 + 2as \\ v^2 &= 2as \\ s &= \frac{v^2}{2a} = \frac{40 \times 40}{2 \times 4} \\ &= \frac{1600}{8} = 200 \text{ m.} \quad \mathbf{1\frac{1}{2}} \end{aligned}$$

(CBSE Marking Scheme, 2014)

Q. 4. A truck is moving on a straight road with uniform acceleration. The following table gives the speed of the truck at various instances of time.

Speed (m/s)	Time (s)
5	0
10	10
15	20
20	30
25	40
30	50

Draw the speed-time graph by choosing a convenient scale. Determine from it :

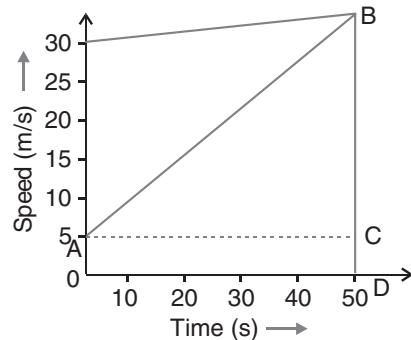
(i) The acceleration of truck.

(ii) The distance travelled by the truck in 50 seconds. (Board Term I, 2012 Set-015; 16)

Ans. Graph of the table : Draw X - axis and Y - axis on the graph with appropriate scale.

Let 1 cm = 10 s on X-axis.

Let 1 cm = 5 m on Y-axis.



(i) Acceleration means slope of graph AB

$$BC/AC = \frac{30-5}{50-0} = \frac{25}{50} = 0.5 \text{ m/s}^2$$

(ii) Distance travelled by truck = Area of trapezium OABD

$$\begin{aligned} &= \frac{1}{2} (AO + BD) \times OD \\ &= \frac{1}{2} (5+30) \times 50 = 875 \text{ m} \quad \mathbf{1+1} \end{aligned}$$

Q. 5. A car travelling at a speed of 10 m/s is brought to rest in 20 seconds by applying brakes. Calculate the acceleration and distance travelled during this time. (Board Term I, 2012 Set-015; 041)

Ans. $v = 0;$ $u = 10 \text{ m/s}$ $t = 20 \text{ sec.}$

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

$$\Rightarrow a = \frac{(0-10)}{20} = -0.5 \text{ m/s}^2$$

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

$$= 10 \times 20 + \frac{1}{2} \times -0.5 \times 20 \times 20 = 100 \text{ m}$$

(CBSE Marking Scheme, 2012) **1½ + 1½**

Q. 6. Define uniformly accelerated motion and uniform motion. Also write any two equations of uniformly accelerated motion.

(Board Term I, 2012 Set-015; 056)

Ans. When a body travels equal distances in equal intervals of time, its motion is called uniform motion.

If an object travels in a straight line and its velocity increases or decreases by equal amounts in equal intervals of time, then the acceleration of the object is said to be uniform and motion is said to be uniformly accelerated motion.

Equations : $v = u + at$ and $v^2 = u^2 + 2as$ **2 + 1**

(CBSE Marking Scheme, 2012)

Q. 7. A bus decreases its speed from 80 km/h to 60 km/h in 5 s. Find the acceleration of the bus.
(NCERT Based)

Ans. Given,

$$\text{Initial speed of bus } (u) = 80 \text{ km/h}$$

$$= 80 \times \frac{1000}{(60 \times 60)}$$

$$= \frac{800}{36} \frac{\text{m}}{\text{s}} = 22.22 \text{ m/s} \quad 1$$

$$\text{Final speed of bus } (v) = 60 \text{ km/h}$$

$$= 60 \times \frac{1000}{3600}$$

$$= \frac{600}{36} \frac{\text{m}}{\text{s}} = 16.66 \text{ m/s} \quad 1$$

$$\text{Time taken } (t) = 5 \text{ s}$$

$$\text{Since } v = u + at$$

$$a = \frac{(v-u)}{t}$$

$$= \frac{16.66 - 22.22}{5}$$

$$= -1.11 \text{ m/s}^2 \quad 1$$

- Q. 8.** (a) Name the type of motion in which speed remains constant but the velocity of body changes.
(b) Name the physical quantity which changes continuously during uniform circular motion.
(c) Is the motion of satellite around the earth uniform or accelerated ?

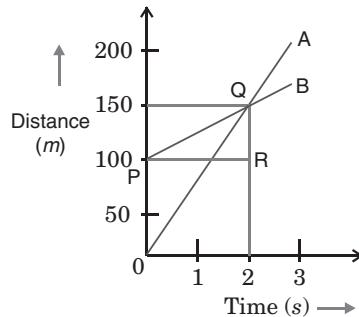
Ans. (a) Accelerated motion.

(b) Velocity of a particle.

(c) Motion of satellite is accelerated because during their motion, the speed remains constant while the direction of motion changes continuously.

1 + 1 + 1

- Q. 9.** The distance – time graph of two trains are given below. The trains start simultaneously in the same direction.



(i) How much is B ahead of A when the motion starts ?

(ii) What is the speed of B ?

(iii) When and where will A catch B ?

(iv) What is the difference between speed of A and B ?

(v) Is the speed of both the trains uniform or non-uniform ? Justify your answers.

Ans. (i) 100 m as OP = 100 m.

(ii) Speed of B = Slope of PQ = $\frac{150 - 100}{2 - 0} = 25 \text{ m/s}$

(iii) A and B meet at Q i.e., 150 m from origin and 2s after the start.

(iv) Speed of A = Slope of OQ = $\frac{150}{2} = 75 \text{ m/s}$.

(v) Speed of both the trains is uniform as s – t graph is a straight line. 1 + 1 + 1

- Q. 10.** Express average velocity when the velocity of a body changes at a non-uniform rate and a uniform rate.

Ans. When the velocity of a body changes at a non-uniform rate, its average velocity is found by dividing the net displacement covered by the total time taken.

$$\text{i.e., Average velocity} = \frac{\text{Net displacement}}{\text{Total time taken}} \quad 1\frac{1}{2}$$

In case the velocity of a body changes at a uniform rate, then the average velocity is given by the arithmetic mean of initial velocity and final velocity for a given period of time.

$$\text{i.e., Average velocity}$$

$$= \frac{\text{Initial velocity} + \text{final velocity}}{2}$$

1½

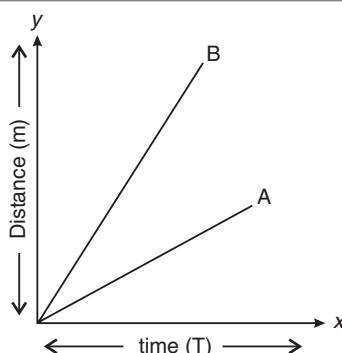
Long Answer Type Questions

5 Marks each

- Q. 1.** (a) Derive the equation of motion, $S = ut + \frac{1}{2}at^2$

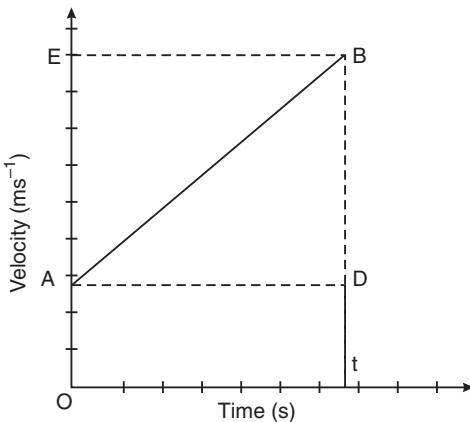
by graphical method.

- (b) Which of the two bodies A and B in the following graph is moving with higher speed and why ?



(Board 2015, LOV7LN75)

Ans. (a) Let us consider that the object has travelled a distance S in time t under uniform acceleration a .



As in the graph, the distance travelled by the object is obtained by the area enclosed within OABC under the velocity-time graph AB.
Thus, the distance S travelled by the object is given by

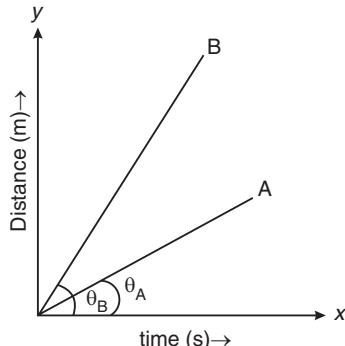
$$\begin{aligned} S &= \text{area OABC (which is trapezium)} \\ &= \text{area of the rectangle OADC} + \text{area of the triangle ABD} \\ &= OA \times OC + \frac{1}{2} (AD \times BD) \end{aligned}$$

Substituting $OA = u$, $OC = AD = t$ and $BD = at$, we get

$$S = u \times t + \frac{1}{2}(t \times at)$$

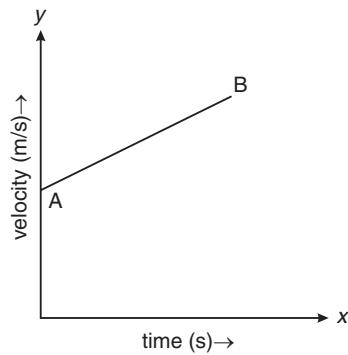
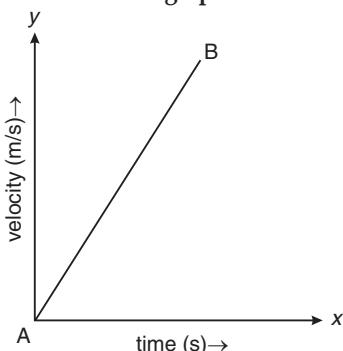
$$\text{or } S = ut + \frac{1}{2}at^2$$

(b)



Speed of the body is directly proportional to θ . Larger the value of θ , the greater is the speed of the body. Thus, B moves with higher speed. 5

Q. 2. (a) Give one similarity and one dissimilarity between the two graphs.



(b) What do you understand by the term acceleration? What is meant by its being positive or negative? Explain with example. Write its SI units? (Board 2015, Set-LOV7LN7)

Ans. (a) **Similarity :** Both the graphs show uniform acceleration.

Dissimilarity : In first graph the body starts from rest ($u = 0$) while in second graph the initial velocity is non-zero ($u \neq 0$).

(b) Acceleration of a body is defined as the rate of change of its velocity with time.

$$\text{Acceleration} = \frac{\text{Change in velocity}}{\text{Time taken for change}}$$

The acceleration is taken to be positive if it is in the direction of velocity. **Example :** a bus moving with increasing speed.

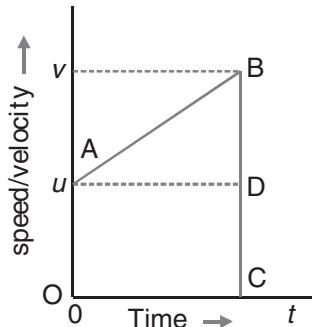
The acceleration is taken to be negative when it is opposite to the direction of light. **Example :** when the brake is applied, the speed of car decreases. The SI unit is ms^{-2} 2 + 3

Q. 3. (i) Using velocity time graph derive : $v^2 - u^2 = 2as$.

(ii) A ball is gently dropped from a height of 20 m. If its velocity increases uniformly at the rate of 10 m/s, with what velocity will it strike the ground?

(DDE-2014; Board Term I, 2012 Set-077)

Ans. (i) The speed-time (or velocity-time) graph for a body under uniform acceleration is given in the fig. as :



Derivation of the third equation of motion :
Equation for position-velocity relation.

Distance travelled,

$s = \text{area of the trapezium OABC}$

$$s = \frac{1}{2} (\text{sum of the parallel sides}) \times \text{perpendicular distance between the two parallel sides}$$

distance between the two parallel sides

$$\text{or, } s = \frac{1}{2} (\text{OA} + \text{BC}) \times \text{OC}$$

Putting the values of OA, BC and OC, we get

$$s = \frac{1}{2} (u + v) \times t \quad \dots(1)$$

As we know, $v = u + at$

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

Putting the value of t in equation (1), we get

$$s = \frac{1}{2} (u + v) \times \left(\frac{(v-u)}{a} \right)$$

$$\text{or, } 2as = (u + v)(v - u) = v^2 - u^2$$

$$\text{or, } 2as = v^2 - u^2$$

This is the third equation of motion.

$$\begin{aligned} \text{(ii)} \quad & u = 0; \quad s = 20 \text{ m} \quad a = 10 \text{ m/sec}^2 \quad v = ? \\ & v^2 = u^2 + 2as \\ & v^2 = 0 + 2 \times 10 \times 20 \\ & v^2 = 400 \\ & v = 20 \text{ m/sec} \end{aligned} \quad 4+1$$

- Q. 4.** (a) When will you say a body is in :
 (i) Uniform acceleration.
 (ii) Non-uniform acceleration ?
 (b) A train starts from rest and accelerates uniformly for 30 s to acquire a velocity of 108 km/h. It travels with this velocity for 20 min. The driver now applies brakes and the train retards uniformly to stop after 20 s. Find the total distance covered by the train.
 (Board Term I 2013, 7ZTHA8G)

- Ans.** (a) (i) A body is in uniform acceleration if it travels in a straight path when its velocity increases or decreases by equal time intervals.
 (ii) A body is in non-uniform acceleration if it travels in a straight path when its velocity increases or decreases by unequal amount in equal time intervals.

- (b) When train starts from rest,

$$\begin{aligned} u &= 0, t = 30 \text{ s}, v = 108 \text{ km/h} \\ &= 108 \times \frac{5}{18} = 30 \text{ m/s}. \end{aligned}$$

$$a = \frac{v-u}{t} = 1 \text{ m/s}^2.$$

$$\begin{aligned} \text{Distance } S_1 &= ut + \frac{1}{2} at^2 \\ &= 0 + \frac{1}{2} \times 1 \times 30 \times 30 \\ &= 450 \text{ m}. \end{aligned}$$

At uniform velocity of 30 m/s for 20 min = 1200 s,

$$\text{Distance } S_2 = 30 \times 1200 = 36000 \text{ m}.$$

On applying brakes,

$$t = 20 \text{ s}, u = 30 \text{ m/s}, v = 0$$

$$a = \frac{v-u}{t} = \frac{0-30}{20} = -1.5 \text{ m/s}^2$$

$$\text{Distance } S_3 = \frac{v^2 - u^2}{2a} = \frac{0-(30)^2}{2 \times -1.5} = 300 \text{ m}$$

$$\text{Total distance} = S_1 + S_2 + S_3$$

$$= 450 + 36000 + 300$$

$$= 36750 \text{ m.} \quad 2+3$$

- Q. 5.** (a) Write three advantages of velocity-time graph.
 (b) A bus starting from rest moves with a uniform acceleration of 0.1 m/s^2 for 2 minutes. Find the speed acquired, and the distance travelled.
 (Board Term I 2012; Set-070)

- Ans.** (a) Advantages :

- (i) It helps to determine the total time.
- (ii) It helps to determine distance travelled, instantaneous velocity
- (iii) It helps to determine acceleration of the object. (any three)

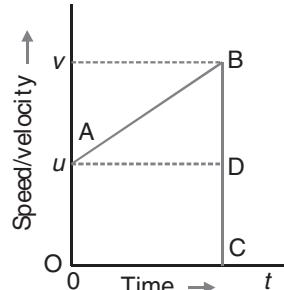
- (b) $u = 0, a = 0.1 \text{ m/s}^2, t = 2 \text{ min} = 120 \text{ s}$.
 speed acquired $v = ?$ distance travelled $s = ?$
 From $v = u + at$
 $v = 0 + 0.1 \times 120 = 12 \text{ m/s}$

$$\begin{aligned} \text{From } s &= ut + \frac{1}{2} at^2 \\ &= 0 \times 120 + \frac{1}{2} \times 0.1 \times 120 \times 120 \\ &= 720 \text{ m} \end{aligned} \quad 3+2$$

(CBSE Marking Scheme, 2012)

- Q. 6.** (a) Draw velocity-time graph for a body starting its motion with a velocity "u" and under uniform acceleration "a" it acquires a velocity "v" in time "t".
 (b) Using above graph, derive II equation of motion for position-time relation.
 (c) Explain how is it possible for an object to move with a constant speed but with uniform acceleration. (Board Term I, 2012 Set-034; 78)

- Ans.** (a) The speed time (or velocity-time) graph for a body under uniform acceleration is given in the fig. as :



- (b) Derivation of second equation of motion :
 Equation for position-time relation –
 Distance travelled,
 $s = \text{area of the trapezium OABC}$
 or,
 $s = (\text{area of the triangle ABD}) + \text{area of the rectangle OADC}$

$$\begin{aligned}
 s &= \left(\frac{1}{2} \times \text{base} \times \text{height}\right) \\
 \text{or,} \quad &+ (\text{length} \times \text{breadth}) \\
 s &= \left(\frac{1}{2} \times \text{AD} \times \text{BD}\right) + (\text{OC} \times \text{OA}) \\
 &\dots(1)
 \end{aligned}$$

From the figure,

$$\begin{aligned}
 \text{AD} &= \text{OC} = t \\
 \text{BD} &= (\text{BC} - \text{DC}) = (v - u) \\
 &= (u + at - u) = at \\
 \text{OA} &= u
 \end{aligned}$$

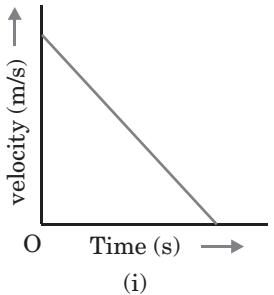
Putting these above values in equation (1), we get

$$\begin{aligned}
 s &= \left(\frac{1}{2} \times t \times at\right) + (t \times u) \\
 s &= ut + \frac{1}{2}at^2
 \end{aligned}$$

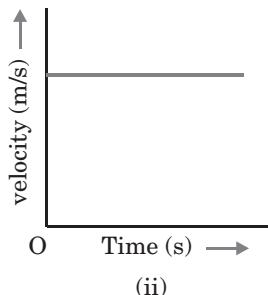
This is the second equation of motion.

- (c) Motion in circular path with constant speed since direction of velocity changes at every point, acceleration is uniform $1 + 3 + 1$

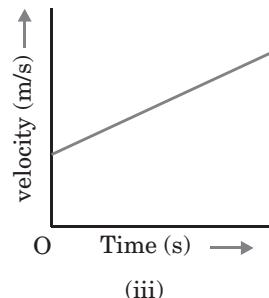
Q. 7. (a) Identify the following graphs and answer the questions :



(i)



(ii)



(iii)

- (i) Which of the graphs indicate negative acceleration? Why?
(ii) What do you infer from the graph where velocity time graph is parallel to the time axis?
(iii) Which of the graphs represent a body moving with initial velocity not equal to zero but with constant acceleration? Justify your answer.

- (b) A bus starting from rest moves with a uniform acceleration 0.1m/s^2 for 2 minutes. Find :
(i) the speed acquired
(ii) the distance travelled.

(Board Term I, 2012 Set-071)

Ans. (a) (i) Graph I; since velocity decreases with time.
(ii) Since velocity is constant the acceleration of the body is zero.
(iii) Graph III; since the velocity-time graph does not pass through the origin.

$$\begin{aligned}
 \text{(b)} \quad v &= u + at, v = 0 + 0.1 \times 120 = 12 \text{ m/s.} \\
 \text{As } s &= ut + \frac{1}{2}at^2, 0 + \frac{(0.1 \times 120 \times 120)}{2} \\
 &= 720 \text{ m}
 \end{aligned}$$

(CBSE Marking Scheme, 2012)

Value Based Questions

Q. 1. Arvind was travelling from Agra to Delhi by his car for a meeting. He had to reach the destination in the given time. So he kept a track of the Odometer and his watch all through the journey to decide upon his speed. This helped him to reach on time for the meeting.

- (i) What measuring devices were used by Arvind?
(ii) What qualities of Arvind are praiseworthy?
(iii) Why did Arvind measure the distance and time?

Ans. (i) Odometer (to measure distance) and his wrist watch to measure time.

- (ii) Sincere, logical thinking, confidence and awareness.

- (iii) Arvind measured distance and time because this would help him to maintain appropriate average speed throughout his journey.

$1 + 1 + 1$

Q. 2. Graphs are an important part of our everyday life. It may not seem that way, but without graphs, we would have lost heaps of data. Without even knowing it, important decisions are made daily throughout the world based on what a graph can tell us.

- (a) What is the importance of graphs?
(b) Give two uses of graphs.

Ans. (a) To get a visual representation of things, to manage the data you have and to obtain those information about values you have not measured.

- (b) (i) Managing a company's data.
(ii) Present information easily and quickly.

$1 + 2$

Q. 3. Two boys start for a race and decide to find out who runs faster. Their sister tells them not to run on the roadside and run in the field. They both however make her stand aside and start with the race. Both

of them start their stopwatches to measure time and race together.

- (i) State the values of the sister.
- (ii) Which values of the boys will you appreciate?
- (iii) Which values of the boys should be changed?
- (iv) What role does stopwatch play in measuring speed?
- (v) How would you convince the boys not to race on roads?

- Ans.**
- (i) She is concerned, caring and sensible.
 - (ii) Boys are united, energetic and have sportive and scientific attitude.
 - (iii) Their tendency is adventurous which can be problematic sometimes.
 - (iv) Time taken to cover a given length of path is measured by stopwatch.
 - (v) Race on roads should be avoided by the boys as that might cause a severe accident.

1 + 1 + 1 + 1 + 1



KNOW THE LINKS

- en.wikipedia.org/wiki/motion
- www.physics4kids.com
- www.sourceforge.net
- www.physics.info/motion-equations



CHAPTER

6

FORCE AND LAWS OF MOTION

SYLLABUS

- *Force and motion; Newton's Laws of motion, Force and Acceleration, Inertia of a body, Inertia and mass, momentum. Elementary idea of conservation of momentum, action and reaction forces.*



TOPIC-1 Force, Motion and Acceleration

QUICK REVIEW

- Force is a push or pull acting upon an object.
- **Balanced forces :** The resultant of all the forces acting on a body is zero.
- **Unbalanced forces :** The resultant of all the forces acting on a body is not zero.
- **Newton's first law of motion** states that a body at rest will remain at rest and a body in motion will remain in uniform motion unless acted upon by an unbalanced force.
- The net force acting on the object is zero, whenever balanced forces act on it.
- The momentum of an object is the product of its mass and velocity and has the same direction as that of the velocity. Its SI unit is $\text{kg}\cdot\text{m}\cdot\text{s}^{-1}$.
- **Newton's second law of motion** states that the rate of change of momentum of a body is directly proportional to the force and takes place in the same direction as the force.
- Force is also defined as the product of mass and acceleration.
- The SI unit of force is $\text{kg}\cdot\text{m}\cdot\text{s}^{-2}$. This is also known as Newton and represented by the symbol N.
- A force of one Newton produced an acceleration of $1 \text{ m}\cdot\text{s}^{-2}$ on an object of mass 1 kg.
- Force of friction always opposes motion of objects.
- Two forces resulting from the interaction between two objects are called action and reaction forces respectively.
- Action and reaction forces act on two different bodies but they are equal in magnitude.
- **Newton's third law :** For every action there is an equal and opposite reaction; but action and reaction act on different bodies.

TOPIC - 1
Force, Motion and Acceleration P. 109

TOPIC - 2
Inertia and Conservation of Momentum P. 124

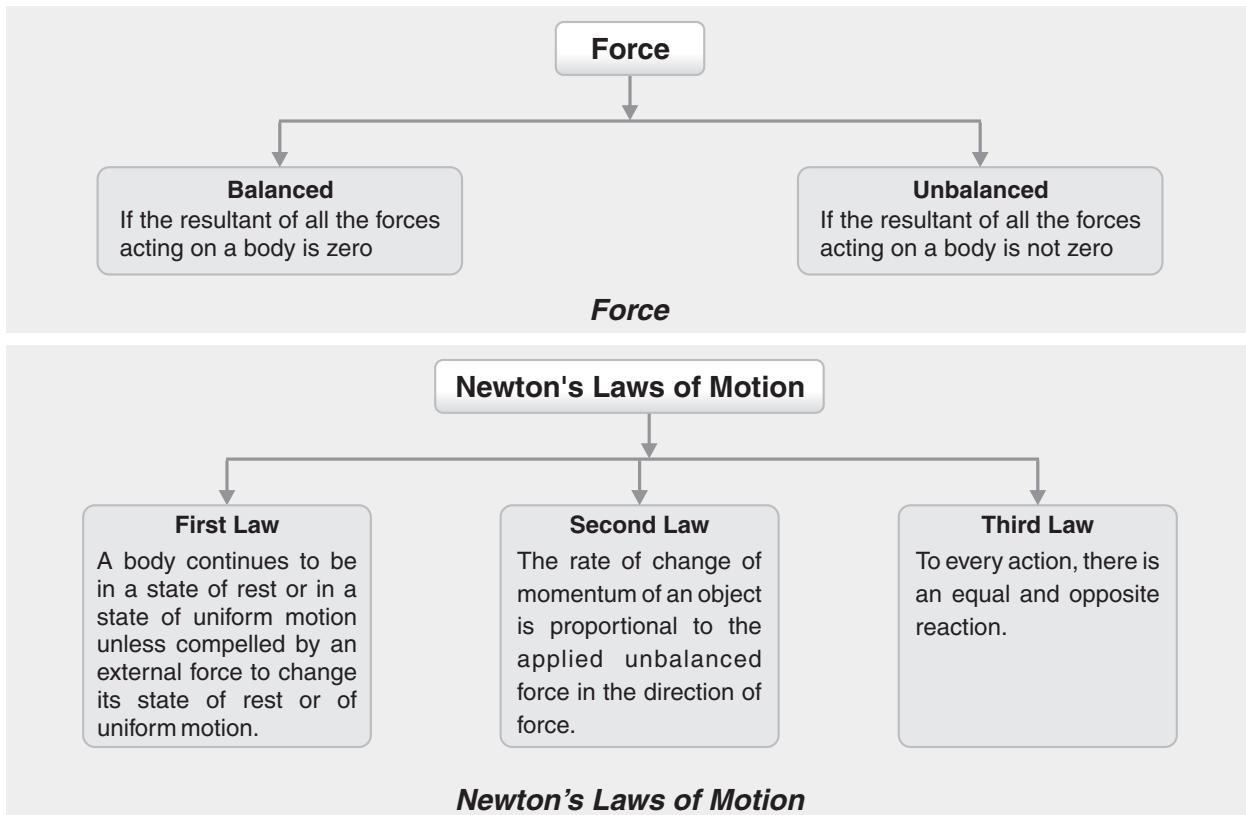


KNOW THE TERMS

- **Force :** A force is physical quantity which causes or tends to cause a motion in an object at rest or changes or tends to change the direction of motion of a moving object or changes or tends to change the size and shape of an object or changes or tends to change the speed of an object.
- **Balanced Force :** When two forces of equal magnitude acts in opposite directions on an object simultaneously, then the object continues in its state of rest or a uniform motion in a straight line. Such forces acting on the object are known as balanced force.

- **Unbalanced Force :** When two forces of unequal magnitudes act in opposite directions on an object simultaneously, then the object moves in the direction of a large force. These forces acting on the object are known as unbalanced force.
- **Momentum :** Momentum of a body is equal to the product of the mass (m) of the body and the velocity \vec{v} of the body. It is denoted by \vec{p} .
Momentum = mass \times velocity.
- **Recoil Velocity :** The velocity with which the gun moves backward after firing a bullet is known as recoil velocity.
- **Friction :** Whenever a body slides or rolls over the surface of another body, a force comes into action which acts in the opposite direction of the motion of a body. This opposing force is called 'friction'.
- **Resultant Forces :** The resultant force or resultant of several forces acting simultaneously on a body is that single force which produces the same effect on a body as all these forces together produce.

FLOWCHARTS



Very Short Answer Type Questions

1 Mark each

Q. 1. Calculate the net force acting on a bus boarded with passenger, of mass 2000 kg moving with a uniform velocity of 60 km/hr.

(Board 2014, Set LFS317K)

Ans. Since velocity is uniform, acceleration will be zero therefore net force is zero. ($F = ma$)

(CBSE Marking Scheme, 2014) 1

Q. 2. If a balloon filled with air and its mouth untied, the air is released from its mouth in the downward direction, and balloon moves upwards. Identify action and reaction in this case.

(Board 2014, Set MNM9GZH)

Ans. Release of air in downward direction is action. Movement of balloon in upward direction is reaction. (CBSE Marking Scheme, 2014) 1

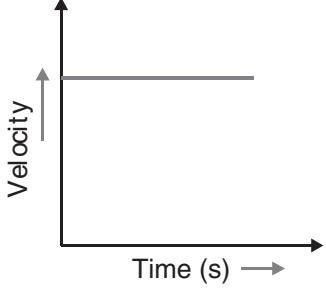
Q. 3. In a tug of war, the rope does not move in any direction. Why? (Board Term I 2013, OAHJD6N)

Ans. Because the forces applied by the two teams are equal and opposite.

(CBSE Marking Scheme, 2014) 1

Q. 4. Name the force which is responsible for change in position or state of an object.

(Board Term I, 2012 Set-015)

- Ans.** Unbalanced forces. 1
(CBSE Marking Scheme, 2012)
- Q. 5.** Name the unbalanced force which slows down a moving bicycle when we stop pedalling it.
(Board Term I, 2012 Set-020)
- Ans.** Force of friction.(CBSE Marking Scheme, 2012) 1
- Q. 6.** Why is it difficult for a fireman to hold a hose, which ejects large amount of water at a high velocity.
(Board Term I, 2012 Set-033)
- Ans.** Water is ejected from a hose with a large amount of force [action]. Hence as per Newton's III law there will be an equal and opposite force on the hose pipe making it difficult to hold. 1
(CBSE Marking Scheme, 2012)
- Q. 7.** Give one point of difference between balanced and unbalanced forces.
(Board Term I, 2012 Set-034)
- Ans.** When forces acting on a body from all sides are equal, they cancel effect of each other and are known as balanced forces. On the other hand, when forces acting on a body are not equal/do not cancel each other are called unbalanced forces. 1
(CBSE Marking Scheme, 2012)
- Q. 8.** Why does the sole of the shoe wears out ?
(Board Term I, 2012 Set-040)
- Ans.** Sole of the shoe wears out due to friction between sole of the shoes and earth's surface. 1
(CBSE Marking Scheme, 2012)
- Q. 9.** State the meaning of recoil velocity of a gun ?
(Board Term I, 2012 Set-042)
- Ans.** The velocity with which a gun moves backward after firing a bullet is called the recoil velocity of a gun. 1
(CBSE Marking Scheme, 2012)
- Q.10.** Mass of a body is doubled. How does its acceleration change under a given force ?
(Board Term I, 2012 Set-048)
- Ans.** Acceleration becomes half. 1
(CBSE Marking Scheme, 2012)
- Q. 11.** Mention any two kinds of changes that can be brought about in a body by force.
(Board Term I, 2012 Set-052)
- Ans.** Changing in speed/change of direction/change of shape. (any two) 1
(CBSE Marking Scheme, 2012)
- Q. 12.** State two effects, a force can produce in a non rigid body fixed at a position.
(Board Term I, 2012 Set-054)
- Ans.** Change its shape and size. 1
(CBSE Marking Scheme, 2012)
- Q. 13.** State an example, how force can change velocity of a body.
(Board Term I, 2012 Set-060)
- Ans.** By applying brakes we can slow down a car or any other relevant example. 1
(CBSE Marking Scheme, 2012)
- Q. 14.** Rakesh tries to push a box on a rough floor but is unable to move it. Name the force which balances the force applied by him.
(Board Term I, 2012 Set-061)
- Ans.** Force of friction. (CBSE Marking Scheme, 2012) 1
- Q. 15.** Given below are some measuring units of different physical quantities :
 $\text{kg} \cdot \text{ms}^{-2}$, ms^{-2} , $\text{kg} \cdot \text{ms}^{-1}$, ms^{-1} , $\text{kg} \cdot \text{m}^2 \text{s}^{-2}$.
Select the units which measure force and momentum respectively.
(Board Term I, 2012 Set-062)
- Ans.** $\text{kg} \cdot \text{ms}^{-2}$, $\text{kg} \cdot \text{m/s}$. ½ + ½
(CBSE Marking Scheme, 2012)
- Q. 16.** Why are the athletes in a high jump event made to fall either on a cushioned bed or on a sand bed ?
(Board Term I, 2012 Set-067)
- Ans.** To reduce the rate of change of momentum and hence the force. (CBSE Marking Scheme, 2012) 1
- Q. 17.** During the game of table tennis, if the ball hits a player it does not hurt him. On the other hand when a fast moving cricket ball hits a spectator it may hurt him. State the reason.
(Board Term I, 2012 Set-070)
- Ans.** The momentum of a cricket ball is larger than a table tennis ball so it hurts the spectator. 1
(CBSE Marking Scheme, 2012)
- Q. 18.** Velocity-time graph of a moving particle of mass 1 kg is shown in figure.
- 
- Is any force acting on the body ? Justify your answer.
(Board Term I, 2012 Set-074)
- Ans.** Acceleration = 0, $F = ma$. So, $F = 0$, force acting is zero. (CBSE Marking Scheme, 2012) 1
- Q. 19.** A force is applied on a metal block lying on floor in one direction. Still the block does not move. Name the force which is balancing it.
(Board Term I, 2012 Set-075)
- Ans.** Force of friction between metal surface and floor. (CBSE Marking Scheme, 2012) 1
- Q. 20.** Find the acceleration produced by a force of 12 N exerted on an object of mass 3 kg.
(Board Term I, 2012 Set-077)
- Ans.** $F = ma \Rightarrow 12 = 3 \times a$, $a = 12/3 = 4 \text{ m/s}^2$. 1
(CBSE Marking Scheme, 2012)

Q.21. What is the net momentum of gun and bullet system after firing ? (HOTS)

Ans. The momentum of gun and bullet system after firing is equal to initial momentum, i.e., zero, because no external force is acting. 1

Q.22. A body accelerates when balanced force acts on it. Is it true or false ? Why ?

Ans. It is false because momentum of a body changes only when, an unbalanced force acts on it. 1

Short Answer Type Questions-I

2 Marks each

Q.1. Derive Newton's first law of motion from the mathematical expression of the second law of motion. [Board 2015, Set-LOV7LN7]

Ans. Newton's first law states that a body stays at rest if it is at rest and moves with a constant velocity unit if a net force is applied on it. Newton's second law states that the net force applied on the body is equal to the rate of change in its momentum.

$$F = ma$$

$$\text{or } F = \frac{m(v-u)}{t}$$

$$\text{or } Ft = mv - mu$$

That is, when $F = 0$, $v = u$ for whatever time, t is taken. This means that the object will continue moving with uniform velocity, u throughout the time, t . If u is zero than v will also be zero, i.e., object will remain at rest. 2

Q.2. Why is it easier to stop a tennis ball in comparison to a cricket ball moving with the same speed ? (DDE 2014; Board 2010)

Ans. Tennis ball is lighter (less mass) than a cricket ball. Tennis ball moving with same speed has less momentum (mass \times velocity) than a cricket ball. It is easier to stop tennis ball having less momentum. 2

Q.3. Two objects having their masses in ratio 3 : 5 are acted upon by two forces each on one object. The forces are in the ratio of 5 : 3. Find the ratio in their accelerations. (Board 2011, 2010)

Ans. Since masses are in ratio 3 : 5.

Let the mass of the objects be $3x$ and $5x$.

Let F_1 and F_2 be the two forces with a_1 and a_2 accelerations.

$$F_1 = m_1 a_1 = 3x a_1$$

$$\text{and } F_2 = m_2 a_2 = 5x a_2$$

Since $F_1 : F_2 = 5 : 3$, we have

$$3x a_1 : 5x a_2 :: 5 : 3$$

$$\Rightarrow a_1 : a_2 = 5 \times 5 : 3 \times 3$$

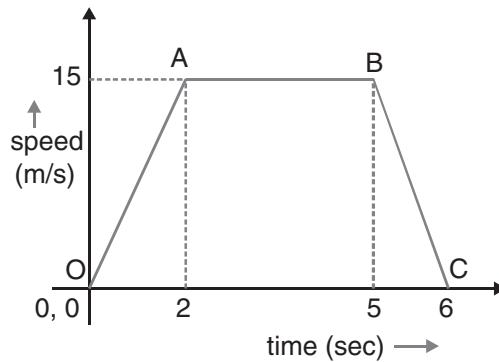
$$\Rightarrow a_1 : a_2 = 25 : 9$$
2

Q.4. The speed-time graph of a car is shown below. The car weighs 1000 kg.

(i) Find the distance covered by the car in first two seconds.

(ii) Find how much force is applied by the car brakes in the fifth second so that the car comes to a halt by sixth second.

(Board 2011; 2010)



Ans. Given, mass of the car (m) = 1000 kg

(i) As shown in graph,

Distance covered in first 2 secs

= Area of Δ inscribed in first 2 s.

$$= \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \frac{1}{2} \times 2 \times 15 = 15 \text{ m}$$

(ii) Force (F) = mass (m) \times acceleration (a)

Time taken by force to stop the car = $6 - 5 = 1$ second

Initial velocity (i.e., velocity at B) = 15 m/s

Final velocity (at point C) = 0 m/s

Using equation $v = u + at$

$$a = \frac{(v-u)}{t} = \frac{(0-15)}{1} = -15 \text{ m/s}^2$$

(– ve sign indicates that it is retardation)

Force applied by brakes = $1000 \times -15 = -15000 \text{ N}$

= -15 KN 2

Q.5. Using a horizontal force of 200 N, we intend to move a wooden cabinet across a floor at a constant velocity. What is the friction force that will be exerted on the cabinet ? (Board Term 1, 2011, 2010)

Ans. A friction force (here it is kinetic or sliding friction) always acts parallel to surface but in direction of the opposing motion. Since the wooden cabinet is moving with uniform speed, a horizontal force of 200 N acts on it. According to Newton's III law of motion, forces are balanced. Hence, a frictional force of 200 N is exerted on the cabinet. 2

Q.6. It is difficult to balance our body when we accidentally slip on a peel of banana. Explain why ? (Board Term 1, 2011, 2010)

Ans. A frictional force always acts parallel to the surface and is directed to oppose sliding. Banana skin reduces friction (or frictional force) and thus brings body in unbalanced state and we tend to fall. 2

Q.7. If action is always equal to the reaction, explain how a horse can pull a cart. (Board Term 1, 2010)

Ans. According to Newton's third law of motion, action force is equal to reaction but acts on two different bodies and in opposite directions. When a horse pushes the ground, the ground reacts and exerts a force on the horse in the forward direction. This force is able to overcome friction force of the cart and it moves. 2

Q.8. A man pushes a box of mass 50 kg with a force of 80 N. What will be the acceleration of the box due to this force ? What would be the acceleration if the mass were doubled ?(Board Term 1, 2011, 2010)

Ans. Given, mass of the box (m) = 50 kg

Force (F) acting on box = 80 N

Acceleration (a) = ?

Since Force (F) = mass (m) × acceleration (a)

$$\Rightarrow a = \frac{F}{m} = \frac{80}{50} = 1.6 \text{ m/s}^2$$

If mass is doubled $m_1 = 2 \times 50 = 100 \text{ kg}$

$$\text{Acceleration } (a) = \frac{80}{100} = 0.8 \text{ m/s}^2 \quad \text{2}$$

Thus, the acceleration will be halved if the mass is doubled.

Q.9. Why does a man jumping out of a moving train fall with his head forward ? (Board 2011; 2010)

Ans. As the man jumps out from a moving train, his feet suddenly come to rest on touching the ground while his body's upper part continues to move forward. For this reason he falls with his head forward. So as to save himself, he should run through some distance in the forward direction. 2

Q.10. A hammer of mass 500 g, moving at 50 m/s, strikes a nail. The nail stops the hammer in a very short time of 0.01 s. What is the force of the nail on the hammer ? (Board Term 1, 2010; 11)

Ans. Given, mass of hammer

$$(m) = 500 \text{ g} = 0.5 \text{ kg}$$

Initial velocity of hammer

$$(u) = 50 \text{ m/s}$$

Final velocity of hammer

$$(v) = 0 \text{ m/s}$$

Duration $(t) = 0.01 \text{ s}$

Using second law of motion,

$$F = ma = m \frac{(v - u)}{t}$$

$$\Rightarrow F = 0.5 (0 - 50)/0.01 \\ = (0.5 \times -50)/0.01 \\ = -2,500 \text{ N}$$

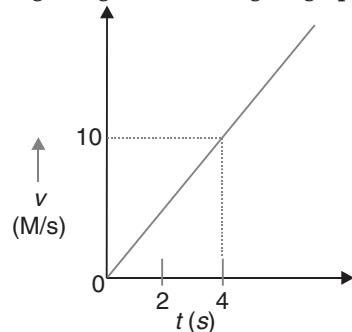
The -ve sign shows the force of 2500 N acts in the opposite direction of motion. 2

Q.11. Two children stand on wheel carts facing each other. One student throws a heavy mass towards the other who catches it. What will be the direction of motion of both the children ? Give reasons for your answer. (HOTS)

Ans. The child who throws the mass towards the other, and the one who catches it, both move backwards.

(Reason) — Thrower moves due to backward reaction of mass pushed forward. Catcher moves due to forward reaction of mass pushed and held backward. 2

Q.12. Find the acceleration and force acting on a body of mass 4kg using the following v-t graph. (HOTS)



Ans. Acceleration

$a = \text{Slope of } v - t \text{ graph}$

$$= \frac{\text{Y axis}}{\text{X axis}}$$

$$= \frac{10 \text{ m/s}}{4 \text{ s}} = 2.5 \text{ m/s}^2$$

From Newton's second law

$$F = ma \\ = 4 \times 2.5 = 10 \text{ N} \quad \text{1 + 1}$$

Short Answer Type Questions-II

3 Marks each

Q.1. A force of 5N produces an acceleration of 8 m/s^2 in mass m_1 and an acceleration of 24 m/s^2 in mass m_2 . What acceleration would it give if both the masses are tied together ? [Board 2015, Set-LOV7LN7]

Ans. $F = ma$

$$m_1 = \frac{5}{8} \text{ kg} \quad m_2 = \frac{5}{24} \text{ kg}$$

If the masses are tied, total mass $M = m_1 + m_2$

$$= \frac{5}{8} + \frac{5}{24} = \frac{5}{6} \text{ kg}$$

$$\therefore \text{Acceleration produced} = \frac{5}{5/6} = 6 \text{ m/s}^2 \quad \text{3}$$

Q.2. Two boys dropped sheets of paper from the top of the tower. One boy dropped his sheet of paper as such, while the other boy dropped it by changing it in the shape of a ball. Which sheet of paper will reach the ground first ? Explain why ? (Assume air-resistance negligible).

(Board 2014, Set-LFS3I7K, Set-MNM9GZH)

Ans. The sheet shaped in form of a ball falls before the open sheet. Because the open sheet experiences more air resistance due to its large surface-area and this restricts its fall.

(CBSE Marking Scheme, 2014) 1 + 2

Q. 3. How would you arrive at a mathematical formula to measure force using second law of motion ? Define the unit of force using this formula.

(DDE 2014; Board Term I 2013; 7ZTHA8G, AGRO)

Ans. Mathematical formulation : If a body of mass (m), moving at velocity (u) accelerates uniformly at (a) time (t), so that its velocity changes to v , then

$$\text{initial momentum } p_1 = mu$$

$$\text{final momentum } p_2 = mv$$

$$\begin{aligned} \text{change in momentum} &= p_2 - p_1 \\ &= mv - mu \\ &= m(v - u) \end{aligned}$$

According to second law of motion, force

$$F \propto \frac{\text{change in momentum}}{\text{time}}$$

$$F \propto \frac{p_2 - p_1}{t}$$

we know that

$$F \propto \frac{m(v-u)}{t} \quad \therefore a = \frac{v-u}{t}$$

$$F \propto ma$$

$$F \propto kma$$

Here $k = 1$

Thus

$$F = ma$$

S.I. unit of force, Newton is equal to kg - m/s².

One Newton force is exerted on an object of mass 1 kg to produce an acceleration of 1 m/s² in it. 3

(CBSE Marking Scheme, 2014)

Q. 4. State three characteristics of action-reaction forces.

(DDE 2014; Board Term I, 2012 Set-056)

Ans. (i) Equal in magnitude.

(ii) Opposite in direction.

(iii) Acts simultaneously on two different bodies.

1 + 1 + 1

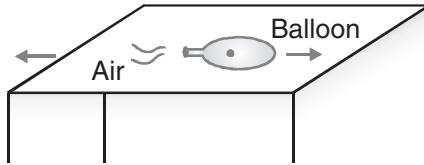
Q. 5. (a) State Newton's third law of motion.

(NCT 2014)

(b) If someone jumps to the shore from a boat the boat moves in the opposite direction. Explain.

(c) When air from an inflated balloon is allowed to be released, the balloon moves in a direction opposite to that of air. Explain.

(Board Term I, 2012, Set-049)



Ans. (a) To every action, there is always an equal and opposite reaction.

(b) The boat moves in the back ward direction when the person jumps from it in the forward direction and in turn boat also exerts an equal force on the man in forward direction.

Force applied by the man on boat – Action.

Force applied by the boat on man – Reaction; which are always equal.

(c) Walls of stretched balloon exert a force on air to push it out, air applies a force in opposite direction.

1 + 1 + 1

(CBSE Marking Scheme, 2014)

Q. 6. Tabulate two differences between balanced and unbalanced forces. Write one example of each.

(Board Term I 2013, 7ZTHA8G)

Ans. Difference between balanced and unbalanced force :

S. No.	Balanced force	Unbalanced force
1.	The net effect produced by a number of forces on a body is zero.	The net effect produced by a number of forces on a body is non-zero.
2.	It can only bring a change in the shape of the body.	It causes a change in state of rest or of uniform motion of a body.
3.	Example : Tug of war.	Example : Moving an object.

3

Q. 7. Which law of motion can best describe the following :

(a) Force applied while pulling a lawn mower.

(b) Shoulder bone fracture from recoil of a gun.

(c) Coin remains on the table, when table cloth is suddenly removed.

(Board Term I, 2013, OAHJD6N)

Ans. (a) According to Newton's II law of motion

(b) According to Newton's III law of motion

(c) According to Newton's I law of motion.

1 + 1 + 1

Q. 8. Give reasons for the following :

(a) Horse continues to apply force in order to move a cart with constant speed.

(b) Water sprinkler used for grass lawns begins to rotate as soon as water is supplied.

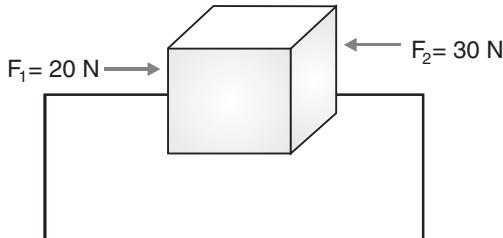
(c) Water drops are removed from wet clothes by giving light jerk to the cloth.

(Board Term I, 2013, AGRO 94)

- Ans.** (a) The frictional force acts on cart wheel in opposite direction to motion of the cart.
 (b) When water is pushed out of sprinkler with a force, it exerts reaction force on the sprinkler, causing it to rotate.
 (c) Water drops have inertia of rest. They do not move with the cloth as it is jerked and come out.

1 + 1 + 1

- Q. 9.** Two forces $F_1 = 20 \text{ N}$ and $F_2 = 30 \text{ N}$ are acting on an object as shown in figure :



- (i) Find the net force acting on the object ?
 (ii) State the direction of the net force acting on the object ?
 (iii) If the body still does not move under the application of these forces, what can be the possible reason for this. Identify the name of this extra force and its direction.

(Board Term I, 2012 Set-077)

- Ans.** (i) Net force acting on the object = $F_2 - F_1$
 $= 30 \text{ N} - 20 \text{ N} = 10 \text{ N}$
 (ii) Net force acts in the direction of force F_2 .
 (iii) Since the object is not moving, all forces are balanced.

The Force is the force of friction. It acts between object (lower surface) and floor (upper surface). Its direction is that of F_1 .

1 + 1 + 1

(CBSE Marking Scheme, 2012)

- Q. 10.** A motor car of mass 1200 kg is moving along a straight line with uniform velocity of 90 km/h. Its velocity is slowed down to 18 km/h in 4 s by an unbalanced external force. Calculate the acceleration and change in momentum. Also calculate the magnitude of external force acting on it.

(Board Term I, 2012 Set-052)

Ans.

$$\begin{aligned} u &= 90 \text{ km/hr} = 25 \text{ m/sec.} & \frac{1}{4} \\ v &= 18 \text{ km/hr} = 5 \text{ m/sec.} & \frac{1}{4} \\ a &= \frac{(v-u)}{t} = \frac{(5-25)}{4} = \frac{-20}{4} \\ &= -5 \text{ m/s}^2 & 1 \\ \text{Change in momentum} &= mv - mu & \frac{1}{4} \\ &= 1200(v-u) & \frac{1}{4} \\ &= 1200(5-25) \\ &= 1200 \times -20 \\ &= -24000 \text{ kg. m/sec.} & \frac{1}{2} \\ f &= ma \\ &= 1200 \times -5 \end{aligned}$$

$$\begin{aligned} &= -6000 \text{ kgm/s}^2 \\ &= 6000 \text{ N.} & \frac{1}{2} \\ & \text{(CBSE Marking Scheme, 2012)} \end{aligned}$$

- Q. 11.** A body of mass 1 kg is kept at rest. A constant force of 6 N starts acting on it. Find the time taken by the body to move through a distance of 12 m.

(Board Term I, 2012 Set-069)

Ans. Here $m = 1 \text{ kg}; u = 0; F = 6 \text{ N}; s = 12 \text{ m}; t = ?$
 From $F = m \times a$
 $a = \frac{F}{m} = \frac{6}{1} = 6 \text{ m/s}^2$ 1
 Now; $s = ut + \frac{1}{2}at^2$
 $12 = 0 + \frac{1}{2} \times 6 \times t^2$ 1
 $3t^2 = 12$
 $t^2 = 4;$
 $t = 2 \text{ sec.}$ 1
 (CBSE Marking Scheme, 2012)

- Q. 12.** (a) State Newton's first law of motion.
 (b) Look at the diagrams given below and state in which case will the block move and in which direction ? Give reasons to support your answer.

(Board Term I, 2012 Set-045)



Left to Right

Right to Left

- Ans.** (a) A body continues to be in state of rest or in state of uniform motion along a straight line unless an external force is applied on it to change the state.
 (b) Case (ii) Right to left due to unbalanced force.

(CBSE Marking Scheme, 2012) 1½ + 1½

- Q. 13.** Give reasons for the following :

- (a) Road accidents at high speeds are very much worse than accidents at low speeds.
 (b) It is easier to stop a tennis ball than a cricket ball moving with the same speed.
 (c) A gun man gets a jerk on firing a bullet.

(Board Term I, 2012 Set-041)

- Ans.** (a) Road accidents at high speeds involve much larger changes in momentum in much smaller time. Therefore the forces developed are very huge resulting in a disaster.
 (b) Tennis ball is lighter than the cricket ball. It has a smaller momentum and hence smaller force is required to stop the tennis ball.
 (c) The gun man gets a jerk because the gun recoils on firing. This is accounted for by the principle of conservation of momentum.

(CBSE Marking Scheme, 2012) 1 + 1 + 1

Q. 14. State reason for the following :

- (a) All the cars are provided with seat belts.
- (b) It is dangerous to move out of a moving bus.
- (c) Road accidents at high speeds are very much worse than accidents at low speeds.

(Board Term I, 2012 Set-015)

Ans. (a) To prevent injuries in case of an accident by increasing the time taken by the passenger to fall forward.

(b) It is because the jumping man who is moving with the high speed of the bus would tend to remain in motion due to inertia and would get hurt due to resistance offered by the ground.

(c) See Q 13 (a) (SAQ 3 marks) 1 + 1 + 1

Q. 15. A man weighing 60 kg runs along the rails with a velocity of 18 km/h and jumps into a car of mass 1 quintal (100 kg) standing on the rails. Calculate the velocity with which car will start travelling along the rails. (Board Term I, 2012 Set-015)

Ans. Mass of man $m_1 = 60 \text{ kg}$

Initial velocity of mass $u_1 = 18 \text{ km/h} = 5 \text{ m/s}$ ½

Mass of car $m_2 = 100 \text{ kg}$

Initial velocity of car $u_2 = 0$ ½

After the man jumps into the car, let their common velocity be v .

Applying the law of conservation of momentum

Total momentum after jump

= Total momentum before jump

$$(m_1 + m_2)v = m_1u_1 + m_2u_2 \quad \frac{1}{2}$$

$$(60 + 100)v = 60 \times 5 + 100 \times 0 \quad \frac{1}{2}$$

$$160v = 300;$$

$$v = 300/160$$

$$v = 1.875 \text{ m/s} \quad 1$$

(CBSE Marking Scheme, 2012)

Q. 16. A scooter is moving with a velocity of 25 m/s and it takes 5 s to stop after the brakes are applied. If the mass of the scooter along with the rider is 180 kg, find the change in momentum in this case.

(Board Term I, 2012 Set-028)

Ans. $u = 25 \text{ m/s}$, $v = 0$, $t = 5 \text{ s}$, $m = 180 \text{ kg}$

$$p_i = mu = 180 \times 25 \\ = 4500 \text{ kg-m/s} \quad 1$$

$$p_f = mv = 180 \times 0 = 0 \text{ kgm/s} \quad 1$$

$$p_f - p_i = 0 - 4500 \\ = -4500 \text{ kg-m/s} \quad 1$$

(CBSE Marking Scheme, 2012)

Q. 17. (a) When two bodies X and Y collide with each other, X exerts a force of 5 N on Y towards east direction. What is the force exerted by Y on X? Justify your answer stating the law.

(b) A circular groove is provided in a saucer for placing the tea cup in it. Give reasons.

(Board Term I, 2012 Set-028)

Ans. (a) Force exerted by y on x is 5 N west direction or – 5 N

This is because of Newton's III law of motion : To every action there is an equal and opposite reaction.

(b) Circular groove is provided so that in case of sudden jerk the cup will not topple / fall from the saucer. 1 + 1 + 1

(CBSE Marking Scheme, 2012)

Q. 18. A girl of mass 50 kg jumps out of a moving boat of mass 300 kg on to the bank with a horizontal velocity of 3 m/s. With what velocity does the boat begin to move backwards ?

(Board Term I, 2012 Set-056)

$$\begin{aligned} \text{Ans. } m_1 &= 50 \text{ kg} & m_2 &= 300 \text{ kg} \\ v_1 &= 3 \text{ m/s} & v_2 &=? \\ m_1v_1 + m_2v_2 &= 0 & 1 \\ v_2 &= \frac{m_1v_1}{m_2} \\ &= \frac{(50 \times 3)}{300} = 0.5 \text{ m/s} & 2 \end{aligned}$$

(CBSE Marking Scheme, 2012)

Q. 19. A swimmer is able to swim in a forward direction in a swimming pool only when he is pushing the water in the backward direction. Give reason for the above mentioned statement and justify the same. (Board Term I, 2012 Set-021)

Ans. It follows Newton's third law of motion : For every action there is an equal and opposite reaction.

Water is pushed back and so the body is pushed forward. 2 + 1

(CBSE Marking Scheme, 2012)

Q. 20. State Newton's first law of motion and use it to explain how :

(i) Dust comes out of the carpet when it is beaten with a stick ?

(ii) Leaves fall when branch of tree is shaken vigorously ? (Board Term I, 2012 Set-031)

Ans. Statement of Newton's Law : See Q 12 (a) (SAQ 3 marks).

(i) On beating with stick, carpet comes in motion but dust particles tend to retain inertia of rest and fall down.

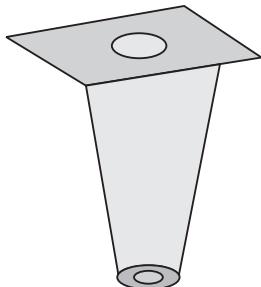
(ii) On shaking, branch comes in motion but leaves tend to retain inertia of rest and fall. 1 + 1 + 1

Long Answer Type Questions

5 Marks each

- Q. 1.** (a) State Newton's second Law of Motion. Express it mathematically and find SI unit of force from it.

(b)



In the diagram given above, if the card is flicked away with a jerk, what will you observe ? Explain the reason for this observation.

[Board 2015, Set-K34UQKW]

- Ans.** (a) Newton's second Law of motion states that the rate of change of momentum of an object is proportional to the applied unbalanced force in the direction of force. It is expressed mathematically as

$$F \propto \frac{m \times (v - u)}{t}$$

$$F = \frac{km \times (v - u)}{t} = kma$$

$$= k \times (1 \text{ kg}) \times (1 \text{ ms}^{-2})$$

$$\text{Force} = \text{kg ms}^{-2}$$

- (b) We well observe that the card moves ahead allowing the coin to fall vertically into the glass. This is due to inertia. The inertia of the coin tries to maintain its state of rest. 3 + 2

- Q. 2.** State Newton's first law of motion. Show that Newton's first law of motion is a special case of Newton's second law. Determine the acceleration of a car of mass 800 kg, on application of a force of 200 N on it. (Board Term I, 2015, 3GS246G)

- Ans.** Statement of Newton first law of motion : See Q. 12(a) (S.A.T.Q. 3 marks)

$$F = ma$$

$$F = \frac{m \times (v - u)}{t}$$

$$Ft = m(v - u)$$

That is, when $F = 0$, then $v = u$. Thus the object will continue to move with uniform velocity.

$$m = 800 \text{ kg}, \quad F = 200 \text{ N}$$

$$a = \frac{F}{m} = \frac{200}{800} = \frac{1}{4} = 0.25 \text{ m/s}^2 \quad 2 + 3$$

- Q. 3.** (a) Newton's first law of motion is also called law of inertia. Justify this statement.

- (b) A plastic ball and a cricket ball are rolled on the floor with same velocity. Which one will cover larger distance before stopping ? Give reason.

- (c) A truck is moving with a velocity of 72 km/h and it takes 3s to stop after the brakes are applied. Calculate the force exerted by brakes. Mass of truck is 1200 kg.

(DDE 2014; Board Term I, 2012 Set-077)

- Ans.** (a) According to first law of motion, everybody tends to resist change of state whether in rest or in motion. Qualitatively this tendency of the body to stay at rest or keep moving with same velocity is called inertia.

- (b) Cricket ball (because its mass is larger, so inertia of motion is larger)

$$(c) \quad u = 72 \text{ km/h} = 20 \text{ m/s} \quad v = 0$$

$$v = u + at$$

$$a = -20/3$$

$$= -6.6 \text{ m/s}^2$$

$$\begin{aligned} \text{Now;} \quad F &= ma \\ &= 1200 \times -6.6 \\ &= -7920 \text{ N} \end{aligned} \quad 2 + 1 + 2$$

- Q. 4.** (i) Write an activity to distinguish between a balanced and an unbalanced force.

- (ii) Explain whether the force is balanced or unbalanced in the following situations.

- (a) A suitcase is dropped from a certain height.

- (b) A bicycle is moving in a straight line with constant velocity.

- (c) In the game of tug of war, the two teams apply force but the rope doesn't move.

- (d) A ball rolling on the ground stops after sometime. (Board 2014, Set-SO1QHXJ)

(Board 2012, Term1; Set-50)

- Ans.** (i) **Balanced forces :**

- (1) A box doesn't move when a small force is applied.

- (2) Force is balanced.

- Unbalanced forces :**

- (3) The box starts moving, when the applied force is increased.

- (4) Force is unbalanced.

- (ii) (a) **Unbalanced** : because the box is coming down with increasing velocity.

- (b) **Balanced** : because velocity is constant.

- (c) **Balanced** : since rope does not go to either side, both are applying equal and opposite forces.

- (d) **Unbalanced** : Since velocity of ball is decreasing. 2 + 3

- Q. 5.** Give statement for Newton's second law of motion. Deduce a mathematical formulation for it. Using above derived expression, calculate the

force exerted by a nail on the hammer of mass 500 g moving at 5.0 m/s striking it. Consider that the nail stops the hammer in a short time of 0.01 s.

(DDE 2014; Board Term I, 2012 Set-033)

Ans. Newton's 2nd law of motion states that the force acting on a body is directly proportional to the product of its mass and acceleration produced by it in the body.

OR

The rate of change of momentum of a body is directly proportional to the force applied on it and the change takes place in the direction of applied force. Suppose a body of mass m is acted on by a force F .

Mathematical derivation :

If the force 'F' changes its velocity from u to v in time t , then rate of change of momentum can be written as

$$\frac{(mv - mu)}{t} = \frac{m(v-u)}{t}$$

This is equal to the force applied on the body by second law $\frac{m(v-u)}{t}$

Hence,

$$F = ma$$

$$m = 500$$

$$g = 0.5 \text{ kg},$$

$$u = 50 \text{ m/s},$$

$$v = 0$$

$$t = 0.01 \text{ s}$$

$$\text{Acceleration of hammer} = \frac{(0 - 50)}{0.01}$$

$$a = -5000 \text{ m/s}^2$$

Force applied by the nail on hammer

$$\begin{aligned} f &= ma = 0.5 \times (-5000) \\ &= -2500 \text{ N.} \end{aligned}$$

Q. 6. State Newton's second law of motion. Define SI unit of force in context to second law of motion

- (i) A Karate player suddenly reduces the speed of his hand while striking a tile. Explain why ?
- (ii) The athletes in high jump event fall on a soft surface and not on hard surface.

(Board Term I 2013, 7ZTHA8G)

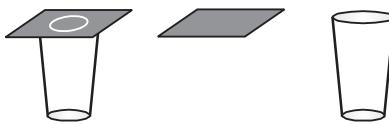
Ans. The force acting on a body is directly proportional to the rate of change of momentum of the body, according to Newton's second law.

Force is equal to 1 newton if it produces an acceleration of 1 m/s^2 in a body of unit mass.

- (i) By reducing the speed of hand suddenly, the player decreases the time of change of momentum. This increases the impact of force exerted on the tile.
- (ii) When athletes fall on a soft surface, their velocity becomes zero in a longer duration of time. Thus, rate of momentum change decreases and less force is exerted by ground on their body.

2 + 3

Q. 7. In the figure below the card is flicked with a push.



- (a) What do you observe in the above case and why ?
- (b) State the law involved in this case.
- (c) What will be your observation if the above coin is replaced by a heavy five rupee coin. Justify your answer.

(Board Term I, 2012 Set-060)

Ans. (a) We observe that the card moves ahead while coin falls in glass.

The coin possesses inertia of rest, it resists the change and hence falls in the glass.

(b) **Newton's first law of motion :**

(See : Q 12 (a). SAQ 3 marks).

(c) Heavy coin will possess more inertia so it will fall in tumbler. 1 + 1 + 1 + 1 + 1

Q. 8. (a) State the law that provides the formula for measuring force and the law which provides the definition of force.

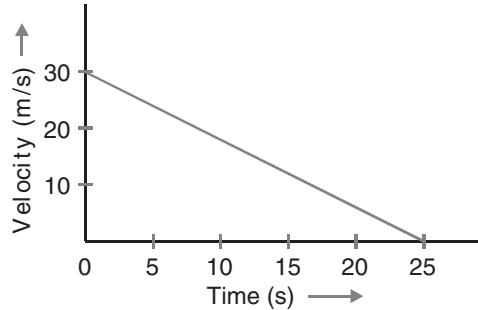
(b) Velocity time graph of a 50 g marble rolling on a floor is given below. Find :

(i) time in which it stops.

(ii) negative acceleration produced on it.

(iii) positive force acting on the marble

(Board Term I, 2012 Set-052)



Ans. (a) Formula for measuring force is given by Newton's 2nd law. Second law of motion gives us a method to measure the force acting on an object as force is the product of its mass and acceleration.

Definition of force is given by Newton's 1st law : (See Q. 16 (a) SAQ 3 marks).

(b) From graph

$$(i) t = 25 \text{ s}$$

$$(ii) a = \frac{(30 - 0)}{25} = 1.2 \text{ m/s}^2$$

$$(iii) F = ma \\ = (50/1000) \times 1.2 = 0.06 \text{ N}$$

½ + 1 + 1 + 1 + ½ + 1

(CBSE Marking Scheme, 2012)

Q. 9. (a) When a bullet is fired from a gun, the gun moves backward. Give reason.

- (b) A gun of mass 500 g fires a bullet of mass 10 g with a speed of 100 m/s. Find :
- Initial momentum of 'gun + bullet'.
 - Momentum gained by the bullet after firing.
 - Recoil velocity of the gun.

(Board Term I, 2012 Set-046)

Ans. (a) Gun exerts force on bullet in forward direction. In turn bullet also exerts an equal and opposite force in backward direction.

- (b) (i) Zero (both are at rest).
(ii) Momentum gained by bullet

$$= m_1 v_1 = \frac{10}{1000} \times 100 = 1 \text{ kgm/s}$$

$$\begin{aligned} \text{(iii)} m_1 u_1 + m_2 u_2 &= m_1 v_1 + m_2 v_2 \\ 0 &= 1 + \left(\frac{500}{1000} \right) v_2 \end{aligned}$$

$$v_2 = -2 \text{ m/s } 1 + 1 + 1\frac{1}{2} + 1\frac{1}{2}$$

(CBSE Marking Scheme, 2012)

Q. 10. (a) Give reasons for following :

- Glass wares are wrapped in straw during their transportation.
 - When a bullet is fired, it exerts an equal and opposite force on the gun, yet hurt caused by recoil of the gun is much less than that by bullet.
- (b) A force of 100 N acts on a body of mass 20 kg initially at rest for 5s. Determine.
- acceleration,
 - final velocity attained by it,
 - distance covered by it.

(Board Term I, 2012 Set-031)

Ans. (a) (i) During transport if there are jerks then straw being soft gets compressed and increases the time of change of momentum. So impact on glass would be reduced.

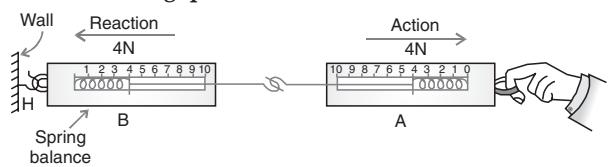
- (ii) Since gun is of larger mass so the recoil velocity is very small and so it does not hurt.

$$\text{(b) (i)} a = \frac{100}{20} = 5 \text{ m/s}^2$$

$$\text{(ii)} v = 0 + 5 \times 5 = 25 \text{ m/s}$$

$$\text{(iii)} s = 0 + \frac{1}{2} \times 5 \times 25 = 62.5 \text{ m } 2 + 1 + 2$$

(CBSE Marking Scheme, 2012)

Q. 11. Look at the diagram above and answer the following questions :

- (a) (i) When a force is applied through the free end of the spring balance A the reading on the spring balance A is 20 gwt. What will be the reading shown by the spring balance B ?

- (ii) Write reasons for your answer.
(b) If a balloon is filled with air and its mouth untied, air is released from its mouth in the downward direction. Write the other observations made by you. Justify your answer. (Board Term I, 2012 Set-019)

Ans. (a) (i) Spring balance B will also show 20 gwt.

(ii) It is because of Newton's III law of motion, when spring balance A exerts force on the balance B then the balance B pulls the balance A with an equal force of 20 gwt, but in the opposite direction. Balance A exerts a force of action on balance B then balance B exerts an equal and opposite force of reaction on balance A.

- (b) It is observed that the balloon moves in the upward direction as air comes out from the balloon. It performs an action in the downward direction as a result of which there will be a reaction (equal in magnitude but opposite in direction) in the form of upward motion. $1 + 2 + 2$

(CBSE Marking Scheme, 2012)

Q. 12. A large bus and a van, both moving with a velocity of magnitude v , have a head-on-collision and both the vehicles stop after the collision. If the time of the collision is 1 sec then,

- Which vehicle experiences smaller force of impact ?
- Which vehicle experiences the smaller momentum change ?
- Which vehicle experiences the greater acceleration ?
- Why is it that the truck suffers less damage than the car ?

(Board Term I, 2011)

Ans. (a) Since the action and reaction is equal and opposite during a collision, both the vehicles experience equal force.

- (b) We are given,
Initial velocity of both the bus and the van = v
Final velocity of both the bus and the van = 0
If m_1 and m_2 are the masses of the large bus and the van respectively, where m_1 is much greater than m_2 ,
Change in momentum of the bus

$$= m_1 \times (0 - v) = -m_1 v$$

Change in momentum of the van

$$= m_2 \times (0 - v) = -m_2 v$$

Since $m_1 > m_2$ the van will experience smaller momentum change.

- (c) The force acting on a body is equal to product of its mass and the acceleration, i.e.,

$$\begin{aligned} F &= \text{mass} \times \text{acceleration} = m \times a \\ a &= F/m \\ a &\propto \frac{1}{m} \end{aligned}$$

$$\text{Acceleration experienced by the bus} \propto \frac{1}{m_1}$$

$$\text{Acceleration experienced by the van} \propto \frac{1}{m_2}$$

Since $m_2 < m_1$, therefore the van experiences greater acceleration

- (d) Due to the transfer of small momentum from the van to the bus, the truck suffers less damage than the car.

(CBSE Marking Scheme, 2011)

Q. 13. Using second law of motion, derive the relation between force and acceleration.

(Board Term I, 2010-11)

Ans. Let an object of mass, m is moved along a straight line with an initial velocity, u .

Let the final velocity = v m/s

Acceleration = a ms $^{-2}$

Time taken = t s and Force applied = F .

Initial momentum (before the force applied)

$$= P_1 = mu$$

Final momentum (after the force applied)

$$= P_2 = mv$$

Change in momentum $\propto P_2 - P_1$

and Rate of Change in momentum

$$\frac{P_2 - P_1}{t} \propto \frac{m(v-u)}{t}$$

According to Newton's second law, Rate of change in momentum = F

$$\Rightarrow F \propto m(v-u)$$

$$\Rightarrow F \propto ma$$

$$(\because v = u + at)$$

$$\Rightarrow F = kma$$

(where k is a constant of proportionality).

The SI units for m is 1 kg, a is ms $^{-2}$, thus $k = 1$

$$\Rightarrow F = ma \quad 5$$

(CBSE Marking Scheme, 2011)

Q. 14. (a) "First law of motion can be mathematically stated from the mathematical formulation of second law of motion." Justify this statement.

- (b) A dumbbell of mass 10 kg falls on the floor from a height of 80 cm. Calculate the change in momentum of the dumb bell and also the force of impact on the floor. (given $g = 10$ m/s 2)

(Board Term I, 2012 Set-062) (HOTS)

Ans. (a) According to 2nd law of motion

$$F = ma = m(v-u)/t$$

or $Ft = mv - mu$

When $F = 0$, $v = u$ for every value of time.

This implies that the body will continue to move with uniform velocity. If $u = 0$ then $v = 0$ i.e., the body will remain at rest.

- (b) $u = 0$, $g = 10$ m/s 2

$$h = 80 \text{ cm} = 0.8 \text{ m}$$

$$v^2 = u^2 + 2gh$$

$$v^2 = 0 + 2 \times 10 \times 0.8$$

$$v^2 = 16$$

$$v = 4 \text{ m/s}$$

Change in momentum = $mv - mu$

$$= 10 \text{ kg} \times 4 \text{ m/s}$$

$$= 40 \text{ kg-m/s}$$

Time taken to reach the floor

$$v = u + gt$$

$$t = \frac{4}{10} = 0.4 \text{ sec.}$$

Force on the floor $F = m(v-u)/t$

$$= \frac{(10 \times 4)}{0.4} = 100 \text{ N}$$

2 + 1 + 2

(CBSE Marking Scheme, 2012)

Q. 15. (i) State Newton's third law of motion and explain it with the help of a relevant example.

(ii) A gun of mass 4kg fires a bullet of 10g with a speed of 100m/s in the forward direction, find :

- (a) The total initial momentum.

- (b) The recoil velocity of gun.

(iii) Why is the recoil velocity of gun much lesser than the velocity of bullet ? (HOTS)

Ans. (i) Every action has equal and opposite reaction. For example, when we step out of a boat, we push the boat backwards. The reaction force of boat pushes us forward. 1

(ii) (a) Total initial momentum = momentum of gun + momentum of bullet

$$= m_g v_g + m_b v_b$$

$$= 4(0) + .01(0) = \text{zero}$$

- (b) Recoil velocity**

$$= \frac{m_b v_b}{m_g} = \frac{0.01 \times 100}{4}$$

$$= 0.25 \text{ m/s}$$

2

(iii) The recoil velocity of the gun is less than that of bullet because mass of bullet is very small as compared to the gun. Since force is the product of mass and acceleration, and action reaction force must be equal in magnitude, gun recoils with a lesser velocity. 2

Value Based Questions

Q. 1. Shivansh wants to find out force exerted by his car, he plotted a velocity-time graph for his journey on highway. Shivansh wondered if he did not accelerate after every minute and the fuel spent by the engine. His wife reminded him that his car overcame friction due to road.

- (i) What values were shown by Shivansh ?
- (ii) How does he find the total displacement ?
- (iii) What values were shown by his wife ?

Ans. (i) Shivansh showed experimental, observatory and skillful behaviour.

- (ii) Displacement = Area under the $v - t$ curve.
- (iii) His wife showed smart, knowledgeable, logical and practical behaviour. 1 + 1 + 1

Q. 2. During the training Sahil's cricket coach taught him to pull his hands backwards while catching a fast moving cricket ball.

- (a) Was Sahil's coach correct ?
- (b) Why does a fielder in the ground gradually pull his hands backwards with the ball, while catching a fast moving cricket ball ?

(c) What would happen if a fielder does not take the advice properly ?

(d) What value is associated with it ?

Ans. (a) Yes.

(b) While catching a fast moving cricket ball, a fielder pulls his hands backwards with the ball. By doing so, the fielder increases the time during which the high velocity of the moving ball decreases to zero. Thus the acceleration of the ball is decreased and therefore the impact of catching the fast moving ball is also reduced and the fielder gets less hurt.

(c) On the contrary, if the ball is stopped suddenly, the high velocity decreases to zero in a very short interval of time. Thus the rate of change of momentum of the ball is very large. Therefore, large force is applied for holding the catch that might hurt the palm of the fielder.

(d) This shows that Sahil's coach is intelligent and a good trainer. 1 + 2 + 1 + 1

Practical Based Questions

Multiple Choice Questions

(1 mark each)

Q. 1. A student performed the experiment, "To establish relationship between weight of a rectangular wooden block lying on a horizontal surface and minimum force required to just move it using a spring balance". If the weight of the given wooden block is nearly 200 g wt and three known weights of 100 g wt, each are to be successively placed on the wooden block to take three more readings, then which one of the following balances available in the laboratory would you select for the best results in the experiment ? It is known that a force of 90 g wt. is required to just move the block on the surface. (Board 2015, Set-LOV7LN7; Board 2014, Set-LFS3I7K)

- (a) Range 0–100g wt. ; Least count 1.0g wt.
- (b) Range 0–200g wt. ; Least count 2.0g wt.
- (c) Range 0–250g wt. ; Least count 2.0g wt
- (d) Range 0–500g wt. ; Least count 5.0g wt.

Q. 2. Range of a spring balance is :

(Board Term I, 2015, 3GS246G)

- (a) the correction that needs to be done in the observed value of weight in a spring balance.
- (b) the smallest difference in weight that can be detected by a spring balance
- (c) the difference between highest and lowest value of weight that can be measured with a spring balance.
- (d) none of the above.

Q. 3. Mohan was performing the experiment to establish relation between weight of a wooden block and minimum force required to just move it on a horizontal surface with the help of a spring balance. He took a spring balance of range 0–500 gwt least count 2 gwt. He suspended the block from its hook and noted that the pointer was at 225th division on the scale. He noted that the correct weight of the block is :

- (a) 225 gwt
- (b) 112.5 gwt
- (c) 22.5 gwt
- (d) 450 gwt

Q. 4. Two opposite forces of same magnitude acting on a body that do not change its state of rest or motion are called : (Board 2014, Set-MNM9GZH)

- (a) Balanced force
- (b) Unbalanced force
- (c) Frictional force
- (d) Gravitational force

Q. 5. The SI unit of rate of change of momentum is :

- (a) Kg m
- (b) Kg – ms
- (c) Kg ms⁻¹
- (d) Newton.

Q. 6. The spring balance which will give the most accurate reading on using it in the experiment to establish relationship between the weight of rectangular wooden block lying on a horizontal table and the force required to just move it should have the least count :

- (a) 1.0 g wt.
- (b) 2.0 g wt.
- (c) 5.0 g wt.
- (d) 0.5 g wt.

Q. 7. Two bodies when placed in contact exert forces parallel to the surface of contact. This force is called :

- (a) normal force (b) contact force
 (c) gravitational force (d) frictional force.

Q. 8. A student measured the minimum force F_1 to just move a rectangular wooden block kept with largest surface area on a horizontal surface by a spring balance. He again measured the minimum force by placing the block with smallest surface area on the table as F_2 . He repeated the experiment and established a relation between the two forces. The correct result will be :

(Board Term I, 2012 Set-015)

- (a) $F_1 > F_2$
 (b) $F_2 > F_1$
 (c) $F_1 = F_2$
 (d) no relation between the two forces.

Q. 9. A rectangular wooden block opened from one side is lying on a horizontal table. Different weights are kept in the box one by one. To establish relationship between weight of a block with minimum force required to just move it using a spring balance, it is observed that the force required to just move the rectangular block is maximum when we put a weight of : (Board Term I, 2012 Set-016)

- (a) 40 gwt (b) 25 gwt
 (c) 30 gwt (d) 35 gwt.

Q. 10. Four spring balances are provided to find the minimum force required to just move a rectangular wooden block lying on a wooden surface. Range and least count of four spring balances are given below. Which of the following spring balance will you select ? (Board Term I, 2012 Set-019; 20)

- (a) Range 0 - 100 gwt and least count of 10 gwt
 (b) Range 0 - 10 gwt and least count of 1 gwt
 (c) Range 0 - 10 gwt and least count of 2 gwt
 (d) Range 0 - 100 gwt and least count of 1 gwt.

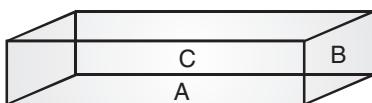
Q. 11. In an experiment to establish relationship between weight of a rectangular block lying on a horizontal wooden table and minimum force required to move it, a spring balance is provided. The least count of the given spring balance is :

(Board Term I, 2012 Set-019)

- (a) 1 gwt (b) 2 gwt
 (c) 5 gwt (d) 3 gwt

Q. 12. In an experiment to establish the relationship between weight of a wooden cuboid lying on the horizontal surface and the minimum force required to move it, which of the following faces of cuboid should be in contact with the surface ?

(Board Term I, 2012 Set-021)



$l = 30 \text{ m}$
 $b = 20 \text{ m}$
 $h = 20 \text{ m}$

- (a) face A with area $30 \times 20 \text{ m}^2$
 (b) face B with area $20 \times 10 \text{ m}^2$
 (c) face c with area $30 \times 10 \text{ m}^2$
 (d) any of the face A, B or C.

Q. 13. In an experiment to establish the relationship between weight of a rectangular wooden block lying on a horizontal table and the minimum force required to just move it using a spring balance, which type of string should be used ?

(Board Term I, 2012 Set-021)

- (a) Very high elasticity (b) Less elasticity
 (c) Moderate elasticity (d) Anyone can be used.

Q. 14. While doing an experiment to establish relationship between weight of a rectangular wooden block lying on a horizontal table and the minimum force required to just move it. Student A performed the experiment on wooden table and calculated force as F_A , student B on table covered with sand calculated force as F_B , student C on table covered with oil poured on it calculated force as F_C . Then : (Board Term I, 2012 Set-028)

- (a) $F_A < F_B < F_C$
 (b) $F_A < F_B > F_C$
 (c) $F_A = F_B = F_C$
 (d) $F_A > F_B > F_C$

Q. 15. While performing an experiment to establish relationship between weight of a rectangular wooden block lying on a horizontal table and the minimum force required to just move it using a spring balance, a student calculated the minimum force required as 180 gwt. to move the wooden block of 400 gwt. If he places another block of mass 100 gwt. over it then the force required will :

(Board Term I, 2012 Set-028)

- (a) remain same
 (b) decrease
 (c) increase
 (d) may decrease or increase.

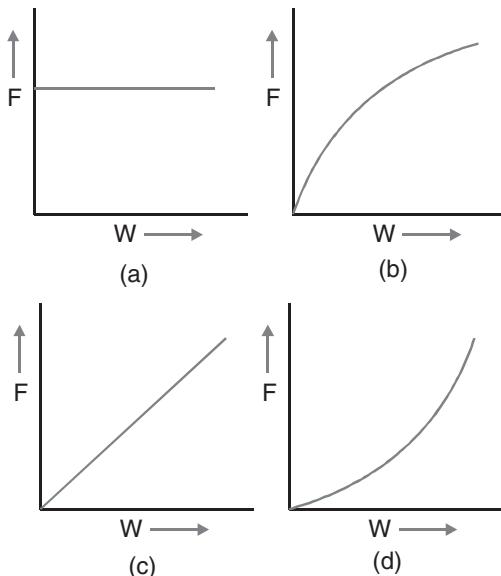
Q. 16. The total number of divisions in the scale of a spring balance of range 0.5 kgwt used for measuring minimum force required to pull a block is 100. Its least count is :

(Board Term I, 2012 Set-031)

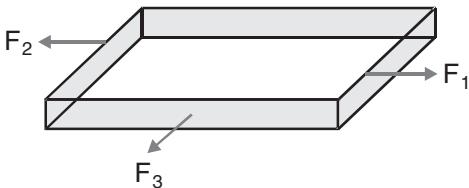
- (a) 0.005 kgwt (b) 0.5 kgwt
 (c) 5 kgwt (d) 50 kgwt

Q. 17. Weight of a wooden block to be pulled by spring balance is gradually increased and graph is plotted between total weight of block (W) and reading of spring balance (F) to pull it. The shape of graph is :

(Board Term I, 2012 Set-031)



shown in the figure. The relation between these forces will be : (Board Term I, 2012 Set-076)



- (a) $F_1 > F_2 > F_3$ (b) $F_2 > F_3 > F_1$
(c) $F_3 > F_1 > F^2$ (d) $F_1 = F_2 = F_3$

Q. 22. The least count of the spring balance used for pulling a block is 5 gwt. While measuring minimum force required to just slide a block, its pointer is at 32nd division the measured force will be : (Board Term I, 2012 Set-075)

(a) 160 gwt (b) 32 gwt
(c) 64 gwt (d) 6·4 gwt

Q. 23. While studying the relationship between weight of rectangular wooden block lying on the horizontal surface and minimum force required to just move it, Bharath applied a force on the wooden block using a spring balance. He observed that the minimum force required to just move it is 50 gwt. The magnitude of force of friction between block and table could be : (Board Term I, 2012 Set-074)

(a) 50 gwt (b) -50 gwt
(c) 0 (d) greater than 50 gwt

Q. 24. A student selected a wooden block of 250 gwt and placed it on a horizontal table. He found that a force of 70 gwt was required to make it just slide. He then placed a 100 gwt on the wooden block and recorded the reading of the spring balance when the block just starts sliding. The reading of the spring balance would be :

(Board Term I, 2012 Set-074)

(a) 70 gwt (b) 320 gwt
(c) Greater than 70 gwt (d) 180 gwt

Q. 25. A wooden box in the shape of a cuboid open from the top is placed on a wooden floor. Following weights are placed inside the box one by one. In which case the force required to move the box is minimum ? (Board Term I, 2012 Set-072)

(a) 40 gwt (b) 35 gwt
(c) 45 gwt (d) 30 gwt

Answers with Explanation

1. (c) (Range 0–250g wt.; Least count 2.0g wt)

2. (c) the difference between highest and lowest value of weight that can be measured with a spring balance.

3. (d) 450 gwt (225×2)

4. (a) (balanced forces do not make the body to move)

5. (c) Momentum $p = mv$
= kg ms⁻¹

6. (d) The least count of spring balance is 0.5 gwt.

7. (d) Force that opposes the motion is called frictional force.

8. (c) $F_1 = F_2$.

9. (a) $F \propto m$.

10. (d) Range 0 – 100 gwt and least count of 1 gwt.

11. (b) $2 \text{ gwt. Least count} = \frac{20 \text{ gwt}}{10} = 2 \text{ gwt}$
12. (d) Any of the face A, B or C as it will not affect the mass.
13. (d) Any of these can be used as it will not affect the mass.
14. (b) $F_A < F_B > F_C$.
15. (c) Increases.
16. (c) 5 kgwt.

17. (c) Straight line graph.
18. (c) Least count = $100/10 = 10$.
19. (c) $F \propto m$.
20. (a) Least count = $500/100 = 5$.
21. (d) $F_1 = F_2 = F_3$.
22. (a) $32 \times 5 = 160$.
23. (a) $F_1 = -F_2$.
24. (c) $F \propto m$.
25. (d) $F \propto m$.

Short Answer Type Questions (2 marks each)

Q. 1. In an experiment, to study the third law of motion using two spring balances, what does third law of motion state ?

Ans. The third law of motion states that when one object exerts a force on another object, the second object also exerts a force back on the first. 2

Q. 2. Can you give any example which shows third law of motion.

Ans. When a person steps out of a boat, he pushes the boat backwards. But the reaction force of the boat pushes the man forward. 2

Q. 3. Give two properties of action and reaction forces.

Ans. (i) Both the forces are equal in magnitude
(ii) Both are applied in the opposite direction. 2

Q. 4. A body of mass 5 kg is moving along a straight line with a uniform velocity of 5m/s. What will be the external force acting on the body ?

Ans. An object moves with a uniform velocity when the force acting on the object is balanced and there is no net external force on it. 2

Q. 5. In the experiment, using spring balances to study the third law of motion, mention any two precautions.

Ans. (i) Before making use of the two spring balances it should be ensured that their pointers are at zero mark.

(ii) The readings of the two spring balances should be noted only when their pointers come to rest. 1 + 1



TOPIC-2 Inertia and Conservation of Momentum

QUICK REVIEW

- The property by the virtue of which an object tends to remain in the state of rest or of uniform motion unless acted upon by some force is called inertia.
 - The mass of a body is a measure of inertia.
 - Inertia is the inability of a body to change its state of rest or of uniform motion in a straight line by itself.
 - The inherent property of a body by virtue of which it cannot change its state of rest is called inertia of rest.
 - **Law of conservation of momentum :** The sum of momentum of the two objects before collision is equal to the sum of momentum after the collision provided there is no external unbalanced force acting on them.
 - Effects of force are :
 - (a) It can produce motion in stationary bodies.
 - (b) It can stop moving bodies.
 - (c) It can change the speed and direction of motion of bodies.
 - (d) It can also bring about change in dimensions of a body.
 - By law of conservation of momentum,
- $$m_1 u_1 + m_2 u_2 = m_1 v_1 + m_2 v_2$$



KNOW THE TERMS

- **Inertia :** The tendency of a body to oppose or resist any change in its state of rest or uniform motion is called inertia of the body.

- **Inertia of Motion :** The tendency of a body to oppose any change in its state of uniform motion is known as inertia of motion.
e.g. : The passengers fall forward when a fast moving bus stops suddenly.
- **Inertia of Direction :** The tendency of a body to oppose any change in its direction of motion is known as inertia of direction
e.g. : When a fast moving bus negotiates a curve on the road, passengers fall towards the centre of the curved road.
- **Recoil velocity :** The velocity with which gun moves in the backward direction.

Very Short Answer Type Questions

1 Mark each

Q. 1. Which has more inertia, a cricket ball or a rubber ball of the same size ? Give reason for your answer.

[Board 2015, Set-K34UQKW]

Ans. Inertia of a body depends on its mass. A cricket ball has more mass than a rubber ball, thus it has greater inertia. 1

Q. 2. When a carpet is beaten with a stick it releases dust. Explain why ?

(NCT 2014; Board Term I, 2012 Set-059)

Ans. As dust possess inertia of rest, it resists the change and falls down. 1

Q. 3. Why does a person in a bus tends to fall forward, when it stops suddenly ?

(Board Term I 2013, AGRO 94)

Ans. When the driver of the bus in which a person is travelling applies brakes suddenly, the person tends to move forward due to inertia. 1

Q. 4. Which has highest inertia : solids made of aluminium, steel and wood of same shape and same volume. (Board Term I, 2012 Set-016)

Ans. Solid made of steel has the highest inertia because its mass is greater than aluminium and wooden solids. (CBSE Marking Scheme, 2012) 1

Q. 5. Raju is having three solid blocks of same size and shape made up of steel, wood and plastic. Which one of these will have highest inertia ? Give reason for your choice. (Board Term I, 2012 Set-035)

Ans. Steel block as it has highest mass.

1

(CBSE Marking Scheme, 2012)

Q. 6. Find the momentum of a man of mass 75 kg when he walks with a velocity of 2 m/s.

(Board Term I, 2012 Set-041)

Ans. 150 kgm/s. (CBSE Marking Scheme, 2012) 1

Q. 7. Name the physical quantity that measures inertia. State its SI unit. (Board Term I, 2012 Set-045)

Ans. Mass. SI unit is kg.

½ + ½

(CBSE Marking Scheme, 2012)

Q. 8. Name the physical quantity which is measured by rate of change of momentum.

(Board Term I, 2012 Set-069)

Ans. Force. (CBSE Marking Scheme, 2012) 1

Q. 9. A ball is thrown vertically upwards. What is its momentum at the highest point ?

(Board Term I, 2012 Set-058)

Ans. Zero as $v = 0$. (CBSE Marking Scheme, 2012) 1

Short Answer Type Questions-I

2 Marks each

Q. 1. State why Newton's first law of motion is called law of inertia. (DDE 2014; Board 2011; 2010)

Ans. Inertia is a tendency of the object to resist change in its state. Newton's first law of motion also states similar i.e., the object will remain in its present state unless an external force is applied. That's why Newton's first law is called Law of inertia. 2

Q. 2. Which is having higher value of momentum ? A bullet of mass 10 g moving with a velocity of 400 m/s or a cricket ball of mass 400 g thrown with the speed of 90 km/hr. (Board 2011)

Ans. Momentum (P) = mass (m) × velocity (v).

$$\text{Mass of bullet} = 10 \text{ g} = 10 \times 10^{-3} \text{ kg} \\ = 10^{-2} \text{ kg}$$

$$\text{Velocity of bullet} = 400 \text{ m/s}$$

$$\text{Momentum of bullet} = 10^{-2} \text{ kg} \times 400 \text{ m/s} = 4 \text{ kg m/s}$$

$$\text{Mass of cricket ball} = 400 \text{ g} = 400 \times 10^{-3} \text{ kg} \\ = 0.400 \text{ kg}$$

$$\text{Velocity of ball} = 90 \text{ km/hr}$$

$$= \frac{90 \times 1000 \text{ m}}{3600 \text{ m}} = 25 \text{ m/s}$$

$$\text{Momentum of ball} = 0.400 \times 25 = 10 \text{ kg m/s} \quad 2$$

∴ The cricket ball has higher momentum.

Q. 3. Why does the pillion rider fall forward when brakes are applied ? (Board 2011; 2010)

Ans. During the ride, pillion rider and driver are in a state of motion. But when the driver applies brakes, the body of pillion rider continues moving forward on account of inertia of motion. Therefore, the pillion rider falls forward. 2

Short Answer Type Questions-II

3 Marks each

Q. 1. Describe an activity with diagram to explain conservation of momentum.

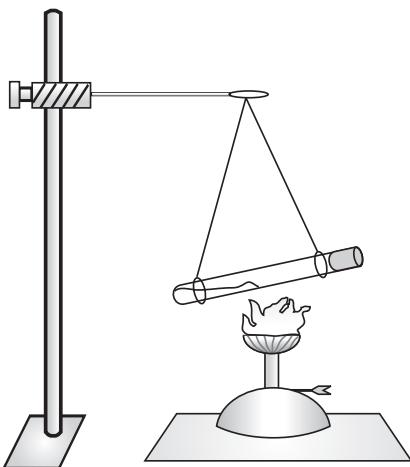
(Board Term I, 2015, 3GS246G)

Ans. Refer 9.6 page 123 NCERT book
(CBSE Marking Scheme, 2015) 3

Detailed Answer :

Activity :

- Take a test tube of good quality glass material and put a small amount of water in it. Place a stop cork at the mouth of it.
- Now suspend the test tube horizontally by two strings or wires as shown in fig.
- Heat the test tube with a burner until water vaporises and the cord blows out.
- Observe that the test tube recoils in the direction opposite to the direction of the cork.



- Also, observe the difference in the velocity the cork appears to have and that of the recoiling test tube.
Hence, the total momentum of the two objects is unchanged or conserved by the collision.

Q. 2. Which accident will be more damaging, collision between two trucks moving with a speed of 50km/hr. or collision between two cars moving with a speed of 50 km/hr.? Explain.

(Board 2014, Set-MNM9GZH)

Ans. Collision between trucks, because more is the mass, more is the inertia and therefore more is the momentum. Mass of the trucks is more than that of cars so collision of trucks will cause more damage. 3

Q. 3. A body of mass 4 kg is dropped from a height of 20 m. Calculate the initial momentum and the momentum just before it strikes the ground ($g = 10 \text{ m/s}^2$) (Board 2014, Set-SO1QHXJ)

$$\begin{aligned} v^2 &= u^2 + 2gh \\ 0^2 &= u^2 + 2 \times 10 \times 20 \\ 0^2 &= u^2 + 400 \\ u^2 &= 400 \\ u &= \sqrt{400} = 20 \end{aligned}$$

$$\begin{aligned} \text{Momentum} &= \text{mass} \times \text{velocity} \\ &= 4 \times 20 \\ &= 80 \text{ kg m/s}^2 \end{aligned}$$

Q. 4. (a) A ball is allowed to roll down from an inclined plane. It reaches the foot of the plane and continues to roll on the ground. It stops after travelling some distance. Is this the violation of law of inertia? Give reasons for your answer. (DDE 2014)

- (b) A player lowers his hand while catching a ball. Explain reason behind his action.

(Board Term I, 2012 Set-075)

Ans. (a) No. It is not the violation of law of inertia. Law of inertia is obeyed only when no external force acts on a body. But in this case the friction due to the ground acts on the ball, so it comes to rest.

- (b) Player lowers his hand because by doing so he increases the time in which velocity of ball comes to zero. This decreases the rate of change of momentum and so the impact of force is reduced.

1 + 1 + 1

(CBSE Marking Scheme, 2012)

Q. 5. (a) Which one has more inertia : a five rupee coin or a one rupee coin ? Why ?

- (b) Two objects P and Q of masses ' m ' and ' $4m$ ' move with velocities ' v ' and ' $4v$ ' respectively. Calculate the ratio of their linear momenta.

(Board Term I, 2012 Set-072)

Ans. (a) Five rupee coin, because it has more mass.

$$(b) \quad P_1 = mv$$

$$P_2 = 4m \times 4v = 16mv$$

$$P_1/P_2 = 1 : 16 \quad 1\frac{1}{2} + 1\frac{1}{2}$$

(CBSE Marking Scheme, 2012)

Q. 6. (a) State the name of the object which has more inertia :

- (i) a rubber ball and a stone of the same size.
- (ii) an empty box and another similar box filled with clothes.

(b) Give reasons for the following :

- (i) Luggage placed on the roof of a car or bus is tied with rope.
- (ii) When a branch of a tree is shaken vigorously, some of the leaves drop down.

(Board Term I, 2012 Set-061)

Ans. (a) (i) Stone. ½

(ii) Box filled with clothes. ½

- (b) (i) This is done to prevent luggage from falling when the vehicle is suddenly stopped or started because due to inertia the luggage will experience a jerk in a direction opposite to the direction of vehicle. 1

- (ii) On shaking, branch comes to state of motion and leaves which are in state of rest experience a jerk due to which these get detached and fall down. 1

(CBSE Marking Scheme, 2012)

Q. 7. Define inertia. Write an activity to show that inertia of a body depends on its mass.

(Board Term I, 2012 Set-046)

Ans. **Inertia :** Inability of the body to change by itself its state of rest or state of uniform motion.

Activity :

- (i) Apply some force on a football.
- (ii) It flies away as it has small inertia.
- (iii) Apply same force on same size of stone.
- (iv) Stone hardly moves as it has more inertia.

(CBSE Marking Scheme, 2012) 1 + 2

Q. 8. State the law of Inertia. Why do we fall in forward direction if a moving bus stops suddenly and fall in the backward direction if it suddenly accelerates from rest ? (Board Term I, 2012 Set-041)

Ans. **Law of Inertia :** An object remains in its state of rest or of uniform motion in a straight line until an external unbalanced force acts on it.

When a moving bus stops suddenly, the bus slows down but our body tends to remain in state of motion due to inertia of motion. Sudden start of bus brings motion to the bus as well as our feet but rest of the body still has inertia of rest due to which we fall backwards.

1 + 2

(CBSE Marking Scheme, 2012)

Q. 9. When a fast moving horse stops suddenly a careless rider falls in the forward direction. Give reason for it. (Board Term I, 2012 Set-019)

Ans. It is because of inertia of motion. When the horse was in motion, the whole body of the rider was in motion. But when the horse stops suddenly the lower portion of the rider which is in contact with the horse comes to rest but the upper portion of him wants to remain in motion.

1 × 3

(CBSE Marking Scheme, 2012)

Q. 10. (a) Why are the wheels of vehicle provided with mud guards ?

(b) A cricket player lowers his hand while catching a ball. Why ?

(c) Why does a glass pane of a window gets shattered when a flying pebble hits it ?

(Board Term I, 2012 Set-016)

Ans. **(a)** Due to inertia of direction, wheels rotate at high speed and mud sticking to the wheel flies off tangentially.

(b) This increases the time of catching, decreases the acceleration of the ball, hence force exerted on the hands decreases.

(c) High velocity of pebbles, decreases to zero in a very short interval of time for which it remains in contact with glass pane and shatters the glass pane.

1 + 1 + 1

(CBSE Marking Scheme, 2012)

Q. 11. State and prove law of conservation of momentum.

Ans. Momentum possessed by a body is defined as the product of mass and velocity of the body.

If a body of mass (m) moves with a velocity (v), then momentum p is given by,

$$p = mv$$

Law of conservation of Momentum : When no external force acts on a body, its momentum will remain constant.

We know, that $F = F_1 + F_2 + \dots + F_N$

$$\text{Force} = \frac{\text{Total change in momentum}}{\text{Time taken}}$$

$$= \frac{\text{Sum of momentum change in each mass}}{\text{Time}}$$

When $F = 0$, then $p = \text{constant}$ or $p_1 + p_2 \dots$

$P_N = \text{constant}$ i.e., sum of the momentum = constant

1 + 2

Long Answer Type Questions

5 Marks each

Q. 1. What is meant by 'inertia' ? What are different types of inertia ? Give two examples in each case.

(Board Term I, 2012 Set-042)

Ans. Inability of the body to change by itself its state of rest or state of uniform motion is called inertia.

Types : Inertia of rest : e.g. :

- (i) When a card is flicked with a finger the coin placed over it falls in the tumbler.

- (ii) Only the carom coin at the bottom of a pile is removed when a fast moving carom striker hits it.

Inertia of motion : e.g. :

- (i) When a moving bus stops suddenly, the luggage might slide towards the front side of the bus and fall.

- (ii) We tend to fall forward when a bus suddenly stops.

1 + 2 + 2

(CBSE Marking Scheme, 2012)

Q. 2. (a) Define momentum. Write its S.I. unit.

(b) How much momentum will an object of mass 10 kg transfer to the floor, if it falls from a height of 5 m ($g = 10 \text{ m/s}^2$).

(c) Explain how a karate player can break a pile of tiles with a single blow of his hand.

(Board Term I, 2012 Set-021)

Ans. **(a)** Momentum is the product of mass and velocity.

SI unit of momentum is -kgm/s.

$$(b) v^2 = u^2 + 2gh$$

$$v^2 = (0)^2 + 2(10)(5)$$

$$v^2 = 100 \therefore v = 10 \text{ m/s}$$

$$\text{momentum} = m \times v$$

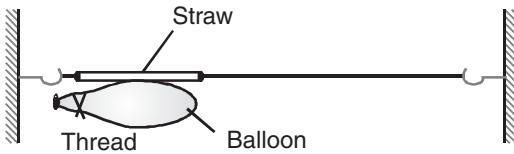
$$= 10 \times 10 = 100 \text{ kg m/s}$$

(c) The karate player strikes the pile of tiles with his hand very fast. In doing so, the large momentum of fast moving hand is reduced to zero in a very short time. This exerts a very large force on the pile of tiles which is sufficient to break them.

1 + 1 + 2 + 1

(CBSE Marking Scheme, 2012)

- Q. 3.** (a) State the law of conservation of momentum.
 (b) Observe the following diagram and answer the questions given below :



- (i) Which direction does the balloon move when the thread tied to its neck is removed and why ?
 (ii) State the conclusion drawn from this activity. (Board Term I, 2012 Set-045)

- Ans.** (a) When two or more bodies act upon one another their total momentum remains constant, provided no external forces are acting.
 (b) (i) Air from inside the balloon escapes from the mouth of the balloon.
 Balloon moves in opposite direction that is from left to right.

(ii) Forces of action and reaction are equal and opposite. 2 + 1 + 1 + 1
 (CBSE Marking Scheme, 2012)

- Q. 4.** (a) Two objects of masses 100 g and 200 g are moving along the same line and direction with velocities of 2 m/s and 1 m/s respectively. They collide and after the collision, the first object moves at a velocity of 1.67 m/s. Determine the velocity of second object.

- (b) If a man jumps out from a boat, the boat moves backwards. Why ? (Board Term I, 2012 Set-016)

Ans. (a) $m_1 = 100$
 $g = 0.1\text{kg}$ $m_2 = 200$ $g = 0.2\text{ kg}$
 $u_1 = 2 \text{ m/s}$ $u_2 = 1 \text{ m/s}$ $v_1 = 1.67 \text{ m/s}$
 $v_2 = ?$

According to law of conservation of momentum

$$\begin{aligned}m_1 u_1 + m_2 u_2 &= m_1 v_1 + m_2 v_2 \\0.1 \times 2 + 0.2 \times 1 &= 0.1 \times 1.67 + 0.2 \times v_2 \\0.2 + 0.2 &= 0.167 + 0.2 v_2 \\v_2 &= 1.165 \text{ m/s}\end{aligned}$$

- (b) It is based on Newton's third law of motion. As boat is floating and is not fixed, so it moves backwards. 3 + 2

(CBSE Marking Scheme, 2012)

Value Based Questions

- Q. 1.** Akhtar, Kiran and Rahul were riding in a motorcar that was moving with a high velocity on an expressway when an insect hit the windshield and got stuck on the windscreen. Akhtar and Kiran started pondering over the situation.

- (a) Kiran suggested that the insect suffered a greater change in momentum as compared to the change in momentum of the motorcar (because the change in the velocity of the insect was much more than that of the motorcar).
 (b) Akhtar said that since the motorcar was moving with a larger velocity, it exerted a larger force on the insect. And as a result the insect died.
 (c) Rahul while putting an entirely new explanation said that both the motorcar and the insect experienced the same force and a change in their momentum.

Comment on these suggestions.

- Ans.** Since both car and insect are moving with uniform speed, and there is no external force applied. Hence, total momentum is conserved, i.e.

$$\begin{aligned}(m_c u_c) + (m_i u_i) &= (m_c - m_i) v \\(1500 \times 25) + (0.01 \times -5) &= (1500 + 0.01) \times v \\&\quad (\text{values are assumed}) \\37500 - 0.05 &= 1500.01 \times v \\37499.95 &= 1500.01 \times v\end{aligned}$$

$$\Rightarrow v = \frac{377499.95}{1500.01} = 24.9998 \text{ m/s}$$

So velocity of insect changes from - 5 m/s to 24.9998 m/s (big change)

Velocity of car changes from 25 m/s to 24.9998 m/s (almost a negligible change)

Change in momentum of the car

$$\begin{aligned}&= (m_c v) - (m_c u_c) = m_c(v - u_c) \\&= 1500 \times (24.9998 - 25) \\&= -0.3 \text{ N-s}\end{aligned}$$

Change in momentum of the insect

$$\begin{aligned}&= (m_i v) - (m_i u_i) = m_i(v - u_i) \\&= 0.01 \times (24.9998 + 5) = 0.3 \text{ N-s}\end{aligned}$$

\Rightarrow The momentum gained by the insect is equal to the momentum lost by the car.

- (a) Kiran is incorrect in terms of change in momentum. However she is correct, the change in velocity of insect is higher than that of the car.
 (b) Akhtar observation is correct that speed of car is higher than that of insect. However he is incorrect that the insect experiences larger force. According to Newton's third law of motion both experienced same amount of force.
 (c) Rahul is correct that both experienced same force. If he says the amount of change in momentum in both objects is same, then he is correct.

2 + 1 + 1 + 1



KNOW THE LINKS

- en.wikipedia.org/wiki/force
- www.physicsclassroom.com
- teachertech.rice.edu
- csep10.phys.utk.edu
- en.wikipedia.org/wiki/newtion's_law_of_motion.
- www.qrg.northwestern.edu/projects_vss/does/propulsion/2-what-is-inertia



CHAPTER

7

GRAVITATION

SYLLABUS

- *Gravitation; Universal law of gravitation; Force of Gravitation; Acceleration due to Gravity; Mass and Weight; Free fall.*



QUICK REVIEW

- According to the law of gravitation, the force of attraction between any two objects is proportional to the product of their masses and inversely proportional to the square of the distance between them. The law applies to objects anywhere in the universe. Such a law is said to be universal.
- Universal gravitational constant $G = 6.67 \times 10^{-11} \text{ Nm}^2\text{kg}^{-2}$.
- Gravitation is a weak force unless large masses are involved.
- Acceleration with which a body falls towards the centre of the earth is called acceleration due to gravity (g).
- The force of gravity decreases with altitude. It also varies on the surface of the earth, decreasing from poles to the equator.
- Mass is the quantity of matter contained in the body.
- Weight of the body is the force with which the earth attracts the body.
- The weight is equal to the product of mass and acceleration due to gravity.
- Mass of a body does not change but weight of a body is different at different places.
- The upward force exerted by a liquid when a body is immersed in the liquid is called up thrust or buoyant force.
- The force of gravity decreases with altitude. It also varies on the surface of the earth, decreasing from poles to the equator.
- All objects experience a force of buoyancy when they are immersed in a fluid.
- Objects having density less than that of the liquid in which they are immersed, float on the surface of liquid. If the density is more, it sinks in the liquid.
- Inverse square rule states that F is inversely proportional to the square of d .
- Weight of an object on the moon is one-sixth time of its weight on the earth.
- Archimedes principle can be stated as when a body is immersed fully or partially in a fluid, it experiences an upward force that is equal to the weight of the fluid displaced by it.
- Applications of Archimedes' principle - use in designing ships and submarines, lactometers, hydrometers.
- The relative density is a ratio of similar quantities, thus has no unit.



KNOW THE TERMS

- **Density** : Mass of a unit volume. Its unit is kg m^{-3} .
- **Relative density** of a substance is the ratio of its density to that of water.
- **Thrust** : Force acting on a body perpendicular to its surface.
- **Gravitation** : It is the force of attraction between any two bodies in the universe.

- **Gravity** : It is the force of attraction between the earth and any object lying on or near its surface.
- **Pressure** : Force acting per unit area of the object.
- **Newton's universal law of gravitation** : This law states that everybody in this universe attracts every other body with a force which is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.

Mathematically,

$$F = G \frac{m_1 m_2}{r^2}.$$

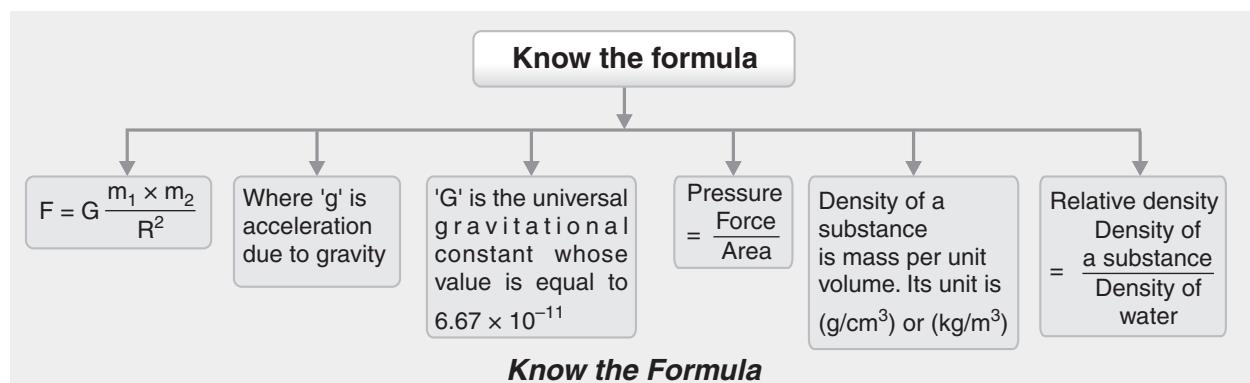
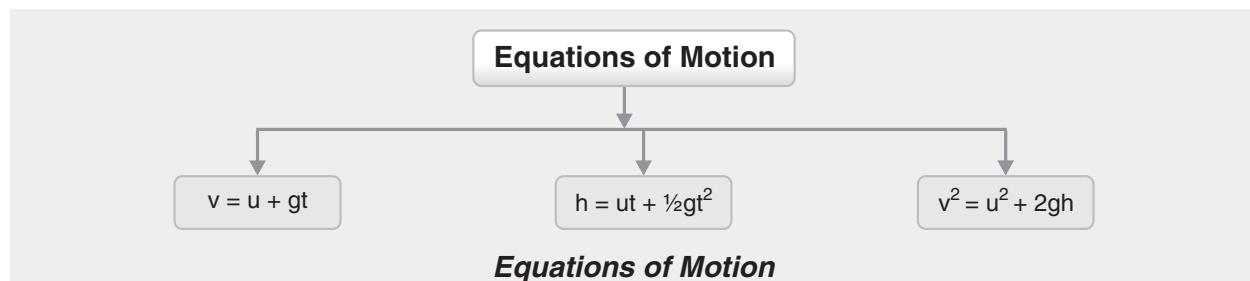
where G is universal gravitational constant.

- **Universal gravitational constant** : It is equal to the force of attraction between two bodies of unit mass each placed at a unit distance apart. It is denoted by G and its value is $6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$.
- **Centripetal acceleration of the moon** : If the moon is revolving with speed v in a circular orbit of radius r , then acceleration acting on it along the radius and towards the centre of its orbit is

$$a_c = \frac{v^2}{r}.$$

- **Free fall** : The motion of a body under the influence of force of gravity alone is called a 'free fall'.
- **Acceleration due to gravity** : The acceleration produced in the bodies due to earth's force of gravity is called acceleration due to gravity. Its value on earth's surface is 9.8 m/s^2 .
- **Centre of mass** : The centre of mass of a body may be defined as the point at which whole mass of the body may be assumed to be concentrated.
- **Centre of gravity** : The centre of gravity of a body is a point at which the resultant of all the parallel forces due to gravity experienced by various particles of the body acts or at which whole of the body acts.
- **Projectile** : Any object thrown into space with some initial velocity and which moves thereafter under the influence of gravity alone is called a 'projectile'. The path of a projectile is a parabola. Its horizontal range is maximum when the angle of projection is 45° .
- **Weightlessness** : The state when an object does not weight anything during free fall.
- **Buoyancy** : An upward force exerted by a fluid that opposes the weight of an immersed object.

FLOWCHARTS



Very Short Answer Type Questions

1 Mark each

- Q. 1.** Write the SI unit of weight.
 (Board 2015, Set-K34UQKW)
Ans. SI unit of weight is newton (N). 1
- Q. 2.** Give reason for the statement, "The value of g is greater at the poles than at the equator."
Ans. At poles the radius of the earth is lesser than that at the equator. (CBSE Marking Scheme, 2015) 1
- Q. 3.** Who discovered that force is the cause of motion ?
Ans. Galileo Galilei. 1
- Q. 4.** Which force causes the things to fall towards the earth ?
Ans. Gravitational force. 1
- Q. 5.** Who formulated the universal law of gravitation ?
Ans. Sir Issac Newton. 1
- Q. 6.** Who found out the value of gravitational constant (G) ?
Ans. Henry Cavendish. 1
- Q. 7.** What is the unit of gravitational constant (G) ?
Ans. The unit of gravitational constant is $\text{Nm}^2 \text{kg}^{-2}$. 1
- Q. 8.** How is gravitation different from gravity ?
Ans. Gravitation is the force of attraction between any two bodies while gravity refers attraction between any body and the earth. 1
- Q. 9.** Is the value of 'G' dependent on the medium present between the two bodies ?
Ans. No. 1
- Q. 10.** What does a small value of G indicate ?
Ans. A small value of G indicates that the force of gravitational attraction between two ordinary sized objects is a very weak force. 1
- Q. 11.** Can the mass of an object be zero ?
Ans. No. 1
- Q. 12.** Why cannot the mass of an object be zero ?
Ans. Mass of an object can never be zero because mass of an object is the measure of its inertia. 1
- Q. 13.** What is the unit of mass ?
Ans. The unit of mass is kilogram (kg). 1
- Q. 14.** What do you mean by weight of a body ?
Ans. Weight of a body is the force with which a body is attracted towards the centre of the earth. 1
- Q. 15.** What is the SI unit of weight ?
Ans. Newton. 1
- Q. 16.** What kind of quantity is weight – a scalar or a vector ?
Ans. Weight is a vector quantity. 1
- Q. 17.** Give the relation between mass and weight of a body.
Ans. $W = mg$. 1
- Q. 18.** How many Newtons are there in 1 kg-wt ?
Ans. 9.8 Newton. 1
- Q. 19.** At what place on the earth's surface is the weight of a body maximum ?
Ans. At the poles. 1
- Q. 20.** At what place on the earth's surface is the weight of a body minimum ?
Ans. At the equator. 1
- Q. 21.** If the mass of a body is 9.8 kg on the earth, what would be its mass on the moon ?
Ans. It will remain the same on the moon, i.e., 9.8 kg. 1
- Q. 22.** What is the nature of gravitational force ?
Ans. Gravitational force is attractive in nature always. 1
- Q. 23.** Why does a body reach the ground quicker at poles than at the equator when dropped from the same height ?
Ans. The acceleration due to gravity is more at the poles than at the equator. The time taken by a body is smaller if the acceleration due to gravity is more when the initial velocities and the distance travelled are the same. So, when dropped from the same height a body reaches the ground quicker at poles than at the equator. 1
- Q. 24.** When does an object show weightlessness ?
Ans. Weightlessness is a state when an object does not weigh anything. It occurs only when a body is in a state of free fall under the effect of only gravity. 1
- Q. 25.** How was Galileo able to conclude that the acceleration of an object falling freely towards the earth does not depend on the mass of the object ?
Ans. Galileo climbed to the top of the Leaning Tower of Pisa in the presence of a large gathering, and dropped spheres of different masses and materials from the top simultaneously. All the spheres reached the earth's surface at the same time. So, he concluded that the acceleration of an object falling freely towards the earth does not depend on the mass of the object. 1
- Q. 26.** Why G is called universal constant ? (Board 2010)
Ans. Because its value remains constant at all the places in the universe. 1
- Q. 27.** When a body is thrown upwards its velocity becomes zero at the highest point. What will be its acceleration at this point ? (HOTS)
Ans. It will be equal to the value of g in the downward direction. 1
- Q. 28.** How is acceleration due to gravity of a falling body related to its mass ? (HOTS)
Ans. Acceleration due to gravity does not depend on the mass of the falling body rather it depends on the mass of the planet towards which the body is falling. 1
- Q. 29.** Why one can jump higher on the surface of moon than on the earth ? (HOTS)
Ans. Because the value of acceleration due to gravity (g) at moon surface is nearly 1/6th of that at the surface of earth. 1

Short Answer Type Questions-I

2 Marks each

Q. 1. An object is dropped from a tower 180 m high. How long does it take to reach the ground?
(Take $g = 10 \text{ m/s}^2$) (Board 2015, Set-K34UQKW)

Ans. $h = 180 \text{ m}, t = ?, g = 10 \text{ m/s}^2, u = 0$

$$h = ut + \frac{1}{2}gt^2$$

or $h = \frac{1}{2}gt^2$

or $180 = \frac{1}{2} \times 10 \times t^2$

or $t^2 = \frac{180 \times 2}{10} = 36$

$t = 6 \text{ sec}$

Mass on moon $m_2 = \frac{10 \times 6}{10} = 6 \text{ kg}$

Because $m_1 = m_2$, hence there has been no loss in mass of the soil on the surface of moon and decrease in weight was due to difference in the gravity. (CBSE Marking Scheme, 2014) 2

- Q. 5.** (a) What keeps the moon in uniform circular motion around the earth ?
(b) Why do astronauts in space feel weightless ?
(Board Term I 2013, OAHJD6N)

Ans. (a) Gravitational force between the moon and the earth keeps moon in uniform circular motion around the earth.

(b) They do not exert any force/weight on their spaceship due to the absence of gravity in space.

(CBSE Marking Scheme, 2014) 1 + 1

- Q. 6.** State any four natural phenomena explained by universal law of Gravitation. (DDE-2014)
(Board Term I, 2012 Set-035)

Ans. (i) The force that binds us to earth.
(ii) The motion of moon around earth.
(iii) The motion of planets around sun.
(iv) Formation of tides. $\frac{1}{2} \times 4$

- Q. 7.** Calculate the force of gravitation between two objects of masses 50 kg and 120 kg, kept at a distance of 10 m from one another. (Gravitational constant $G = 6.7 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$) (DDE-2014)
(Board Term I, 2012 Set-065)

Ans. $G = 6.7 \times 10^{-11} \text{ Nm}^2 \text{ Kg}^{-2}, m_1 = 50 \text{ kg}, m_2 = 120 \text{ kg}$
 $d = 10 \text{ m}$

$$F = G \frac{m_1 \times m_2}{d^2} \quad \frac{1}{2}$$

$$F = 6.7 \times 10^{-11} \times \frac{50 \times 120}{10^2} \quad \frac{1}{2}$$

$$F = 6.7 \times 10^{-11} \times \frac{50 \times 120}{100} \quad \frac{1}{2}$$

$$F = 4.02 \times 10^{-9} \text{ N} \quad \frac{1}{2}$$

- Q. 8.** Explain what happens to the force between two objects if : (i) the mass of one object is doubled?
(ii) the distance between the object is tripled.

(DDE-2014) (Board Term I, 2012 Set-051)

Ans. $F = \frac{Gm_1 m_2}{d^2}$

(i) If $m_1 = 2m$, then F becomes twice.

(ii) If $d = 3d_1$, then F becomes one-ninth. $1 + 1$

(CBSE Marking Scheme, 2014)

- Q. 9.** Find the weight of a 80 kg man on the surface of moon ? What should be his mass on the earth and on the moon ? ($g_e = 9.8 \text{ m/s}^2; g_m = 1.63 \text{ m/s}^2$)
(Board Term I, 2012 Set-015)

- Q. 3.** Name the positions on earth where the value of 'g' is (i) maximum (ii) minimum ? Justify your answer. (Board 2014, Set-MNM9GZH)

Ans. On earth value of g is maximum at poles and minimum at the equator. At poles radius of earth is less so value of g is more, at equator radius of earth is more so value of g is less. $g = 1/R$.

(CBSE Marking Scheme, 2014) 1 + 1

- Q. 4.** An astronaut carried a pot containing soil weighing 60 N from the earth to the surface of moon. He kept it there and just before return journey from moon to earth he weighed the soil there on the surface of moon and found that it was only 10 N. Where did the rest of the soil go and how much mass of soil

was lost ? ($g_{\text{earth}} = 10 \text{ ms}^{-2}$) ($g_{\text{moon}} = \frac{g_{\text{earth}}}{6}$)

(Board Term I 2013, 7ZTHA8G) (DDE-2014)

Ans. Given that, the weight of the soil on earth is 60 N.
 $g_{\text{earth}} = 10 \text{ ms}^{-2}$

$$\text{Mass on the earth } m_1 = \frac{60}{10} = 6 \text{ kg}$$

Weight of the soil on moon = 10 N

$$g_{\text{moon}} = \frac{g_{\text{earth}}}{6} = \frac{10}{6} \text{ ms}^{-2}$$

Ans. Mass of man = 80 kg
 $g_e = 9.8 \text{ m/s}^2$ $g_m = 1.63 \text{ m/s}^2$
 $W_m = m \times g_m$
 $= 80 \times 1.63 \text{ N} = 130.40 \text{ N}$

Mass of man on earth and on the surface of moon will be 80 kg. (CBSE Marking Scheme, 2012) 2

Q. 10. State two factors on which value of 'g' depends.
 (Board Term I, 2012 Set-016)

Ans. (i) Latitude of the place.
 (ii) Mass of the earth.
 Value is maximum at poles and minimum at equator of the earth. 1 + 1
 (CBSE Marking Scheme, 2012)

Q. 11. A coin and a piece of paper are dropped simultaneously from the same height. Which of the two will touch the ground first? What will happen if they are dropped in vacuum? Give reasons for your answer.
 (Board Term I, 2012 Set-020)

Ans. In air the coin will touch the ground first. In vacuum both will touch the ground together.
Reason : In case of air the resistance provided by the air is more for paper than coin. 1 + 1
 (CBSE Marking Scheme, 2012)

Q. 12. What is meant by free fall? A ball is dropped from the roof of a building. It takes 10 seconds to reach the ground. Find the height of the building.
 (Board Term I, 2012 Set-021)

Ans. The falling of a body from a height towards earth under the gravitational force of earth (with no other force acting on it) is called free fall.

$$\begin{aligned} H &= ut + \frac{1}{2}gt^2 \\ &= 0 \times 10 + \frac{1}{2} \times 9.8 \times 10^2 \\ &= 490 \text{ m} \end{aligned} \quad 1 + 1$$

(CBSE Marking Scheme, 2012)

Q. 13. State two factors on which gravitational force depends and also mention how it depends on these factors?
 (Board Term I, 2012 Set-031)

Ans. (i) Masses of object, (ii) Distance between them as

$$F \propto m_1 \times m_2 \text{ and } F \propto \frac{1}{d^2} \quad 1 + 1$$

(CBSE Marking Scheme, 2012)

Q. 14. Gravitational force of an object on an imaginary planet is half of that of the gravitational force of same body on earth. Find : (i) the value of acceleration due to gravity on this planet and (ii) weight of an object of mass 50 kg on that planet.
 (Board Term I, 2012 Set-033)

Ans. $g_{\text{planet}} = \frac{1}{2} g_{\text{earth}} = 5 \text{ m/s}^2$ ½
 $W = mg$ ½
 So, $W_{\text{planet}} = 50 \times 5 = 250 \text{ N}$ 1
 (CBSE Marking Scheme, 2012)

Q. 15. What is the acceleration of free fall? What do we call the gravitational force between the earth and an object?
 (Board Term I, 2012 Set-041)

Ans. Acceleration of free fall is called as acceleration due to gravity $g = 9.8 \text{ m/s}^2$
 Gravitational force between the earth and an object is called weight. 1 + 1
 (CBSE Marking Scheme, 2012)

Q. 16. How does the force of gravitation between two objects change when the distance between them is reduced to half?
 (Board Term I, 2012 Set-042)

Ans. It becomes four times when distance between them is reduced to half as $F \propto \frac{1}{d^2}$. 1 + 1
 (CBSE Marking Scheme, 2012)

Q. 17. A stone and the earth attract each other with an equal and opposite force. Why then we see only the stone falling towards the earth but not the earth rising towards the stone?
 (Board Term I, 2012 Set-045)

Ans. $a = F/m$. The mass of a stone is very small due to which the gravitational force produces a large acceleration in it. Due to very large mass of earth, the same gravitational force produces very small acceleration in the earth. 2
 (CBSE Marking Scheme, 2012)

Q. 18. Ravi weighs few grams of sugar first at the poles and then at the equator. Will he observe the same weight in both the cases? Justify your answer.
 (Board Term I, 2012 Set-046)

Ans. He will observe more weight at the poles because $g_{\text{pole}} > g_{\text{equator}}$ So, $m g_p$ will be more than $m g_e$. 1 + 1

Q. 19. An object of mass x units weighs 300 N on the surface of earth. What would be its mass and weight on the surface of moon? ($g_e = 10 \text{ m/s}^2$ and acceleration due to gravity on moon is one sixth of that on the earth.)
 (Board Term I, 2012 Set-069)

Ans. $W_e = 300 \text{ N}; g_e = 10 \text{ m/s}^2$
 $W_m = \frac{1}{6} W_e = \frac{1}{6} \times 300 = 50 \text{ N}$
 As mass always remains constant therefore mass on moon = mass on earth = x units. 1 + 1
 (CBSE Marking Scheme, 2012)

Q. 20. On what factors does the weight of a body depend? Can a body have mass but no weight?
 (Board Term I, 2012 Set-059)

Ans. Weight of body depends on mass of body and value of ' g ' at that place

$$W = m \times g$$

Yes, in the centre of earth body has mass but no weight because value of $g = 0$. 1 + 1

Q. 21. There are two planets A and B of masses m_1 and m_2 respectively. They revolve around the Sun in circular orbit. The orbital radius of A from the Sun is twice that of orbital radius of B. The mass of A is twice that of mass of B. Compare the forces of gravitation between A to Sun and B to Sun.
 (Board Term I, 2012 Set-075)

Ans.

$$F_A = G \frac{M \text{ of sun} \times m_A}{(2d)^2} \text{ and}$$

$$= G \frac{M \text{ of sun} \times m_B}{d^2} = F_B \quad \frac{1}{2}$$

$$F_A/F_B = G \frac{M \text{ of sun} \times m_A}{4d^2} /$$

$$G \frac{M \text{ of sun} \times m_B}{d^2} \quad \frac{1}{2}$$

But $(m_a = 2m_B)$

$$\therefore \frac{F_A}{F_B} = \frac{1}{2} \quad 1$$

$$F_A : F_B = 1 : 2$$

(CBSE Marking Scheme, 2012)

Q. 22. A stone is released from the top of a tower of height 19.6 m. Calculate its velocity just before touching the ground. **(Board Term I, 2012 Set-071)**

Ans. Height of tower, $h = 19.6$ m.

Initial velocity $u = 0$ m/s

Final velocity, $v = ?$

Acceleration due to gravity,

$$g = 9.8 \text{ m/s}^2$$

$$v^2 = u^2 + 2gh \quad \frac{1}{2}$$

$$v^2 = 0 + 2 \times 9.8 \times 19.6 \quad \frac{1}{2}$$

$$v^2 = 19.6 \times 19.6 \text{ m} \quad \frac{1}{2}$$

$$v = 19.6 \text{ m/s} \quad \frac{1}{2}$$

(CBSE Marking Scheme, 2012)

Q. 23. Acceleration due to gravity is 9.8 m/s^2 (a) What will be the velocity of a freely falling body 2 seconds after the fall? (b) A body of mass m is lying on the surface of the earth (Mass of the earth = M and radius = d). Derive an expression for the relation between g and G . **(Board Term I, 2012 Set-034; 46)**

Ans. Since velocity increases by 9.8 m/s after every one second

(a) Velocity will be 19.6 m/s

(b) Force on the object = weight of the body

$\frac{1}{2} + \frac{1}{2}$

$$F = G \frac{Mm}{d^2}$$

$$mg = G \frac{Mm}{d^2}$$

$$g = \frac{GM}{d^2} \quad 1$$

(CBSE Marking Scheme, 2012)

Q. 24. The weight of a body on earth is 600 N. What is its weight and mass on moon. (Given that acceleration due to gravity on moon is one sixth of that on the earth and ' g' = 10 ms^{-2})

(Board Term I, 2012 Set-049)

Ans. $g_{\text{moon}} = \frac{g_{\text{earth}}}{6}$

$$W = mg$$

$$W_m = \frac{1}{6} W_e = \frac{1}{6} \times 600 = 100 \text{ N}$$

$\frac{1}{2} + \frac{1}{2}$

$$\text{Mass of the body} = W/g = \frac{600}{10} = 60 \text{ kg} \quad \frac{1}{2}$$

As mass always remains constant therefore mass on moon = mass on earth = 60 kg
(CBSE Marking Scheme, 2012)

Q. 25. If the distance between two objects is increased four times, then by how many times will the mass of one of the objects be changed to maintain the same gravitational force?

(Board Term I, 2012 Set-052)

Ans. $F = G \frac{Mm}{d^2}$ and we know that $F \propto m_1 \times m_2$ and

$F \propto \frac{1}{d^2}$ Now, if distance is increased four times,

one of mass has to be increased 16 times, it will keep F same.
1 + 1

(CBSE Marking Scheme, 2012)

Q. 26. Gravitational force on an imaginary planet by a body is 6 times stronger than the gravitational force of the earth on the body. Determine the value of acceleration due to gravity and weight of an object of mass 50 kg on that planet.

(Board Term I, 2012 Set-060)

Ans. Force on planet = $6 \times$ force on earth

$$\text{So, } g \text{ on planet} = 6g \text{ on earth} = 6 \times 9.8 \\ = 58.8 \text{ m/s}^2$$

$$\text{Weight on planet} = mg = 50 \times 58.8 = 2940 \text{ N}$$

(CBSE Marking Scheme, 2012) $1 + 1$

Q. 27. All the planets are moving in circular orbits. What provides the necessary force for this motion and what is the direction of this force? Write the name of this force. What will happen if this force disappears suddenly? **(Board Term I, 2012 Set-061)**

Ans. Force of attraction between the sun and the planets is centripetal force and direction is towards the sun.

All planets will move along a straight line.

(CBSE Marking Scheme, 2012) $1 + \frac{1}{2} + \frac{1}{2}$

Q. 28. What is the acceleration of free fall? **(HOTS)**
(Board Term I 2013, AGRO 94)

Ans. The acceleration of free fall is the acceleration produced in the motion of an object when it falls freely towards the earth. It is also called acceleration due to gravity. Its value on earth surface is 9.8 ms^{-2} . 2

Q. 29. What is the source of centripetal force that a planet requires to revolve around the Sun? On what factors does that force depend? **(HOTS)**

Ans. The motion of the planet around the Sun is due to the centripetal force. This centripetal force is provided by the gravitational force between the planet and the Sun. This force depends on the mass of the sun and mass of the planet, on the distance between sun and planet. 2

Q. 30. Two stones are taken and simultaneously thrown from a tower. One is thrown horizontally while other is dropped down. Which of them reaches the ground first and why ? (HOTS)

Ans. Both the stones reach the ground together.
 (i) Time of descent along vertical path does not depend on horizontal velocity.
 (ii) Initial vertical velocity of both bodies is zero while g on both is same. 1 + 1

Short Answer Type Questions-II

3 Marks each

Q. 1. A man's weight when taken at the poles is 600 N. Will his weight remain the same when measured at the equator ? Will there be an increase or decrease in his weight ? Explain.

(Board 2015, Set-LOV7LN7)

Ans. No, his weight will not remain same as that at the poles. There will be a decrease in his weight at the equator. As the radius of the earth increases from the poles to the equator, the value of 'g' becomes greater at poles decreasing towards equator. Also, the force of gravity decreases from poles to the equator. 3

Q. 2. The gravitational force between two objects is 100 N. How should the distance between these objects be change so that the force between them becomes 50 N? (Board 2015, Set-LOV7LN7)

Ans. Let $F = \frac{Gm_1m_2}{r^2}$ and $F' = \frac{Gm_1m_2}{(r')^2}$

We know $F = 100 \text{ N}$ $F' = 50 \text{ N}$

$$\frac{F}{F'} = \frac{(r')^2}{r^2}$$

or, $\frac{100}{50} = \left(\frac{r'}{r}\right)^2$ or, $r' = \sqrt{2} r$.

The distance should be $\sqrt{2}$ times. 3

Q. 3. In which direction do the following forces act when an object is in motion ? Explain with the help of an example.

(a) Frictional force

(b) Gravitational force (Board 2015, Set-LOV7LN7)

Ans. (a) Frictional force : Backwards

Example : If a book slides across the surface of a desk, then the desk exerts a frictional force in opposite (*i.e.* backwards) direction of its motion.

(b) Gravitational force : Downwards

Example : When we throw a ball in the air, it returns to the ground. 1½ + 1½

Q. 4. A body of mass 4 kg is dropped from a height of 20 m. Calculate the initial momentum and the momentum just before it strikes the ground. ($g = 10 \text{ m/s}^2$) (Board 2015, Set-K34UQKW)

Ans. ($u = 0$, Initial momentum = $P_i = mv = 0$, $h = 20 \text{ m}$)

$$\begin{aligned} v &= \sqrt{2gh} \\ &= \sqrt{2 \times 10 \times 20} = \sqrt{400} \\ v &= 20 \text{ m/s} \end{aligned}$$

Final momentum $P_f = mv = 4 \times 20 = 80 \text{ kg m/s}$ 3

Q. 5. Explain :

- (i) Universal gravitational constant
- (ii) Free fall (Board 2015, Set-K34UQKW)

Ans. (i) Universal gravitational constant is the constant 'G' appearing in Newton's law of gravitation.

$$F = \frac{GMm}{r^2},$$

where F is the force between two masses m and M at a distance r apart. The numerical value of G is equal to $6.673 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$. The value of G was found out by Henry Cavendish (1731-1810) by using a sensitive balance.

(ii) Free fall : Whenever objects fall towards the earth under the gravitational force alone, we can say that the objects are in free fall. While falling there is no change in the direction of motion of the objects. But due to earth's attraction, there will be a change in the magnitude of the velocity. 1½ + 1½

Q. 6. (a) What is the relation between the mass m and the weight w of a body ?

(b) What are the differences between mass and weight ? (Board 2015, Set-K34UQKW)

Ans. (a) Weight of a body is the force of attraction of the earth on that body. This force depends on the mass (m) of the body and the acceleration due to gravity (g).

$$F = m \times a$$

$$F = m \times g$$

$$W = m \times g$$

The weight (W) of the body is directly proportional to the mass of the body.

(b) Difference between mass and weight :

Mass	Weight
1. Its value remains constant at all places.	1. Its value changes from place to place due to change in the 'g'.
2. It is a scalar quantity.	2. It is a vector quantity.
3. It is never zero.	3. It is zero at the centre of earth.
4. Its unit is kg.	4. Its unit is N or kg wt.

1 + 2

Q. 7. State the universal law of gravitation. Mention four phenomena which can be explained by this law. (Board Term I, 2015, 3G246G)

Ans. Refer 10.11 page 132 NCERT book
 (i) The force that binds us to earth.
 (ii) The motion of the moon around the earth.
 (iii) The motion of planets around the sun.
 (iv) The tides due to the moon and the sun.
 (CBSE Marking Scheme, 2015) 3

Detailed Answer :

Universal law of gravitation states that the force of attraction between two objects is proportional to the product of their masses and inversely proportional to the square of the distance between them.

Four phenomena which can be explained by this law are :

- (i) The force that binds us to earth.
- (ii) The motion of the moon around the earth.
- (iii) The motion of planets around the sun.
- (iv) The tides due to the moon and the sun.

Q. 8. The weight of a body on the surface of the earth is 392 N. What will be the weight of this body on a planet whose mass is double that of the earth and radius is four times that of the earth.

(Board 2014, Set-LFS3I7K)

Ans. Let the mass of earth be 'M' and its radius be 'R'
 Then the acc. due to gravity (g) = $GM/R^2 = 9.8 \text{ m/s}^2$ where G is the Gravitational Constant.
 Mass of the planet = $2M$
 Radius of the planet = $4R$
 Hence, acc. due to gravity on that planet (g') = $G^2M/(4R)^2$
 $= 2GM/16R^2$
 $= 1/8 (GM/R^2)$
 $= 1/8 \times 9.8 = 1.225 \text{ m/s}^2$

Weight of the body on earth = 392 N
 Hence, its mass will be $(392/9.8) = 40 \text{ kg}$
 So, its weight on that particular planet will be $(40 \times 1.225) = 49 \text{ N}$ (CBSE Marking Scheme, 2014) 3

Q. 9. In which direction do the following forces act when an object is in motion :

- (a) Frictional force
- (b) Gravitational force
- (c) Centripetal force (Board 2014, Set-LFS3I7K)

Ans. (a) Backward
 (b) Downward
 (c) Towards the centre 1 + 1 + 1
 (CBSE Marking Scheme, 2014)

Q. 10. Write three differences between gravitational acceleration (g) and gravitational constant (G).
 (NCT-2014) (Board Term I 2012, Set-16)

Ans.

S. No.	Acceleration due to gravity, (g)	Universal gravitational constant (G)
1.	Acceleration due to gravity is the acceleration acquired by a body due to the earth's gravitational pull on it.	Gravitational constant is numerically equal to the force of attraction between two masses of 1 kg that are separated by a distance of 1 m.

- | | | |
|----|----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2. | g is a vector quantity. | G is a scalar quantity. |
| 3. | It is different at different places on the surface of the earth. Its value also varies from one celestial body to another. | The ' G ' is a universal constant i.e., its value is the same (i.e. $6.7 \times 10^{-11} \text{ N m}^2 \text{ kg}^{-2}$) everywhere in the universe. |

1 × 3

Q. 11. State universal law of Gravitation. Derive an expression for gravitational force between two bodies. (Board 2014, Set-SO1QHXJ) (NCT-2014)
 (DDE 2014)(Board Term I, 2012 Set-033)

Ans. Universal law of gravitation states that the force of attraction between two bodies is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.

Let the two bodies 'A' and 'B' be of masses 'M' and 'm' respectively, which are separated by a distance ' r '.

According to Universal law of Gravitation,

$$\text{Then, } F \propto M \times m \quad \dots(i)$$

$$\text{and } F \propto \frac{1}{r^2}$$

Combining (i) and (ii),

$$F = G \frac{M \times m}{r^2}$$

Where ' G ' is called universal gravitation constant.

The numerical value of $G = 6.67 \times 10^{-11} \text{ N m}^2 \text{ Kg}^{-2}$

1 + 2

Q. 12. What happens to the magnitude of the force of gravitation between two objects if :

- (a) mass of one of the object is tripled ?
- (b) distance between the objects is doubled ?
- (c) mass of both objects is doubled ?

(DDE 2014) (Board Term I, 2012 Set-040)

Ans. The force between two objects is given by 'Universal gravitation law'. It is numerically stated as,

$$F = \frac{G (m_1 m_2)}{d^2}$$

(a) Mass of one object is tripled :

$$F = \frac{G(3m_1)m_2}{d^2}$$

$$F = \frac{3G(m_1 m_2)}{d^2}$$

Force will be tripled.

(b) Distance between the objects is doubled :

$$F = \frac{G(m_1 m_2)}{2(d^2)}$$

$$F = \frac{G(m_1 m_2)}{4d^2}$$

$$F = \frac{\frac{1}{4}\{G(m_1 m_2)\}}{d^2}$$

Force will reduce to one-fourth of its previous value.

- (c) Masses of both objects are doubled:

$$F = \frac{G\{(2m_1)(2m_2)\}}{d^2}$$

$$F = \frac{4G\{m_1 m_2\}}{d^2}$$

Force will be four times greater than its previous value.

$1 + 1 + 1$

- Q. 13.** A ball is thrown upwards from the ground at a tower with a speed of 20 m/s. There is a window in the tower at the height of 15 m from the ground. How many times and when will the ball pass the window? (Take $g = 10 \text{ m/s}^2$)

(Board Term I 2013, 7ZTHA8G)

Ans. Initial velocity = $u = 20 \text{ m/s}$

Maximum height the ball will reach (h) = ?

Using equation $v^2 = u^2 + 2gh$

(∴ at maximum height, $v = 0$)

$$\begin{aligned} h &= \frac{-u^2}{2g} = \frac{-(20)^2}{2(-10)} \\ &= \frac{400}{20} = 20 \text{ m.} \end{aligned}$$

This means ball will reach the height of 20 m and come back. It will pass the window two times.

Now to calculate the time, ball will take to reach 15 m height,

Using equations, $h = ut - \frac{1}{2}gt^2$

$$15 = 20t - \frac{1}{2}(10)t^2$$

$$5t^2 - 20t + 15 = 0$$

$$t^2 - 4t + 3 = 0$$

$$(t-1)(t-3) = 0$$

$$t = 1, 3$$

Thus, ball will pass the window at 1 second and 3 seconds respectively.

3

(CBSE Marking Scheme, 2013)

- Q. 14.** A ball is thrown vertically upwards with a velocity of 49 m/s. Calculate :

- (a) The maximum height to which it reaches.
(b) The total time it takes to return to the surface of the earth.

(DDE-2014)

(Board Term I, 2012 Set-042)

Ans. Initial velocity of the ball (u) = 49 m/s

Final velocity of the ball (v) = 0 m/s

Acceleration for upward motion (a) = -9.8 m/s^2

- (a) Maximum height reached by the ball = s

$$v^2 - u^2 = 2as$$

$$0 - (49 \text{ m/s})^2 = 2 \times (-9.8 \text{ m/s}^2) \times s$$

$$s = \left(\frac{2401}{19.6}\right) \text{ m} = 122.5 \text{ m}$$

- (b) Time taken to reach the maximum height, t

$$v = u + at$$

$$0 = 49 + (-9.8)t$$

[As final velocity, $v = 0 \text{ m/s}$] = 5 s

Since, same time is taken to reach the ground from the maximum height.

So, total time taken to return to the ground

$$= (2 \times 5) \text{ s} = 10 \text{ s} \quad 3$$

- Q. 15.** A stone is dropped from a height of 10 m on an unknown planet having $g = 20 \text{ m/s}^2$.

Calculate the speed of the stone when it hits the surface of the planet. Also calculate the time it takes to fall through this height.

(Board Term I, 2012 Set-021)

Ans. Given,	$h = 10 \text{ m}$	$g = 20 \text{ m/s}^2$
	$v^2 = u^2 + 2gh$	$\frac{1}{2}$
	$v^2 = 0 + 2 \times 20 \times 10$	$\frac{1}{2}$
	$v^2 = 400$	$\frac{1}{2}$
	$v = 20 \text{ m/s}$	$\frac{1}{2}$

Now;	$v = u + gt$	
	$20 = 0 + 20t$	$\frac{1}{2}$
	$t = 1 \text{ sec.}$	$\frac{1}{2}$

(CBSE Marking Scheme, 2012)

- Q. 16. (i)** Seema buys few grams of gold at the poles as per the instructions of one of her friends. She hands over the same when she meets her at the equator. Will the friend agree with the weight of gold bought? If not, why?

- (ii)** If the moon attracts the earth, why does the earth not move towards the moon?

(Board Term I, 2012 Set-015)

Ans. (a) No, because weight is the force with which the earth attracts the object, $W = m \times g$
Value of g is greater at poles, weight of the same amount gold will be less on equator.

(b) The moon attracts the earth, but the earth does not move towards the moon because mass of moon is very less as compared to mass of the earth.

$1 + 1 + 1$

(CBSE Marking Scheme, 2012)

- Q. 17.** Define mass and weight of an object. Write their S.I. units. An object has mass of 20 kg on earth. What will be its mass and weight on the surface of the moon? (g on moon = 1.6 m/s^2)

(Board Term I, 2012 Set-019)

Ans. Mass is the quantity of matter contained in an object.

Weight is the force with which an object is attracted towards the centre of earth.

S.I. unit of mass is kg. and S.I. unit of weight is Newton

$$W = mg$$

Mass of the body on moon = 20 kg

$$\begin{aligned} \text{Weight on moon} &= mg_{\text{moon}} = 20 \times 1.6 \\ &= 32 \text{ N} \quad \frac{1}{2} \times 6 \end{aligned}$$

(CBSE Marking Scheme, 2012)

- Q. 18.** Suppose a planet exists whose mass and radius both are half those of earth. Calculate the acceleration due to gravity on the surface of this planet. (Board Term I, 2012 Set-069;19)

Ans.

$$g_e = \frac{GM}{R^2} \quad g_p = \frac{Gm}{r^2} \quad 1$$

$$\begin{aligned} g_p &= g_e \times \frac{m}{M} \times \frac{R^2}{r^2} \\ &= g_e \times \frac{\left(\frac{1}{2}m\right)}{M} \times \frac{(R^2)}{\left(\frac{1}{2}R\right)^2} \quad 1 \end{aligned}$$

$$g_p = 2 \times g_e = 2 \times 9.8 = 19.6 \text{ m/s}^2 \quad 1$$

(CBSE Marking Scheme, 2012)

- Q. 19.** (a) State how is gravitational force between two bodies related to their masses.
 (b) Mass of moon is 7.31×10^{22} kg and its radius is 1.7×10^6 m. Determine acceleration due to gravity on its surface. ($G = 6.7 \times 10^{-11}$ N m 2 kg $^{-2}$) (Board Term I, 2012 Set-054)

Ans. (a)

$$F \propto m_1 \times m_2 \quad 1$$

(b)

$$g = \frac{GM}{d^2}$$

$$g = \frac{6.7 \times 10^{-11} \times 7.31 \times 10^{22}}{(1.7 \times 10^6)^2}$$

$$= 1.69 \text{ m/s}^2 \quad 2$$

(CBSE Marking Scheme, 2012)

- Q. 20.** A ball is dropped from the top of a tower 100 m high and at the same time another ball is projected vertically upwards from the ground with a velocity of 25 m/sec. Calculate where and when the two stones will meet. (take $g = 9.8 \text{ ms}^{-2}$) (Board Term I, 2012 Set-033)

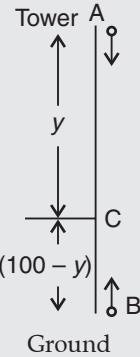
Ans. Let the ball 'A' be dropped from the tower.

Its initial velocity $u_1 = 0$ and acceleration $a_1 = +g = +10 \text{ m/s}^2$.

The ball 'B' is projected upwards with velocity $u_2 = 25 \text{ m/s}$ and its acceleration is $a_2 = -g = -10 \text{ m/s}^2$.

Let the two balls meet at point 'C' at distance 'y' below from 'A'.

Let the ball 'A' be dropped from the tower.



For ball A,

$$y = u_1 t + \frac{1}{2} a_1 t^2$$

$$\Rightarrow y = \frac{1}{2} \times 10t^2 = 5t^2 \quad \dots(i)$$

For ball B,

$$(100 - y) = u_2 t + \frac{1}{2} a_2 t^2$$

$$\Rightarrow (100 - y) = 25t + \frac{1}{2} \times (-10) \times t^2$$

$$\Rightarrow 100 - y = 25t - 5t^2 \quad \dots(ii)$$

Adding (i) and (ii) we have

$$100 = 25t$$

$$\therefore t = 4 \text{ s}$$

Putting the value of t in (i),

$$y = 5 \times 4^2 = 80 \text{ m}$$

From the top of the tower or 20 m from the ground.

(CBSE Marking Scheme, 2012) 3

- Q. 21.** (i) Give reasons for the following :

- (a) A sheet of paper falls slower than when it is crumpled into a ball.
 (b) A body weighs more at the poles than at equator.

- (ii) What is meant by the statement that acceleration due to gravity is 9.8 ms^{-2} ?

(Board Term I, 2012 Set-052)

- Ans.** (i) (a) It is due to resistance offered by air on paper sheet.

- (b) $g_p > g_e$ because $R_e > R_p$.

- (ii) It means when a body falls freely under gravity its velocity increases by 9.8 m/s in every one second. 1×3

- Q. 22.** State the difference between gravity and gravitation. A sphere of mass 40 kg is attracted by another sphere of mass 80 kg, by a force of 2.5×10^{-6} N when their centres are 300 mm apart. Find the value of G. (Board Term I, 2012 Set-031)

- Ans.** The force of gravitation exerted by earth (or any other planet) on the objects on its surface is called gravity. Every object attracts every other object due to the force of gravitation. So, gravity is a special case of gravitation. 1

$$F = GMm/R^2$$

$\frac{1}{2}$

$$\begin{aligned} 2.5 \times 10^{-6} &= G(80)(40) / (300 \times 10^{-3})^2 \frac{1}{2} \\ G &= (300 \times 10^{-3})^2 \times \\ &\quad (2.5 \times 10^{-6}) / 3200 \frac{1}{2} \\ G &= 7.03 \times 10^{-11} \text{ Nm}^2 \text{kg}^{-2} \quad \frac{1}{2} \\ &\quad (\text{CBSE Marking Scheme, 2012}) \end{aligned}$$

Q. 23. A ball thrown vertically up returns to the thrower after 6 s. Find :

- (a) The velocity with which it was thrown up.
- (b) The maximum height it reaches.
- (c) Its position after 4 s.

(Board Term I, 2012 Set-051)

Ans. (a) Acceleration due to gravity, $g = -9.8 \text{ ms}^{-2}$

As the time to go up and return is 6 s.

$$\therefore \text{The time to go up, } t = 3 \text{ s} \left(\frac{6}{2}\right)$$

Final velocity, $V = 0 \text{ ms}^{-1}$

Initial velocity, $u = ?$

As we know, by the first equation of motion,

$$\begin{aligned} u &= u + gt \\ 0 &= u + (-9.8) \times 3 \\ 0 &= u - 29.4 \\ u &= 29.4 \text{ ms}^{-1} \end{aligned}$$

Thus, the velocity with which it was thrown up

$$= 29.4 \text{ ms}^{-1}$$

(b) Distance (s) = Height (h) = ?

As we know, by the second equation of motion,

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

$$\therefore s = 29.4 \times 3 + \frac{1}{2}(-9.8) \times (3)^2$$

$$\Rightarrow s = 88.2 \text{ m} - 44.1 \text{ m}$$

$$\Rightarrow s = 44.1 \text{ m}$$

(c) Time, $t = 4 \text{ s}$

Distance, $s = ?$

Now, by second equation of motion,

$$\begin{aligned} s &= ut + \frac{1}{2}gt^2 \\ s &= 29.4 \times 4 + \times (-9.8) (4)^2 \\ s &= 117.6 \text{ m} - 78.4 \text{ m} \\ \Rightarrow s &= 39.2 \text{ m} \quad 1+1+1 \end{aligned}$$

(CBSE Marking Scheme, 2012)

Q. 24. Determine the magnitude of the gravitational force between a planet of mass $6 \times 10^{24} \text{ kg}$ and a 1 kg object on its surface. Let the radius of the planet be $6.4 \times 10^6 \text{ m}$. $G = 6.67 \times 10^{-11} \text{ Nm}^2 \text{ kg}^{-2}$.

(Board Term I, 2012 Set-035)

Ans. R_E , radius of the planet = $6.4 \times 10^6 \text{ m}$

$$\begin{aligned} M_E &= \text{mass of the planet} \\ &= 6 \times 10^{24} \text{ kg} \end{aligned}$$

G = Universal Gravitational Constant

$$= 6.67 \times 10^{-11} \text{ Nm}^2/\text{kg}^2$$

m = mass of object = 1 kg

According to Newton's Law of gravitation, the gravitation force (F) is

$$F = GM_p m / R_p^2 \quad \frac{1}{2}$$

$$\begin{aligned} F &= (6.67 \times 10^{-11})(6 \times 10^{24})(1) \\ &\quad / (6.4 \times 10^6)^2 \quad 2 \\ F &= 9.8 \text{ N} \quad \frac{1}{2} \\ &\quad (\text{CBSE Marking Scheme, 2012}) \end{aligned}$$

Q. 25. To estimate the height of a bridge over a river, a stone is dropped freely in the river from the bridge. The stone takes 2 s to touch the water surface in the river. Calculate the height of the bridge from the water level. (Board Term I, 2012 Set-040)

Ans. The stone is being dropped freely from rest, so the initial velocity of the stone, $u = 0$. Again, the velocity of the stone is increasing as it comes down, so the acceleration due to gravity 'g' is to be taken as positive.

Here, Initial velocity $u = 0 \text{ m/s}$

Time taken $t = 2.0 \text{ s}$

Let h be the height of the bridge

Apply 2nd kinetic equation;

$$\begin{aligned} h &= ut + \frac{1}{2}gt^2 \\ \text{or,} \quad &= [0 + \frac{1}{2}9.8(2.0)^2] \text{m} \\ \text{or,} \quad &= 19.6 \text{ m} \quad 3 \\ &\quad (\text{CBSE Marking Scheme, 2012}) \end{aligned}$$

Q. 26. A body of weight 600 N rests on the floor of a lift. If the lift begins to fall freely under the gravity, what is the force with which the body presses on the floor ? (Board Term I, 2012 Set-049)

Ans. When the lift is falling freely under the gravity, then the body of weight 600 N kept in it also falls freely under the action of gravity. In this case the reaction (force) of the floor of the lift on the body is zero, so the action (force) of the body on the floor of the lift should also be zero (By Newton's III Law of Motion). Hence, no force is exerted by the body on the floor of the lift when the lift is falling freely under the gravity. The body is weightless under such situations. 3

Q. 27. What is meant by acceleration due to gravity ? Derive an expression for acceleration due to gravity in terms of mass M of earth and its radius R .

(Board Term I, 2012 Set-076)

Ans. The acceleration produced in the motion of a body falling freely under the force of gravity is called acceleration due to gravity. It is denoted by 'g'.

Consider the earth to be a sphere of mass M and radius R , as shown in the figure. Suppose a body of mass m situated at distance r from the centre of the earth.

As we know, according to Newton's law of gravitation, the force of attraction between the earth and the body is given by

$$F = GmM/r^2 \quad \dots(1)$$

This force produces an acceleration 'g', called acceleration due to gravity in the body of mass m .

So, from Newton's second law,

$$F = mg \quad \dots(2)$$

From equations (1) and (2), we get

$$mg = \frac{GMm}{r^2}$$

$$\text{or } g = \frac{GM}{r^2} \quad \dots(3)$$

This equation gives acceleration due to gravity at points far away from the earth. Now, if body is located on the surface of the earth, then $r = R$, i.e., the radius of the earth. Then equation (3) becomes

$$G_{\text{surface}} = \frac{GM}{R^2}$$

This equation gives acceleration due to gravity at the surface of the earth.

The value of 'g' on the earth's surface is 9.8 ms^{-2} .

(CBSE Marking Scheme, 2012) 1 + 2

Q. 28. At what height above the surface of the earth, the value of g becomes 64% of its value at the surface of the earth. Take the radius of the earth = 6400km. (HOTS)

Ans. Let g = acceleration due to gravity at the earth surface.

g_h = acceleration due to gravity at height (h) = $0.64g$.

Understand from where 1 eqn came

$$\therefore \text{Ratio of } \frac{g_h}{g} = \frac{\frac{GM_E}{(R_E+h)^2}}{\frac{GM_E}{R_E^2}} = \frac{g(R_E)^2}{(R_E+h)^2}$$

$$0.64(R_E + h)^2 = R_E^2$$

$$0.8h = R_E = 0.2 \times 6400$$

$$h = \frac{2 \times 6400}{8}$$

$$= 1600 \text{ km.}$$

3

Q. 29. Prove that if the earth attracts two bodies placed at some distance from the centre of the earth with the same force, then their masses are equal. (HOTS)

(Board Term I 2013, OAHJD6N)

Ans. Suppose A and B are two bodies

Then, the mass of body A be m_1 and the mass of body B be m_2 .

From universal law of gravitation, the force of attraction between the earth and the body A is given by

$$F_A = \frac{GM_e m_1}{R^2}$$

Where, R is the distance of the body from the centre of the earth.

Similarly, the force of attraction between the earth and the body B is given by

$$F_B = \frac{GM_e m_2}{R^2}$$

But $F_A = F_B$ (given)

$$\frac{GM_e m_1}{R^2} = \frac{GM_e m_2}{R^2}$$

$$m_2 = m_1$$

⇒ Thus the mass of two bodies A and B are same.

1 + 1 + 1

Long Answer Type Questions

5 Marks each

Q. 1. Write three points of differences between mass and weight. How much would a 70 kg astronaut weigh on moon? What would be his mass on the earth and on the moon?

(Board 2015, Set- K34UQKW)

Ans. Differences between mass and weight : See Q. 6(b) S.A.T. II.

Mass of the astronaut on moon = 70 kg, $g = 1.6 \text{ m/s}^2$ on moon

$$\begin{aligned} W &= m \times g \\ &= 70 \times 1.6 \end{aligned}$$

= 112 N is the weight of astronaut on moon.

The mass of a body is constant everywhere in the universe. So, the mass of the astronaut would be same on the earth as well as on the moon i.e. 70 Kg.

3 + 2

Q. 2. (a) A person weighs 110.84 N on moon, whose acceleration due to gravity is 1/6 of that earth. If the value of 'g' on earth is 9.8 ms^{-2} . Calculate.

(i) 'g' on moon.

(ii) mass of person on moon

(iii) weight of person one earth

(b) How does the value of g on the earth is related to the mass of the earth and its radius ? Derive it.

$$\text{Ans. (a) (i) } g_{\text{earth}} \times \frac{1}{6} = 9.8 = 1.63 \text{ ms}^2$$

$$\text{(ii) Mass on moon} = \frac{F}{g} \times \frac{110.84}{1.63} = 68 \text{ kg}$$

$$\text{(iii) Weight on earth} = mg = 68 \times 9.8 = 666.04 \text{ N.}$$

(b) Derivation of $g = GM/R^2$

(CBSE Marking Scheme, 2015) 5

Detailed Answer :

$$\text{(a) (i) } g_{\text{earth}} \times \frac{1}{6} = 9.8 = 1.63 \text{ ms}^2$$

(ii) Mass on moon will be constant and does not change from place to place. Hence, mass of the person on moon will be 68 kg.

$$\text{(iii) Weight on earth} = 110.84 \times 6 = 666.04 \text{ N.}$$

(b) According to Newton's law of gravitation, the force of attraction between earth and a body is given by

$$F = \frac{GmM}{r^2} \quad \dots \text{(i)}$$

Force produces an acceleration 'g'. So, from Newton's second law $F = mg$ (ii)

From equation (i) and (ii) we get

$$mg = \frac{GmM}{r^2}$$

$$g = \frac{GM}{r^2}$$

- Q. 3.** (a) Prove that if the earth attracts two bodies placed at the same distance from the centre of earth, with equal force; then their masses will be the same.
 (b) Mathematically express the acceleration due to gravity that is expressed by a free falling object.
 (c) Why is 'G' called a universal constant ?
 (Board 2014, set - LFS3I7K)

Ans. (a) Let mass of first body be m_1
 Let mass of second body be m_2
 Force on 1st body = Force on 2nd body
 $GMm_1/R^2 = GMm_2/R^2$
 G and G cancel. M and M cancel R^2 and R^2 cancel
 This leaves
 $m_1 = m_2$
 Hence proved.
 (b) $g = GM/R^2$
 (c) Its value is constant in universe. 3 + 1 + 1
 (Board marking scheme, 2014)

- Q. 4.** Sunil threw a ball while standing on the jumping board of a swimming pool, which is at a height of 45 m. After one second, he threw another ball from the same board with initial velocity u . Both the balls hit the water together.
 (i) Find the initial velocity with which the second ball was thrown.
 (ii) Do the two balls hit the water with the same velocity ? Explain. (NCERT Based)

Ans. (i) For the first ball,
 Initial velocity, $u = 0$ m/s; distance covered, $s = 30$ m; acceleration, $a = g = 10$ m/s²
 Now, using the second equation of motion,

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

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

Substituting the values in the above equation, we get

$$45 = 0 \times t + \frac{1}{2} \times 10 \text{ m/s}^2 \times t^2$$

$$45 = 5 \text{ m/s}^2 \times t^2$$

$$t^2 = 9 \text{ s}^2 \Rightarrow t = 3 \text{ s}$$

Thus, the first ball takes 3 s to reach the water surface.

For the second ball,

initial velocity, $u = ?$; distance covered, $s = 45$ m; time taken, $t = 3 \text{ s} - 1 \text{ s} = 2 \text{ s}$

Now, again using the second equation of motion,

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

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

$$\text{So, } 45 \text{ m} = u \times 2 \text{ s} + \frac{1}{2} \times 10 \text{ m/s}^2 \times (2 \text{ s})^2$$

$$45 = u \times 2 \text{ s} + 20 \text{ m}$$

$$\Rightarrow u = 12.5 \text{ m/s}$$

- (ii) Velocities of the two balls when they hit the water :

If v_1 is the velocity of the first ball,

$$v_1 = u + at = u + gt \\ = 0 + 10 \text{ m/s}^2 \times 3 \text{ s} = 30 \text{ m/s}$$

If v_2 is the velocity of the second ball,

$$v_2 = 12.5 \text{ m/s} + 10 \text{ m/s}^2 \times 2 \text{ s} \\ = 32.5 \text{ m/s}$$

Thus, the two balls hit the water surface with different velocities. The second ball hits the water with higher velocity. 3 + 2

(CBSE Marking Scheme, 2014)

- Q. 5.** Manu was standing on a 245 m high tower with a stop watch. He dropped a stone from the tower and noted that the time taken by the stone to reach the ground is 6 s.

- (i) Was the time taken by the stone to reach the ground correct ?
 (ii) What was its velocity when it touched the ground ?
 (iii) Make table showing the distance, velocity and acceleration at the end of each second of the journey of the stone.
 (iv) Plot distance-time, velocity-time and acceleration-time graphs. (NCERT Based)

Ans. Since, height of the tower,

$$h = 245 \text{ m}$$

Initial velocity of the particle,

$$u = 0 \text{ m/s}$$

- (i) Time taken by the stone to reach the ground, $t = ?$
 Using the equation,

$$h = ut + \frac{1}{2} gt^2, \text{ we get}$$

$$\Rightarrow 245 = 0 \times t + \frac{1}{2} \times 10 \times t^2$$

$$\Rightarrow t = 7 \text{ sec}$$

Thus, the measured time was incorrect.

- (ii) Final velocity, when the stone touched the ground,

Using the equation, $v = u + gt$

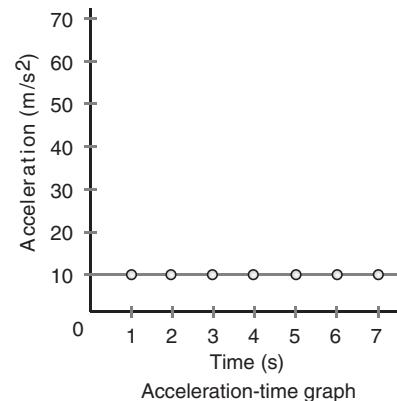
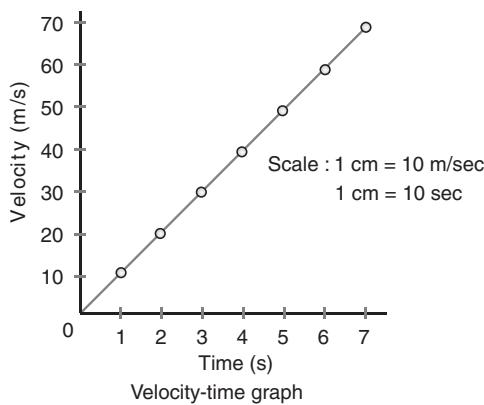
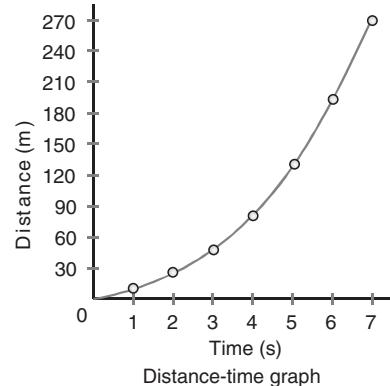
$$\Rightarrow v = 0 + 10 \text{ m/s}^2 \times 7 \text{ s} = 70 \text{ m/s}$$

- (iii) By using the above given equations of motion, we draw the following table.

Time (t)	Distance (s)	Velocity (v)	Acceleration a (= g)
0 s	0 m	0 m/s	
1 s	5 m	10 m/s	10 ms^{-2}

0 s	0 m	0 m/s	
1 s	5 m	10 m/s	10 ms^{-2}
2 s	20 m	20 m/s	10 ms^{-2}
3 s	45 m	30 m/s	10 ms^{-2}
4 s	80 m	40 m/s	10 ms^{-2}
5 s	125 m	50 m/s	10 ms^{-2}
6 s	180 m	60 m/s	10 ms^{-2}
7 s	245 m	70 m/s	10 ms^{-2}

- (iv) The distance-time graph, velocity-time graph and acceleration-time graph for the above table are given below :



5

- Q. 6. How does the force of attraction between the two bodies depend upon their masses and distance between them ? What happens when two bricks tied together would fall faster than a single one under the action of gravity. Do you agree with the statement or not ? Comment. (HOTS)

Ans. The force of attraction between two bodies of masses m_1 and m_2 and separated by distance r is given by :

$$F = \frac{Gm_1m_2}{r^2}$$

Where G is the universal constant in nature.

This force is known as gravitational force. The gravitational force is directly proportional to the product of the masses of two bodies and inversely proportional to the square of the distance between them.

All bodies fall with the same acceleration due to gravity whatever their masses be. So, two bricks tied together will not fall faster than a single brick under the action of gravity.

1 + 2 + 2

Value Based Questions

- Q. 1. Radhika buys a few grams of precious stones in Jaipur. She takes them to equator and is surprised to see that their weight is reduced. She thinks that she has been cheated. She goes back to the seller and claims the exchange amount. The shopkeeper explains the fact that how weight differs due to value of g .

- (i) How does g vary with distance ?
- (ii) What values are shown by Radhika ?
- (iii) What is the relation of g with G (gravitational force) ?

Ans. (i) $g \propto \frac{1}{R^2}$, at equators g is minimum and at poles g is maximum.

- (ii) Radhika was illogical, enthusiastic and doubtful towards things. (Sceptical)
- (iii) Relation between ' g ' and ' G ' is

$$g = \frac{Gm}{R^2} \quad 1 + 1 + 1$$

- Q. 2. Manu is an archery trainer. While teaching his students, he asks them to keep the arrow a little above the target. Sonu is very curious to know the reason behind this and asks him. Manu explains very patiently to Sonu, on how the arrow travels when released.

- (a) What explanation does Manu give to Sonu ?
- (b) What are the values of Sonu ?
- (c) What are the values of Manu ?

(AGRO 94, 2013)

- Ans. (a) He tells Sonu that the arrow follows a curved path (projectile motion) and hits a little below the aim.
- (b) Sonu is recipient, logical and questioning child.
 - (c) Manu is patient, scientific, logical and convincing.

1 + 1 + 1

Q.3. Sonu throws a ball horizontally while Monu throws a ball vertically downwards from a tower. Both of them do so in an attempt to see who hits the stone on ground first. After that, they try to reason their findings.

- Which ball reaches the ground first ?
- What will be the final velocity, when a ball is dropped from a height ?
- What values are shown by Sonu and Monu ?

Ans. (i) Both balls reach the ground simultaneously because both of them have been dropped from the same height.

- Final velocity will be zero.

$$\text{Final velocity} = \text{acceleration} \times \text{time} + 0 \\ (\text{as initial velocity} = 0) \\ (\text{acceleration} = \text{gravity})$$

- They show logical, experimental, observatory and practical attitude.

1 + 1 + 1

Q.4. A man bought a few gram (force) of gold at the poles as per instruction of one of his friends. He handed over the same when he meets him at equator. His friend did not agree with the weight of gold bought.

- Why didn't his friend agree ? Explain.
- What values are displayed by Aman ? Was he a cheater ? What do you think ?

Ans. (a) As we know, Weight of an object is given by $W = mg$, where ' m ' is mass of the object ' g ' is the acceleration due to gravity.

As we know, the weight of an object is less at the equator than at the poles as the magnitude of ' g ' is less at the equator than at the poles. Therefore, his friend will not agree with weight of the gold bought at the poles when measured at equator.

(b) No, he was not a cheater. Might be he was not aware of the fact that value of g is less at the equator.

2 + 1



KNOW THE LINKS

- www.physicsclassroom.com
- hyperphysics.phy-astr.gsu.edu
- www.springer.com
- en.wikipedia.org/wiki/gravity



SYLLABUS

- *Plant and animal breeding and selection for quality improvement and management; use of fertilizers and manures; protection from pests and diseases; organic farming.*



TOPIC-1

Plant and animal breeding, Selection for quality improvement and management

QUICK REVIEW

- Agriculture and animal husbandry provide us with all our animal and plant food.
 - Capacity of producing crop plants and managing livestock should be increased through various efforts like green revolution and white revolution. But this should be done by employing sustainable practices without destroying our environment.
 - Improving the financial status of people, especially those involved in agricultural practices is essential to provide food security to everyone.
 - The optimum requirement of temperature, water, light and other conditions varies for different crops.
 - Kharif crops like paddy and cotton are grown in rainy season whereas Rabi crops like wheat and mustard are grown in winter season.
 - Crop variety improvement, crop production improvement and crop protection management help to increase the crop yields.
 - Hybridization and genetic modification techniques introduce the useful characters into crop plants.
 - It is desirable to develop crops that can survive and give good yields in different climatic conditions and areas.
 - The characteristics desirable in crop plants are (i) Increased yield (ii) Improved quality (such as baking quality in wheat, protein quality in pulse) etc. (iii) Resistance to biotic and abiotic factors, especially those harming the plant. (iv) Reduction in duration of plant maturity. (v) Broad range adaptability of the crop plant under various environmental conditions. (vi) Desired agronomic characteristics particular to a plant. Variety improvement may be done for one or several of these characteristics.
 - In India, the land holding, financial conditions and use of modern technologies vary among different farmers. Hence the inputs of farmers are also different, leading to different production practices and yields.
 - The sixteen nutrients required by plants are obtained through air, water and soil.
- (i) There are 6 macronutrients. **Macronutrients** : Nitrogen, phosphorus, potassium, calcium, magnesium and sulphur.
- (ii) There are 7 micronutrients. **Micronutrients** : Iron, manganese, boron, zinc, copper, molybdenum and chlorine.
- (iii) Air supplies carbon and oxygen and hydrogen comes from water.
- Due to the food needs of the ever increasing human population, animal husbandry, especially of cattle, goat, sheep, poultry and fish, is gaining a lot of importance.

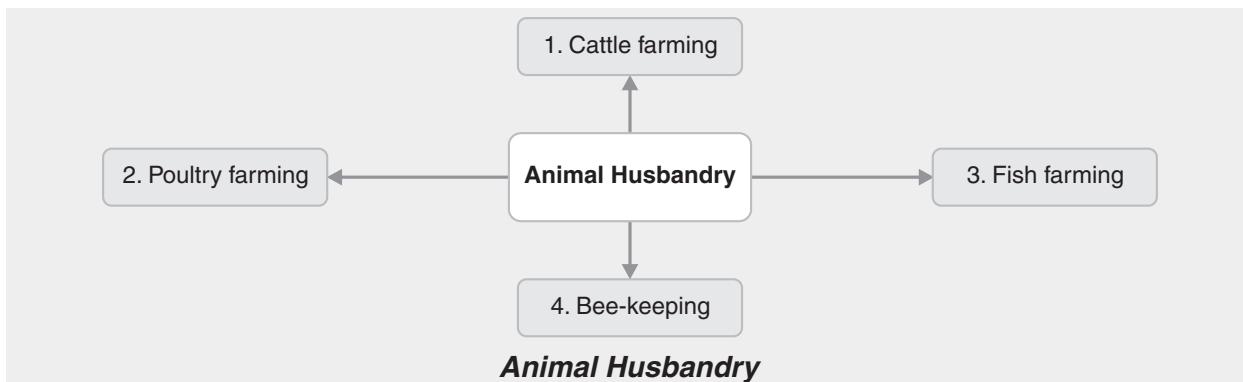
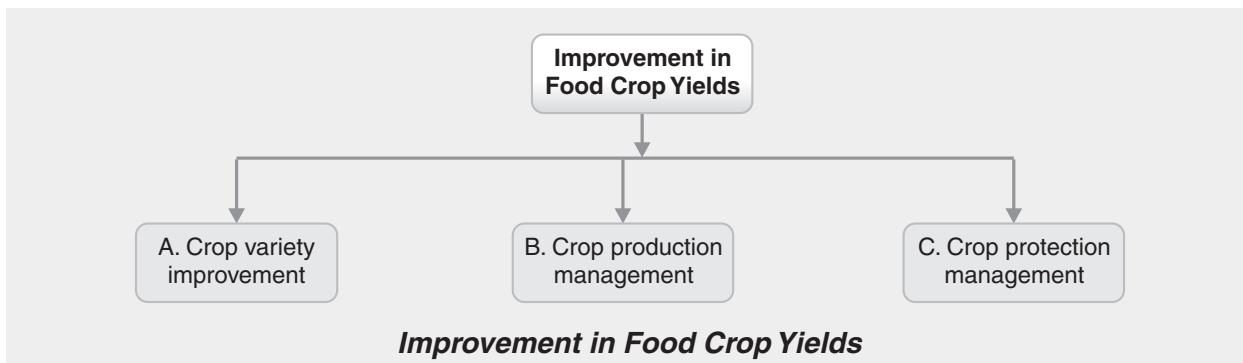
- In India, cows and buffaloes are used for draught labour and producing milk and are called draught animals and milky animals respectively.
- Long lactation period is a desirable quality in milky animals.
- Exotic breeds showing long lactation are cross bred with local breeds showing resistance to diseases to obtain high quality breeds.
- For good health and milk production, proper cattle management is required such as shelter, feeding, breeding and disease control.
- The cattle shelter should be well-ventilated, hygienic and dry.
- Cattle food should include roughage and concentrates in balanced amounts and are required for the healthy maintenance as well as milk production of the cattle.
- Cattle diseases are caused by external and internal parasites as well as by bacteria and viruses. These affect the health as well as milk production of the animals and can be largely controlled through vaccinations.
- Poultry farming targets egg production and broiler production for chicken meat.
- Cross-breeding is done between the Indian and foreign breeds of poultry to obtain improved varieties containing desirable traits such as tolerance to high temperature, dwarf broiler parent, low maintenance requirements and reduction in size of the layers.
- The shelter, feeding and other requirements of broilers and layers differ from each other.
- The diet of broilers is planned with the aim of achieving good growth rate and quality of carcass whereas the diet of layers is aimed to achieve large number and high quality of eggs.
- Broiler diet is rich in proteins and vitamins, along with the required amount of fat.
- The poultry shelter should be hygienic, well-lighted and maintained at appropriate temperatures.
- Poultry need to be protected from various diseases caused by bacteria, fungi, viruses, parasites and nutritional deficiencies, through proper treatment, sanitation and vaccination.
- In fish production, both the finned true fish as well as shellfish are obtained from marine or fresh water through capture fishing or culture fishery.
- India's marine fishery resources are the vast coastlines and extensive seas; the freshwater resources are canals, ponds, reservoirs and rivers whereas the brackish water fishery resources are estuaries and lagoons.
- In India, marine fishes such as pomphret, tuna, mackerel and sardines are located through satellites and echo sounders and captured using fishing nets.
- Marine fish farming of high economic value fishes like mullets, oysters and prawns are done in sea water.
- Freshwater fish production is mainly carried out through aquaculture.
- Composite fish culture system is used commonly for fresh water fish farming. In this system, five or six fish species with different food habits are farmed together in a single pond, so as to increase the yield of fish.
- Since high quality fish seed is not always available, fish are now-a-days bred using hormonal stimulation, thus ensuring continuous supply of the seed.
- Bee-keeping is a low investment activity carried out by farmers to obtain honey and wax.
- *Apis cerana indica*, *Apis dorsata* and *Apis florea* are the Indian bee varieties whereas *Apis mellifera* is an Italian variety used for commercially producing honey.
- The availability of sufficient amount of pasturage as well as the type of flowers decide the quality of honey.



KNOW THE TERMS

- **Hybridization** : Crossing between genetically dissimilar plants.
- **Intervarietal hybridization** : Hybridization between different varieties of plants.
- **Interspecific hybridization** : Hybridization between plants belonging to two different species of the same genus.
- **Intergeneric hybridization** : Hybridization between plants of different genera.
- **Macronutrients** : Nutrients required by plants in large quantities.
- **Micronutrients** : Nutrients required by plants in small quantities.
- **Broiler** : Gallinaceous domesticated fowl, bred and raised specifically for meat production.
- **Composite fish culture** : Polyculture system in which compatible fishes of different species having different feeding habits are selected and grown in the pond to exploit all types of available food.
- **Livestock** : Domesticated animals raised in an agricultural setting to produce commodities such as food, fiber and labor.

FLOWCHARTS



Very Short Answer Type Questions

1 Mark each

Q. 1. Name the process by which green plants make their own food. (Board Term 1, 2013 [AHJD6N])

Ans. Photosynthesis. (CBSE Marking Scheme, 2014) 1

Q. 2. Mention any two food materials which provide us carbohydrates. (Board Term 1, 2013 [7ZTHA8G])

Ans. Potato and Rice. $\frac{1}{2} + \frac{1}{2}$
(CBSE Marking Scheme, 2014)

Q. 3. Name two breeds of buffaloes. (NCT 2014)

Ans. Murrah and Mehsana. 1

Q. 4. In a certain technique, the developing embryo from a superior breed is removed and transferred into another female of inferior characters. Name this technique.

Ans. The technique is embryo transfer. 1

Q. 5. In a certain organisation in India cross breeds such as Karan swiss, Karan fries etc. have been developed. Which organisation is it ? Where is it located ?

Ans. National Dairy Research Institute (NDRI) at Karnal, Haryana. $\frac{1}{2} + \frac{1}{2}$

Q. 6. Cows A and B are of same breed. Cow A is fed on grass and cow B is fed on maize, grass, barley, etc. Which do you expect to give a higher quantity of milk ?

Ans. Cow B as it has both roughage and concentrates in its diet. 1

Q. 7. A certain health conscious person needs to choose between milk of the Surti and the Murrah. Which one should he/she choose ?

Ans. He/she should opt for the milk from the Murrah as its fat content (< 7%) is lesser than that of the Surti (8% – 12%). 1

Q. 8. What has green revolution led to ?

Ans. Increased food grain production. 1

Q. 9. What has white revolution led to ?

Ans. Better and more efficient use and availability of milk. 1

Q. 10. What are photoperiods related to ?

Ans. Duration of sunlight. 1

Q. 11. What is the duration of Kharif season ?

Ans. From the month of June to October. 1

Q. 12. What is the duration of Rabi season ?

Ans. From the month of November to April. 1

Q. 13. Name the three stages in which farming practices are divided.

Ans. (1) Choice of seeds, (2) Nurturing of crop plants and (3) Protection of the growing and harvested crops from loss. 1

Q. 14. What is the name given to crops obtained by introducing a gene that provides the desired characteristic ?

Ans. Genetically modified crops. 1

Q. 15. Name any two factors for which variety improvement is done.	Ans. Higher yield and improved quality. 1	Ans. Red Sindhi and Sahiwal. 1
Q. 16. What is animal husbandry ?	Ans. Animal husbandry is the scientific management of animal livestock and includes feeding, breeding and disease control. 1	Q. 19. Name any two signs of a healthy animal.
Q. 17. What is the purpose of cattle husbandry ?	Ans. The cattle husbandry is done mainly for two purposes-milk and draught labour for agricultural work such as tilling, irrigation and carting. 1	Ans. A healthy animal feeds regularly and has a normal posture. 1
Q. 18. Name two cattle breeds which show excellent resistance of diseases.		Q. 20. Name the internal parasites which affect stomach, intestine and liver in cattle.
		Ans. Worms, Liverfluke. 1
		Q. 21. What is the purpose of poultry farming ?
		Ans. To raise domestic foul for egg production and chicken meat. 1
		Q. 22. What is fish farming called ?
		Ans. Culture fishery. 1

Short Answer Type Questions-I

2 Marks each

Q. 1. Give two reasons as to why there is tremendous scope to develop fisheries in India. (Board Term 1, 2011)	Ans. There is good scope for fisheries in India because : (a) India has 1·6 million hectares of inland water bodies. (b) Its coastline is 7500 km long. 1 + 1	Q. 6. Match the following : (NCERT Based) 1. White leghorn a. Meat yielding Poultry 2. Karan Swiss b. Egg Laying Poultry 3. Murrah c. Buffalo 4. Aseel d. Exotic Breed of Cow
Q. 2. Chicken A is (all chicken in reference are of same variety egg laying) exposed to very bright sunlight, chicken B is kept inside a dark building whereas chicken C is kept in a well-lit building. Which chicken will have maximum laying output ? (Board, 2010)	Ans. Chicken C will have maximum laying output. This is because it is exposed to moderate sunlight. Moderate light intensity and duration has a favourable effect on the egg laying output of the hens. 1 + 1	Ans. 1. – b, 2. – d, 3. – c, 4. – a. 1 + 1
Q. 3. Give two advantages of Holstein-Friesian over the Red Sindhi. (Board Term 1, 2010)	Ans. Advantages of Holstein-Friesian over the Red Sindhi are : (a) Average milk production is more. (b) Lactation periods extend throughout the year. 1 + 1	Q. 7. How can you classify the practices involved in improving crop yields ? (NCERT Based)
Q. 4. The production of food from animal sources has increased in the last few decades. Justify. (Board Term 1, 2010, 11)	Ans. (a) Improved varieties and cross-breeds have been developed, (b) Proper health and disease control have also improved the yield. 1 + 1	Ans. We can divide the practices involved in farming into three stages. The first is the choice of seeds for planting. The second is the nurturing of the crop plants. The third is the protection of the growing and harvested crops from loss. Thus, the major groups of activities for improving crop yields can be classified as : – Crop variety improvement – Crop production improvement – Crop protection management. 2
Q. 5. Why are wrestlers and sportsmen recommended to have egg, meat and fish as a part of their diet ? (NCERT Based)	Ans. Sportsmen and wrestlers are recommended to have egg, meat and fish as a part of their diet because these contain high amounts of protein which is essential for growth and development of muscles. 2	Q. 8. Why according to you is animal husbandry essential ? (Board Term 1, 2010)
		Ans. Animal husbandry is essential because of the following reasons : (1) To increase milk production, which automatically fulfils the need of the growing population. It also increases the production of various milk products like butter and cheese. (2) To increase egg and meat production, which are highly nutritious. (3) To increase fish production. (4) For the proper utilization of animals wastes. ½ × 4
		Q. 9. Define livestock. (NCERT Based)
		Ans. Livestock includes domesticated animals like cows, buffaloes, sheep, goats, pigs, horses, etc. which are reared for financial gain. Out of all the livestock animals, cow and buffalo are the most important. These are not only used in agricultural operations and transportation, but they also provide milk, meat, hides, dung manure and fuel (in biogas plants). 2

Short Answer Type Questions-II

3 Marks each

Q. 1. State the meaning of Layers. Why limestone is added in their diet ? Name one other dietary requirement of poultry birds.

(Board 2014, Set-LFS3I7K)

Ans. Layers are the birds, reared for egg production. Limestone is added in their diet to form the shell of eggs

Other example : Proteins and roughage

(CBSE Marking Scheme, 2014) 1 + 1 + 1

Q. 2. Define macro nutrients and micro nutrients? Write one example of each. (Board 2014 Set-SO1QHXJ)

Ans. Macronutrients are nutrients required in large quantity. e.g., nitrogen.

Micronutrients are nutrients required in small quantity. e.g., boron.

(CBSE Marking Scheme, 2014) 1½ + 1½

Q. 3. Cattles are fed with roughage and concentrates. Why ? Which feed additives are added in the cattle field apart from nutrients ?

(Board Term I, OAHJD6N, 2013)

Ans. Roughage – to provide fibres.

Concentrates – to provide proteins and other nutrients.

Food additives – micronutrients to promote health and milk output of dairy animals. 1 + 1 + 1

(CBSE Marking Scheme, 2013)

Q. 4. Name the environmental factors related to cultivation practices and crop yield. Explain how they are related to crop yield.

(Board Term I, OAHJD6N, 2013)

Ans. (i) **Weather** : Climatic conditions should be favourable for the growth of crops, like duration of sunlight, temperature, rainfall etc.

(ii) **Soil Quality** : All plants require nutrients for their growth. Soil acts as a medium. Soil should be rich in nutrients and should have a balanced pH for the growth of the crops.

(iii) **Availability of Water** : Irrigation should be proper for the better production of crops.

1 + 1 + 1

Q. 5. Explain the ways by which crop-production can be increased. (Board Term I, 2013, 7ZTHA8G)

Ans. There are three ways :

(i) **Crop Variety Improvement** : This approach aims at finding a crop variety that can give a good yield variety that can produce high yield under different conditions and can withstand different situations like weather changes, soil quality, water availability etc.

(ii) **Crop Production Management** : Farmers have to look into the financial aspect of a crop. They have to think about the capital to invest on the land and the benefits they get from it. It is the financial condition that allows farmers to grow

a particular crop. The purchasing capacity for inputs decides cropping system and production practices.

(iii) **Crop Protection Management** : Field crops are infested by a large number of weeds, insect pests and diseases. If they are controlled at correct time, it will ensure increased crop production. 1 + 1 + 1

Q. 6. Define Animal husbandry. Why livestock production needs to be improved ?

(Board Term I, 2013, 7ZTHA8G)

Ans. Animal husbandry can be defined as the science of rearing, feeding, caring, breeding and utilisation of animals.

Needs of improving livestock production :

(i) It is required to meet the increasing demands of animal based goods like milk, meat, egg, leather etc.

(ii) Animal husbandry sets guidelines for proper management and systematic approach to animal rearing.

(iii) It also helps in proper utilisation of animal wastes like animal dung. 1 + 2

Q. 7. List any three management practices while designing a shelter for cattle.

(Board Term I, 2012 Set-015)

Ans. While designing a shelter for cattle we must have a shelter that is :

(a) Well ventilated,

(b) Protects animals from rain, heat and cold,

(c) The floor of the cattle shed needs to be sloping so as to stay dry and facilitate cleaning.

(CBSE Marking Scheme, 2012) 1 + 1 + 1

Q. 8. State two advantages of composite fish culture. What is the application of hormonal stimulation in fish culture ? (Board Term I, 2012 Set-019)

Ans. Advantages of composite fish culture :

(i) It helps to get a variety in fish yield.

(ii) Food in the pond gets evenly used up due to different varieties of fish having different food habits present in a pond.

(iii) Fish do not compete for food as all type of fish get their kind of food. (any two)

Hormonal stimulation ensures the supply of pure fish seed in desired quantities. 1 + 1 + 1

(CBSE Marking Scheme, 2012)

Q. 9. (a) Name one indigenous and one exotic breed of domestic fowl.

(b) **What are the two main products obtained from raising domestic fowl ?**

(c) **Name two vitamins that should be included in high amount in poultry feed.**

(Board Term I, 2012 Set-020)

Ans. (a) Indigenous breed — Aseel,
Exotic breed — Leghorn.
(b) Egg, chicken meat,
(c) Vitamin A, Vitamin K. $\frac{1}{2} \times 6$
(CBSE Marking Scheme, 2012)

Q. 10. (a) State two characteristics of an ideal cattle shed.
(b) Cattles are mainly reared for milk or performing agricultural tasks. What are these two categories of cattle known as ?
(c) Name two indigenous breeds of cattle.
(Board Term I, 2012 Set-020)

Ans. (a) Two characteristics of an ideal cattle shed are : well roofed/well ventilated/sloppy floor (any two)
(b) Milch animals, draught animals.
(c) Red Sindhi, Sahiwal $\frac{1}{2} \times 6$
(CBSE Marking Scheme, 2012)

Q. 11. Mention three different ways in which crop plants can be attacked by insect pests. Also suggest one control measure and two preventive measures against pests. **(Board Term I, 2012 Set-021; 42)**

Ans. Three ways in which crop plants can be attacked by insect pests :
(i) eat up the plant parts
(ii) suck the cell sap from various parts
(iii) bore into stem and fruits.
Control measure : Spraying pesticides.
Preventive measure :
(i) Use of resistant varieties
(ii) Summer ploughing. $\frac{1}{2} \times 3 + \frac{1}{2} \times 3$
(CBSE Marking Scheme, 2012)

Q. 12. (a) Besides causing ill health and death, how do diseases affect the dairy animals ?
(b) In a cattle farm, there are fifteen cattles. How can you differentiate between diseased and healthy cattle without conducting diagnostic tests ?
(c) Cattle feed should include right amount of concentrates. What do concentrates in cattle feed refer to ? **(Board Term I, 2012 Set-021)**

Ans. (a) Diseases reduce milk production.
(b) Diseased cattle don't take regular feed and don't show normal posture.
(c) Concentrates : Animal feed with high protein and low fibre content with other nutrients.
(CBSE Marking Scheme, 2012) 1×3

Q. 13. Define draught animals. Mention the desired qualities which will be seen in a cross-breed between a Brown Swiss and a Sahiwal ?
(Board Term I, 2012 Set-028)

Ans. The animals which are used for farm labour are called draught animals.
Desired qualities : Long lactation period and excellent resistance to diseases. $1 + 2$
(CBSE Marking Scheme, 2012)

Q. 14. (a) Differentiate between broilers and layers.
(b) Nutritional requirements of broilers differ from those of egg layers. Justify the statement.
(c) Mention any two factors that can cause diseases to poultry fowls.
(Board Term I, 2012 Set-031)

Ans. (a) Broilers are raised for chicken, meat and egg. Layers are raised for eggs.
(b) Broilers need more proteins with adequate fat. Egg layers are given more of vitamin A and K.
(c) Virus, bacteria, fungi, parasites, nutritional deficiencies.
 $1 + 1 + 1$
(CBSE Marking Scheme, 2012)

Q. 15. Name two local and exotic breeds of bees used for commercial production of honey. List any three qualities for which foreign breed are adopted.
(Board Term I, 2012 Set-031)

Ans. (a) Indian bee – *Apis cerana indica* (local)
(b) The rock bee – *Apis dorsata* (Exotic)
(c) Italian bee variety – *Apis mellifera*.
Three qualities for which foreign breed are adopted are :
(i) Higher honey collecting capacity
(ii) Sting less
(iii) Stays in a given beehive for long period
(iv) Breeds well. $\frac{1}{2} \times 3 + \frac{1}{2} \times 3$
Q. 16. Explain the term "animal husbandry"? Differentiate between milch and draught animals. Name the two species of Indian cattle.
(Board Term I, 2012 Set-033)

Ans. Animal husbandry is the scientific management of animal livestock. It includes various aspects such as breeding, feeding and disease control.
Milch Animals : Milk producing female animals.
Draught Animals : Animals used for farm labour.
Bos indicus and *Bos bubalis* are the two species of Indian cattle.
 $1 + \frac{1}{2} \times 4$
(CBSE Marking Scheme, 2012)

Q. 17. Define capture fishing and culture fishery. Why are prawns and oysters cultivated ?
(Board Term I, 2012 Set-041)

Ans. Capture fishing : Fishing from natural resources.
Culture fishery : Fish farming.
Oysters are cultivated for pearls.
Prawns are cultivated as a food item. $1 + 1 + 1$
(CBSE Marking Scheme, 2012)

Q. 18. (a) Classify three major groups of activities for improving crop yields.
(b) Name another way of improving crop variety. How is it done? **(Board Term I, 2012 Set-042)**

Ans. (a) (i) Crop production management
(ii) Crop improvement
(iii) Crop protection management
(b) Another way of improving crop variety is hybridization. It is done by crossing genetically dissimilar plants. $1 \frac{1}{2} + 1 \frac{1}{2}$
(CBSE Marking Scheme, 2012)

Q. 19. (a) Distinguish between : (i) Inland fishery and marine fishery, (ii) Culture fishery and capture fishery.

- (b) List one problem associated with composite fish culture. (Board Term I, 2012 Set-059)**

Ans. (a) (i) Marine fisheries are concerned with obtaining fish from oceans and seas and inland fishers include capturing fish from fresh water resources.

(ii) Culture fishery is a way of fish farming and capture fishery is obtaining the fish from natural resources.

- (b) Problem associated with composite fish culture is lack of availability of good seed.

(CBSE Marking Scheme, 2012) 1 + 1 + 1

Long Answer Type Questions

5 Marks each

- Q. 1. (a) What is meant by lactation period ?
 (b) Name two exotic cattle breeds with long lactation period.
 (c) To increase the milk production what kind of feed should be given to cattle ?**
 (Board 2015, Set-LOV7LN7)

Ans. (a) Lactation period is the period of milk production after the birth of a calf.
 (b) Jersey, Brown Swiss.
 (c) To increase the milk production feed should include concentrates and roughage. 1 + 2 + 2

- Q. 2. State the meaning of sustainable agriculture. Name the scientific practices that you can undertake to obtain higher yield from agriculture.**

(Board 2014, Set MNM9GZH)

Ans. Sustainable agriculture is the successful management of resources for agriculture to satisfy the changing human needs, while maintaining or enhancing the quality of environment and conserving natural resources. The scientific practices that you can undertake to obtain higher yield from agriculture are :
 (i) Mixed farming
 (ii) Intercropping
 (iii) Crop rotation
 (iv) Integrated farming practices

3 + 2

OR

- Ans.** Definition of sustainable agriculture.
 (i) Mixed farming
 (ii) Intercropping
 (iii) Crop rotation (CBSE Marking Scheme, 2014)

- Q. 3. Describe briefly about the traits and their utilities important for a cereal crop in improvement of varieties.**

(DDE 2014), (Board Term-I 2013, 7ZTHA8G)

- Ans.** (i) **Higher Yield :** To increase the productivity of crop per acre.
 (ii) **Improved Quality :** Quality considerations such as baking quality, protein quality, oil quality and preserving quality of crop products vary from crop to crop.
 (iii) **Biotic and Abiotic Resistance :** Crop production can go down due to biotic and abiotic stresses under different situations. Varieties resistant to these stresses can improve crop production.
 (iv) **Change in Maturity Duration :** The shorter the duration of the crop from sowing to harvesting, the more economical is the variety.

- (v) **Wider Adaptability :** Developing varieties for wider adaptability will help in stabilising the crop production under different environmental conditions.
 (vi) **Desirable Agronomic Characteristics :** Developing varieties of desired agronomic characters helps to give higher productivity. 5

- Q. 4. Mention the type of loss caused by inappropriate conditions of moisture and temperature prevailing during storage of grains.**

(Board Term I, 2013, OAHJD6N)

- Ans.** (i) Degradation of quality
 (ii) Loss in weight
 (iii) Poor germinability
 (iv) Discolouration of produce.
 (v) Poor marketability. 1 + 1 + 1 + 1 + 1
 (CBSE Marking Scheme, 2013)

- Q. 5. (a) What are genetically modified crops ?
 (b) Name four factors for which variety improvement is done.
 (c) Write any two ways to control weeds.**

(Board 2014, Set-SO1QHXJ),

(Board Term I, 2013, AGRO 94)

- Ans.** (a) **Genetically modified crop :** In this method, a gene that would provide the desired characteristics is introduced into the crop.
 (b) **Some of the factors for which crop variety improvement is done are :**
 (i) **Higher Yield :** Variety improvement has been done to increase the productivity of the crop per acre. This is very important in order to meet food demand for rapidly growing population.
 (ii) **Improved Quality :** The definition of quality is different for different crops e.g., baking quality is important in wheat, protein quality in pulses, oil quality in oil seeds and preserving qualities in fruits and vegetable.
 (iii) **Wider Adaptability :** Varieties that can grow under any condition and can adapt themselves to various environmental conditions, help in stabilizing the crop production.

- (iv) Biotic and Abiotic Resistance :** Biotic factors like (pathogens, insects and nematodes) and abiotic factors (drought, salinity, water

logging, heat cold and frost) affect crop production a lot. Varieties resistant to such factors are always preferred and improve crop production.

(c) Two ways to control weeds :

- (i) **Preventive methods :** Proper seed bed preparation, timely sowing of crops, intercropping and crop rotation.
- (ii) **Chemical methods :** Spraying of herbicides or weedicides. E.g., Atrazine. 2, 4 - D.

1 + 2 + 2

Q. 6. (a) Write any two advantages of composite fish farming. (NCT 2014)

- (b) Name the two components of cattle feed and their function.

- (c) Name any two milch breeds of cow.

(Board Term-I AGRO, 94 2013)

Ans. (a) Two advantages of composite fish farming are :

- (i) A combination of five or six fish species is used in single fish pond.
- (ii) Fish species have different food habits. Different food habits are advantageous, as all the food in the pond is consumed by the fish.

- (b) Two components of cattle feed are :**

- (i) **Roughage :** This is largely fibrous, containing low nutrients. e.g., green fodder, silage hay and legumes.
- (ii) **Concentrates :** These are low in fibre and contain relatively high levels of proteins and other nutrients. e.g., cereals like gram and bajra.

- (c) Two milch breeds of cow are Jersey and Brown swiss.

2 + 2 + 1

Q. 7. (a) Why do cattle need a balanced diet ?

- (b) How many nutrients are essential for plants ?
(c) List the nutrients supplied by air, water and soil.

(Board Term I, 2012 Set-015)

Ans. (a) Balanced diet promotes the health and milk output of dairy animals.

- (b) 16 nutrients.

- (c) **Nutrients supplied by :**

Air – Carbon, oxygen,
Water – Hydrogen, oxygen,
Soil – Nitrogen, phosphorus, potassium together with other macro & micronutrients.

(CBSE Marking Scheme, 2012) 1 + 1 + 3

Q. 8. (a) How do the following factors improve the crop yield ? (i) shorten maturity duration, (ii) biotic and abiotic resistance, (iii) wider adaptability.

- (b) Define two methods of improving crop variety.** (Board Term I, 2012 Set-019)

Ans. (a) (i) Multiple rounds of crops a year.

- (ii) Crops can withstand stress due to biotic and abiotic factors and thus result in good production.

- (iii) Crops can be grown under different climatic conditions.

(b) Hybridization : Crossing between genetically dissimilar plants.

Gene manipulation : Inserting gene of desired character in a progeny.

3 + 2

(CBSE Marking Scheme, 2012)

Q. 9. (a) What are the common names of *Apis dorsata*, *Apis florea* and *Apis cerana indica* ?

- (b) Name one Italian bee variety. Also justify the use of Italian bee for honey production giving two reasons.**

- (c) State one factor which affects the quality of honey produced.** (Board Term I, 2012 Set-020)

Ans. (a) *A. dorsata* : Rock bee,
***A. florea* : Little bee,**
***A. cerana indica* : Indian bee.**

(b) *Apis mellifera*

Reasons for using Italian bees for honey production :

- (i) High honey collecting capacity
- (ii) Sting less
- (iii) Stays in bee hive for long periods
- (iv) Breeds very well

(c) Kind of flower available. $\frac{1}{2} \times 3 + \frac{1}{2} + 2 + 1$

(CBSE Marking Scheme, 2012)

Q. 10. (a) Classify the following as food or fodder crop : Wheat, barseem, oats, black gram.

- (b) List the two ways of incorporating desirable characters into crop varieties.**

- (c) State two desirable agronomic characteristics for crop improvement.**

(Board Term I, 2012 Set-033)

Ans. (a) Wheat, Black gram – food crop.

Barseem, Oats – fodder crop.

(b) By hybridization and by introduction of gene.

(c) Tallness and profuse branching are desirable characteristics in fodder crops and dwarfness is desirable in cereals so that fewer nutrients are consumed by these crops.

1 + 2 + 2

(CBSE Marking Scheme, 2012)

Q. 11. (a) Classify the following as Rabi or Kharif crops : Paddy, Soyabean, Wheat, and Mustard.

- (b) Why are certain crops grown in a particular season? Give two reasons.**

- (c) Explain how is green manure formed.**

(Board Term I, 2012 Set-033)

Ans. (a) Paddy, Soyabean – Kharif crop.

Wheat, Mustard – Rabi crop.

(b) As different crops require different photoperiod, climatic conditions and temperature. (any two)

(c) Prior to the sowing of crop seeds, some plants like sun hemp or guar are grown and then mulched by ploughing them into soil. These plants turn into green manure.

2 + 2 + 1

(CBSE Marking Scheme, 2012)

Value Based Questions

Q. 1. Vishnu's father had two healthy Sahiwal cows. Vishnu told his father that the lactation period of cows can be increased by cross breeding cattle with foreign breeds and it is possible artificially too. In this way if villagers participated in cross-breeding programme, they would get a breed of cattle which would produce higher milk yield.

- (i) What is meant by lactation period ?
- (ii) Name two exotic cattle breeds with long lactation period.
- (iii) What values are exhibited by Vishnu ?

(Board Term I, 2015, 3GS246G)

Ans. Expected Answer/Value Points of Test item - 51.

- (i) Period of milk production after the birth of calf.
- (ii) Jersey, Brown Swiss
- (iii) Scientific temper, concern for others, cooperation etc.

(CBSE Marking Scheme, 2012) 3

Detailed Answer :

- (i) Lactation period is the period of milk production after the birth of calf.
- (ii) Jersey, Brown Swiss.
- (iii) Scientific temper, concern for others, cooperation etc.



TOPIC-2

Use of Fertilizers and Manures; Irrigation, Protection from Pests and Diseases; Organic Farming, Types of Farming

QUICK REVIEW

- Manures and fertilizers supplement the soil with the required nutrients to increase crop yield.
- Manures contain decomposed animal and plant wastes and increase soil nutrition and fertility.
- The bulk organic matter present in manure improves soil structure.
- In composting, the biological waste material is decomposed in pits. Composting done using earthworms is called vermi-composting.
- In green manuring, green crops are grown, mulched by ploughing and mixed with soil to improve soil structure and fertility.
- The commercially produced fertilizers provide macronutrients like N, K and P and ensure healthy growth of plants.
- Excessive use of fertilizers causes water pollution and loss of soil fertility.
- A best crop yield is obtained by a balance between the use of fertilizers and manures.
- In organic farming, use of chemicals is discouraged whereas use of organic manures, bio-agents and healthy cropping systems is encouraged.
- Irrigation is essential to ensure agricultural success in India since our agriculture is mainly rain-fed.
- Wells, canals, rivers and tanks are some important irrigation systems in our country.
- The source of wells is underground water whereas canals get water from rivers or reservoirs. River lift systems draw water directly from rivers.
- Rainwater harvesting and watershed management increase storage of rain water for later use in agriculture.
- Risk of crop failure is reduced in mixed cropping wherein two or more crops are grown together on the same field.
- Two or more crops with different nutritional requirements are grown on the same farm in inter-cropping so as to utilize maximum nutrients and prevent spread of diseases and pests.
- In crop rotation, different crop combinations are grown on the same field in a pre-planned succession so as to get maximum returns.
- Weeds, pests and diseases can destroy large amounts of crop plants.
- Weed removal from crop fields is essential since they use up the requirements of crop plants like food, space, light etc.
- Insect pests and plant pathogens attack different parts of the plant and thus reduce crop yields.
- Pesticides are used to control weeds, insects and diseases, but they should be used only as much as needed to avoid environmental pollution and health hazards.

- Several preventive methods can be adopted to carry out pest and weed control.
- Biotic and abiotic factors can cause huge storage losses of food grains that can be taken care of by proper treatment.
- It is better to use preventive and control methods for protecting crops such as proper cleaning and drying of the crops followed by fumigation, rather than treatment measures.



KNOW THE TERMS

- **Composting** : The process in which farm waste material like livestock excreta, vegetable waste, animal refuse, domestic waste, sewage waste etc. is decomposed in pits.
- **Vermicompost** : Compost prepared by using earthworms to hasten the decomposition process of plant and animal refuse.
- **Manure** : Organic substances of animal or plant origin that is added to the soil to increase its fertility and structure.
- **Fertilizer** : Commercially produced plant nutrients that enrich the soil fertility and increase the crop yield.
- **Organic farming** : A farming system with minimal or no use of chemicals as fertilizers, pesticides etc. and with a maximum input of organic manures, recycled farm-wastes, along with use of bio-agents and healthy cropping systems.
- **Mixed cropping** : The practice of growing two or more crops simultaneously on the same field.
- **Inter-cropping** : The practice of growing two or more crops simultaneously on the same field in a definite pattern.
- **Crop rotation** : The growth of different crops on a piece of land in a pre-planned succession.
- **Weeds** : Unwanted plants in the cultivated field.
- **Watershed Management** : Scientific conservation of soil and water.
- **Pest** : Unwanted plants, animals, insects, germs or other organisms that interfere with human activity through bite, destroy food crops, damage property or make our lives more difficult.
- **Biotic factor** : Any living component that affects another organism, including animals, which consume the organism for food. e.g., plants, animals.
- **Abiotic factor** : Non-living components of a habitat which facilitate the thriving of the organisms. e.g., climate, temperature.

Very Short Answer Type Questions

1 Mark each

Q. 1. Expand FYM.

Ans. Farm Yard Manure.

1

Q. 2. Name the two types of manure on the basis of the kind of biological material involved.

Ans. (i) Compost and vermicompost.

(ii) Green manure.

½ + ½

Q. 3. What is organic farming ?

Ans. It is a farming system with minimal or no use of chemicals and with maximum input of organic manures, recycled farm wastes and bio-agents with healthy cropping system.

1

Q. 4. Name a bio-pesticide.

Ans. Neem.

1

Q. 5. Why do droughts occur ?

Ans. Because of scarcity or irregular distribution of rains.

1

Q. 6. What is mixed cropping ?

Ans. Mixed cropping is growing two or more crops simultaneously on the same piece of land.

1

Q. 7. What is the main benefit of mixed cropping ?

Ans. It reduces risk and gives some insurance against failure of one of the crops.

1

Q. 8. What is inter-cropping ?

Ans. It is growing two or more crops simultaneously on the same field in a definite pattern.

1

Q. 9. What is crop-rotation ?

Ans. It is growing different crops on a piece of land in a pre-planned succession.

1

Q. 10. Give an example of the crops grown in two-year rotation.

Ans. Maize-potato-sugarcane-peas.

1

Q. 11. How are diseases in plants caused ?

Ans. Diseases in plants are caused by pathogens such as bacteria, fungi and viruses.

1

Q. 12. Name the biotic factors responsible for storage losses in agricultural produce.

Ans. Insects, rodents, fungi, mites and bacteria.

1

Q. 13. What is Organic farming ? (HOTS)

Ans. It is a farming system with minimal use of chemicals and maximum input of organic manures, recycled farm wastes, and bioagents with healthy cropping systems.

1

Q. 14. What do you understand by the term photoperiod? (HOTS)

Ans. It is daily duration of light hours, which also affects plants' growth along with climatic conditions, temperature etc. It is the duration of light required by plants for doing their normal activities.

1

Short Answer Type Questions-I

2 Marks each

Q. 1. Differentiate between Fertilizers and Manure.

(NCT-2014), (DDE-2014), (Board Term 1, 2011)

Ans. Differences between Fertilizers and Manure :

S. No.	Fertilizers	Manure
1.	They are chemical in nature and these are manufactured in factories.	Manure is an organic substance that is obtained from decomposition of vegetable and animal wastes.
2.	Microbes are not needed for their formation.	Microbes are needed to form manure since they degrade the organic substances.
3.	Easy to transport, store and apply to crops.	It is difficult to transport, store and apply manure to crops.
4.	They do not restore soil texture.	They restore soil texture.
5.	They do not help in retention of water.	They help in the retention of water.

(any 4) $\frac{1}{2} \times 4$

Q. 2. How is Inter-cropping different from Mixed cropping ? (NCT 2014) (Board Term 1, 2010, 11)

Ans. Differences between Mixed cropping and inter-cropping :

S. No.	Mixed cropping	Inter-cropping
1.	There is no definite pattern of rows.	Crops are grown in definite pattern of rows like 1 : 1, 1 : 2 or 1 : 3.
2.	It is undertaken to reduce the chances of crop failure.	It is undertaken to enhance the production of crops per unit area.
3.	Harvesting and threshing can't be done separately for crops.	In inter-cropping, crops can be harvested as well as threshed separately.
4.	Seeds are mixed up before sowing.	Seeds are not mixed before sowing.
5.	Application of fertilizers and spraying of pesticides separately for each crop is not required as well as pesticides can be applied easily.	As per the need of the individual crop, fertilizers possible.

(Any four) $\frac{1}{2} \times 4$

Q. 3. Why should the pesticides be used judiciously ?

(Board Term 1, 2011)

Ans. Pesticides are the chemicals that are used to control weeds, insects, rodents, fungi as well as diseases of plants. They include weedicides, insecticides and fungicides. Their excessive use cause environmental pollution. They reach the water resources by leaching and affect the aquatic flora and fauna. These harmful chemicals reach the bodies of birds, animals and human beings through the various food chains and are thus harmful to one and all. Hence, they should be used judiciously. 2

Q. 4. How are crops selected for crop rotation ?

(Board Term 1, 2010, 11)

Ans. Growing different crops on the same field or a piece of land in a pre-planned succession is called crop rotation.

For crop rotation, the selection of crops depends on the :

- (1) Type of soil.
 - (2) Nutrient status.
 - (3) Availability of water through rain or irrigation.
 - (4) Length of rainy season.
 - (5) Duration of crop-short or long, and
 - (6) Availability of inputs like fertilizers, pesticides, manpower etc.
- (any 4) $\frac{1}{2} \times 4$

Q. 5. Enumerate the advantages of mixed farming.

(Board Term 1, 2010, 11)

Ans. Following are the main advantages of mixed farming :

- (1) The risk of complete crop failure is minimized due to uncertain monsoon.
 - (2) Higher yield is obtained with better soil fertility.
 - (3) It provides work to all the members of a family throughout the year.
 - (4) By adopting exact combination in mixed farming, a variety of produce can be obtained to fulfill family needs.
- $\frac{1}{2} \times 4$

Q. 6. Why storage of grains leads to losses ? What preventive and control measures are adopted before grains are stored for future use ?

(Board Term 1, 2010, 11)

Ans. Due to biotic factors like insects, rodents, fungi, mites, bacteria and abiotic factors like inappropriate moisture and temperature in the place of storage, there is degradation in quality, loss in weight, poor germinability, discolouration of produce, all leading to poor marketability.

So, preventive and control measures are used before grains are stored for future use, which include strict cleansing of the produce before storage, proper drying of the produce first in sunlight and then in shade and fumigations by using chemicals that kill pests.

1 + 1

Q. 7. Weeds are unwanted plants in the cultivated field. Give some methods to eradicate them. (HOTS)

Ans. Some methods to remove weeds are :

- (i) **Mechanical removal** – Uprooting weeds, hand hoeing, ploughing etc.
- (ii) **Preventive methods** – Proper seed bed preparation
 - (a) Timely sowing of crops.
 - (b) Inter cropping
 - (c) Crop Rotation.

1 + 1

Q. 8. Explain why legume crop does not require nitrogenous fertilizers ? (HOTS)

Ans. Nitrogen fixing bacteria e.g., *Rhizobium* is present in the roots of leguminous plants. Therefore, they do not require nitrogenous fertilizers.

2

Q. 9. Why farmers grow guar before sowing of crop seeds ? (HOTS)

Ans. Nowdays, green manures are used to maintain the nutrients and fertility of the soil in the field. For this reason farmer grow guar prior to the sowing of crop seeds as guar is mulched by ploughing into the soil, works as a green manure and enrich the soil by providing nitrogen and phosphorus to the soil.

2

Short Answer Type Questions-II

3 Marks each

Q. 1. Differentiate between compost and vermi compost. Write any three points of difference. (Board 2015, Set-LOV7LN7)

Ans.

Compost	Vermi Compost
1. Manure prepared from farm waste material, vegetable waste, animal refuse, sewage waste, domestic waste, straw etc. on decomposition in pits.	1. Compost which is prepared by using earthworms.
2. It takes 3-6 months to prepare.	2. It takes 1-2 months to prepare.
3. Organic remains are decomposed by microbes naturally.	3. Organic remains are pulverized by earthworms.

1 + 1 + 1

Q. 2. Mention the freshwater and brackish water resources for fish culture. (Board 2015, Set-K34UQKW)

Ans. Fresh water resources : Lakes, rivers, ponds.

Brackish water resources : Estuaries, lagoons, creeks.

1½ + 1½

Q. 3. Define mixed cropping. Write two advantages of this cropping pattern ?

Ans. Mixed cropping is the growing of two or more crops simultaneously on the same piece of land.

Two advantages are :

- (i) Reduces risk
- (ii) Gives variety in the crop field.

3

Q. 4. What are weeds ? Give two examples. Explain why is the removal of weeds necessary from the

cultivated fields ? Mention one method to control the growth of weeds. (Board Term I, 2012 Set-033) (DDE-2014)

Ans. Weeds are unwanted plants in the cultivated field. e.g., *Xanthium*, *Parthenium*, *Cypernicus rotundus*. (any two)

Weeds take up nutrients and reduce the growth of the crop. Therefore their removal is necessary.

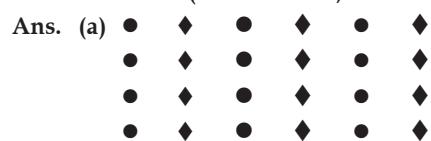
Control method : Use of herbicides. $\frac{1}{2} \times 3 + 1 + \frac{1}{2}$

Q. 5. (a) Using the symbols given below make a diagrammatic representation of intercropping– Crop A - ● Crop B - ♦

(b) Give two examples of crops selected for intercropping.

(c) Mention two benefits that a farmer gets by following this cropping pattern.

(Board Term I, 2012 Set-075), (DDE 2014)

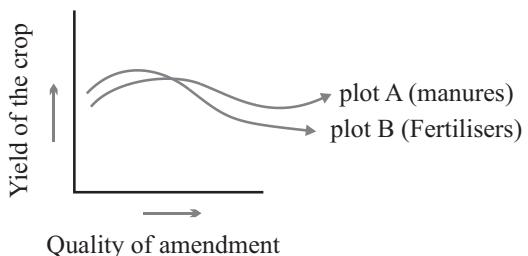


(b) Soyabean + maize, finger millet + cowpea

- (c) (i)** It ensures maximum utilisation of nutrients.
- (ii)** It prevents pest and diseases from spreading to all plants.

1 + 1 + 1

Q. 6. (a) The graph below shows two crop yields [plot A and B] that have been treated by manures and chemical fertilizers respectively, keeping other environmental factors same.



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 ?
- (b) Name two plants that can be turned into green manure. (Board 2013, Set-OAHDJ6N)

Ans. (a) (i) Addition of chemical fertilizers in plot B will increase yield suddenly due to availability of NPK nutrients which improve the soil fertility for short duration so there is a gradual decrease in yield afterwards.
 (ii) In plot A, manures supply nutrients slowly to the soil. Manures contain large quantity of organic matter that is slowly decomposed by microbes to release nutrients in small quantities. Thus, manures enrich soil fertility gradually.
 (b) Sun hemp, guar. 1 + 1 + 1
(CBSE Marking Scheme, 2013)

Q. 7. Based on the kind of biological material used, list two kinds of manures. How are they prepared ?
(Board Term I, 2013, 7ZTHA8G)

Ans. (i) Compost and vermi compost

(ii) Green manure

Compost and vermi compost : The process in which farm waste material, vegetable waste, animal refuse, domestic waste, sewage waste, straw, eradicated weed, etc. are decomposed in pits. It is rich in organic matter and nutrients. Compost is also prepared by using earthworms to hasten the process of decomposition of plant and animal refuse. This is vermicompost.

Green manure : Prior to the sowing of the crop seeds, some plants like sun hemp or guar are grown and then mulched by ploughing. It helps in enriching the soil in nitrogen and phosphorus.

(CBSE Marking Scheme, 2013) 1 + 1 + 1

Q. 8. (a) Which of the two factors bring about loss of food grains during storage ? Give one example for each.
(b) State any two control measures to be taken before grains are stored.
(Board Term I, 2013, AGRO94)

Ans. (a) During storage of grains high losses can occur. Factors responsible for such losses can be categorised as :

- (i) Biotic factors : These include rodents, fungi, insects, mites and bacteria.
- (ii) Abiotic factors : These are like inappropriate moisture and temperature conditions in the place of storage.

(b) Preventive measures :

- (i) Strict cleaning of the produce before storage.
- (ii) Fumigation should be done to kill pests.

2 + 1

Q. 9. Define Crop rotation. While choosing plants for crop rotation, what factors should be kept in mind ?
(Board Term I, 2012 Set-015)

Ans. Crop rotation : Growing of different crops on a piece of land in a pre planned succession is called crop rotation. The availability of moisture and irrigation facilities decides the choice of the crop to be cultivated after one harvest. 1 + 1 + 1
(CBSE Marking Scheme, 2012)

Q. 10. What are manures ? State two kinds of manures. How does manure affect the soil fertility ?
(Board Term I, 2012 Set-016)

Ans. Manures contain organic matter and supply nutrients to soil. 1
 Kinds of manure : Green manure, compost or vermicompost. (any two) ½ + ½
 Manure helps in enriching soil with nutrients and organic matter and thus increases soil fertility. 1
(CBSE Marking Scheme, 2012)

Q. 11. Define hybridization. State its types.
(Board Term I, 2012 Set-016)

Ans. Hybridization refers to crossing between genetically dissimilar plants. This crossing may be intervarietal (*i.e.*, between different varieties), interspecific (*i.e.*, between two different species of the same genus) or intergeneric hybridization (*i.e.*, between different genera).
(CBSE Marking Scheme, 2012) 1 + 2

Q. 12. Why are manures and fertilizers used in fields ?
 A farmer irrigated his field excessively just after applying fertilizers. Explain why this is not a correct practice ?
(Board Term I, 2012 Set-028)

Ans. All the plants require specific nutrients for their growth to increase the yield. The soil can be enriched by supplying these nutrients. Manure is used because it helps in enriching the soil with nutrients, organic matter and increasing soil fertility.

Fertilizers are used to ensure good vegetative growth, giving rise to healthy plants.
 This is not a correct practice because excess fertilizers can lead to water pollution. 1 + 1 + 1
(CBSE Marking Scheme, 2012)

Q. 13. A farmer found that *Xanthium* and *Parthenium* are also growing along with paddy in the field. What are such plants called ? How does the presence of these plants affect the crop yield ? List any 4 methods for controlling them.
(Board Term I, 2012 Set-034)

Ans. These plants are called weeds. These plants compete for food, space and light, therefore their removal from cultivated fields is essential.
 By use of weedicides, mechanical removal (with khurpi), biological method (natural enemy of the weed is used) and chemical control (herbicides).
(any 4) 1 + ½ × 4
(CBSE Marking Scheme, 2012)

Q. 14. (a) Differentiate between compost and vermicompost.

(b) Mention the long term benefits of using manure in crop production.

(Board Term I, 2012 Set-035)

Ans. (a) The farm waste material-domestic and sewage waste which is decomposed in pits is known as compost. Compost is also prepared by using earth worms to hasten the process of decomposition of plants and animal refuse. This is called vermicompost.

(b) Manure helps in enriching soil with nutrients and organic matter and increasing soil fertility. The bulk of organic matter in manure helps in improving the soil structure. **2 + 1**

(CBSE Marking Scheme, 2012)

Q. 15. State one point of difference between bio-fertilizers and fertilizers. Give one example of each. What is the advantage of using bio-fertilizers over fertilizers ? (Board Term I, 2012 Set-040)

Ans. Culture of living organisms like blue green algae as a means of supplying nutrients are bio-fertilizers, while fertilizers are commercially produced by chemicals.

Example : Blue green algae; NPK fertilizer.

Biofertilizers ensure maximum input of organic manure as a means of substituting chemicals.

(CBSE Marking Scheme, 2012) **1 + 1 + 1**

Q. 16. Depending on the kinds of resources available, what are the different kinds of irrigation systems adopted in our country to supply water to agricultural lands. Mention any three.

(Board Term I, 2012 Set-067)

Ans. Three kinds of irrigation systems are :

(a) Through wells, (b) through canals and (c) through rivers. **1 × 3**

(CBSE Marking Scheme, 2012)

Q. 17. There is a water reservoir near the village and a river flows near the village. Due to insufficient rain, farmers are worried about their crops. Suggest and explain the irrigation practice that can be adopted

to supply water to the entire agricultural land in the village. **(HOTS)**

Ans. Canal system.

Such a system receives water from rivers or from one or more reservoirs. It consists of main canals to which are attached many branch canals. These branch canals are connected to distributaries.

Distributaries distribute water to the fields. **1 + 2**

Q. 18. (a) A farmer wants to harvest more than two varieties at a time from his crop field. He has no idea about the cropping patterns. Suggest him one method to get the desired result. Also state three advantages of this cropping pattern.

(b) Name any two fodder crops. **(HOTS)**

Ans. (a) Mixed cropping. **½**

Advantages of mixed cropping :

- (i) Reduces risk **1½**
- (ii) Insurance against failure of one crop
- (iii) Gives variety in crop yield

(b) Fodder crops : Barseem / Oats / Sudan grass. **1**

Q. 19. Cross breeding programme is successfully done in poultry farming. Enlist some desirable traits for which, cross breeding is done in poultry birds.

(HOTS)

Ans. The desired traits include :

- (i) **Number and quality of chicks :** The cross bred variety should produce good quality chicks in large quantities.
- (ii) Dwarf broiler parent for commercial chick production.
- (iii) **Summer adaptation capacity :** The variety should be adaptable to survive in high temperature and different climatic conditions.
- (iv) **Low maintenance requirement :** It is also one of the important trait desired to decrease investment.
- (v) Reduction in the size of the egg laying bird with ability to utilize more fibrous cheaper diets formulated using agricultural by-products. **3**

Long Answer Type Questions

5 Marks each

Q. 1. Describe in short five methods by which you can increase the yield of crops and livestock.

(Board 2015, Set-K34UQKW)

Ans. Five methods by which we can increase the yield of crops and livestock are as follows :

- (1) By including better crop management like mixed farming, crop and fodder yields can be improved.
- (2) By improved varieties of seeds etc. and cropping practices, we can improve the yield of crops which indirectly provides improved food for livestock.

(3) By minimizing the application of fertilizers and pesticides.

(4) By adopting integrated farming practices, e.g., combining agriculture with livestock.

(5) By promoting the usage of livestock excreta for production of compost, we can supply required nutrients through soil. **1 × 5**

- Q. 2. (a)** What is meant by composite fish culture ?
(b) What is the basis of selecting the different species of fish ?
(c) Which method is used to get pure fish seed ?

- Ans.** (a) Combination of 5 or 6 fish species in a single fish pond.
 (b) Species are selected so that they do not compete for food. Food available in all parts of the pond is utilized.
 This increases fish yield
 (c) Hormonal Stimulation

(CBSE Marking Scheme, 2015) 5

Detailed answer :

- (a) Composite fish culture is the poly culture system in which combination of 5 or 6 fish species are selected and grown in a single fish bond.
 (b) The selection of different species of fish is done so that they do not compete for food and the food available in all the parts of the pond is utilized. This increases the fish yield.
 (c) Hormonal stimulation.

Q. 3. "Continuous use of fertilizers destroys soil fertility". Hence long term use of fertilizers is substituted by different cropping pattern. Discuss three new techniques of cropping pattern of their significance.

(Board 2014, Set - LFS3I7K, Set-MNM9GZH)

Ans. Three different cropping patterns, namely mixed cropping, intercropping, and crop rotation are generally practised.

(i) Mixed cropping allows two or more crops to be sowed simultaneously in the same land. Wheat and gram, wheat and mustard, ground nut and sunflower etc. are some common examples of mixed cropping. Mixed cropping also increases soil fertility by maintaining microbial diversity. In mixed cropping, crops are chosen in such a way that they require different amounts of minerals.

(ii) Intercropping allow farmers to grow two or more crops simultaneously in the same field in a definite pattern. For example, cauliflower and chilli plants are grown together in alternating rows. To ensure the maximum utilization of nutrients applied, crops are selected in such a way that their nutrient requirements are different. Other examples include soyabean and maize, finger miller (bajra) and cowpea (lobia) etc.

(iii) Crop rotation is the practice of growing two or more varieties of crops in the same region in sequential seasons. A common example of crop rotation is to cultivate maize followed by soyabean. This system also helps in preventing crops from pests and diseases. The crops selected, vary in nutrient requirements. This ensures complete and uniform utilization of nutrients.

1 + 4

Q. 4. (a) List the different ways in which biotic and abiotic factors affect stored food grains ?

(NCT 2014)

- (b) What preventive and controlling measures need to be taken before and after storing the grains ?

(c) Name two weeds. (Board Term I, 2012 Set-028)

Ans. (a) Biotic factors like insects, rodents, fungi, mites and abiotic factors like inappropriate temperature and moisture cause degradation in quality, loss in weight, poor germination, discolouration of produce, all leading to poor marketability.

(b) The preventive and control measures include strict cleaning of the produce before storage, proper drying of the produce first in sunlight and then in shade and fumigation using chemicals.

(c) *Xanthium* and *Parthenium*. 2 + 2 + 1

Q. 5. (a) Briefly describe the formation of vermicompost and green manure. (Board Term I, 2012 Set-021),
 (b) How can poultry fowl be prevented from various diseases ? State any three methods.

(Board Term I, 2012 Set-016)

Ans. (a) **Compost and vermicompost :** The process in which farm waste material, vegetable waste, animal refuse, domestic waste, sewage, straw, eradicated weeds etc. are decomposed in pits. It is rich in organic matter and nutrients. Compost is also prepared by using earthworms to hasten the process of decomposition of plant and animal refuse. This is vermicompost. **Green Manure :** Manure prepared by the green plants like sunhemp or guar that are grown prior to the sowing of the crop seeds.

- (b) (i) Appropriate vaccination.
 (ii) Spraying of disinfectants at regular intervals.
 (iii) Proper cleaning, sanitation, hygienic conditions in housing and poultry feed.

(CBSE Marking Scheme, 2012) 2 + 3

Q. 6. Unpredictable monsoon / droughts / low rainfall is adversely affecting the Indian agriculture.

(a) Mention any two initiatives that have been adopted to increase the availability of water for agricultural purposes.

(b) State two advantages of making check dams.

(c) Briefly describe canal and river lift system of irrigation. (Board Term I, 2012 Set-019)

Ans. (a) Rain water harvesting and water shed management.

(b) Two advantages of check dams :

(i) Increase the ground water level

(ii) Reduce soil erosion

(iii) Prevent rain water from flowing away

(Any two)

(c) Canal system : From rivers /reservoirs to crop field through system of canals.

River lift system : Water is drawn from rivers for supplementing irrigation. $1 + 2 + 2$
(CBSE Marking Scheme, 2012)

Q. 7. India has a wide variety of water resources and a highly varied climate. Describe in brief any five kinds of irrigation systems adopted to supply water to agricultural lands. (Board Term I, 2012 Set-040)

- Ans.** (i) **Dug well** : Water is collected from water bearing strata.
Tube well : Water is collected from deeper strata.
(ii) **Canals** : Extensive irrigation system. Canal receives water from one/more water reservoirs.
(iii) **River lift system** : In areas where canal cannot flow or canal flow is insufficient due to inadequate reservoir release. This system is more rational.
(iv) **Tanks** : Small storage reservoirs which intercept or store the run-off of smaller catchment area.
(v) **Rain water harvesting / watershed management** for increasing the water available for agriculture. 1×5
(CBSE Marking Scheme, 2012)

Q. 8. What are pests? How can plant pests be controlled? In what way biopesticides are better than the chemical pesticides? (Board Term I, 2012 Set-069)

- Ans.** Pests are destructive organisms which cause destruction of crop plants and their products. Plant pests can be controlled by using resistant variety of crop plants, inter-cropping and summer ploughing. Chemical pesticides cause pollution and harm useful insects whereas biopesticides are eco-friendly.

(CBSE Marking Scheme, 2012) $1+2+2$

Q. 9. Define fumigation and fumigant. Give an example of a fumigant. How does fumigation differ from spraying? Give two points.

(Board Term I, 2012 Set-070)

Ans. Fumigation is a method in which the insecticide solution is converted into fumes to kill the insects; fumigants are the insecticides which are used for making such fumes.

Example : EDB (Ethylene di-bromide).

In fumigation, the solution is converted into fumes and it is done during the storage of food grains whereas in spraying the solution remains in liquid form and it is done either before or after the storage of food grains.

$2 + 1 + 2$

(CBSE Marking Scheme, 2012)

Q. 10. An Italian bee variety *A. mellifera* has been introduced in India for honey production. Write about its four merits over other varieties. List two local varieties of Indian bee used for honey production. What is pasturage and how is it related to honey production?

Ans. Italian bee has high honey collection capacity, stings somewhat less, stays in a given beehive for long periods and breeds very well.

Apis cerana indica (Indian bee) and *Apis dorsata*.

Pasturage is the flowers available to the bees for nectar and pollen collection.

The adequate quantity of pasturage and the kind of flower will determine the taste of honey.

$2 + 1 + 1 + 1$

Q. 11. The quantity and the quality of food is decreasing day by day. As population is increasing drastically, mention the steps taken to improve this condition.

Ans. The following steps should be taken to improve the conditions of food :

- (i) By selecting good hybrid varieties of crop having desirable agronomic traits.
- (ii) The field should be kept fertile and nutrient rich and it should be managed properly.
- (iii) By using high yielding variety seeds for high yield per acre.
- (iv) By using a beneficial cropping pattern either mixed cropping or crop rotation.
- (v) By improving the irrigation facilities.

$1 + 1 + 1 + 1 + 1$

Value Based Questions

Q. 1. Ravi was studying in the city. In holidays he went to his village. There his father took him to his fields. He saw that the field crops were infested by insects, pests, diseases and weeds. His father was very worried. Ravi told his father what measures to be taken to protect the crop from these.

- (i) How do weeds affect the crop ?
- (ii) Name any two weeds.
- (iii) List any two aspects of Ravi's behaviours that are worth appreciation here.

(Board 2015, LOV7LN7)

Ans. (i) Weeds damage the crops by retarding their growth. They compete with the main crop for air, water and other available nutrition.

(ii) *Xanthium, Cyperinus rotundus*.

(iii) Vigilance and awareness.

$1 + 1 + 1$

Q. 2. Teacher mentioned about the organisms which enrich the soil with nutrients. Rahila was curious to know more about them. So she searched internet and came to know about *Rhizobium* bacteria and cyanobacteria.

- (i) What are bio-fertilizers ?

(ii) Explain how any one of the organism mentioned above enrich the soil with nutrients.

(iii) Why Rahila was curious to get more information? (Board 2015, Set-K34UQKW)

Ans. (i) Biofertilizers are the substances containing living micro-organisms that add nutrients to the soil making it fertile. e.g., *Rhizobium*.

(ii) When applied to seeds soil or plants, it colonizes the interior of the plant and promotes growth by increasing the availability of nutrients to the plant.

(iii) Rahila was curious to know more about these particular organism and their mechanism.

1 + 1 + 1

Q. 3. Surbhi alongwith her younger sister Vibha loved going to field with parents. She helped taking out certain plants from the filed using khurpi. She told Vibha that only selected plants need to be uprooted. Vibha asked her why only specific plants need to be pulled at Surbhi explained that these where weeds which are not desired with the crop.

(i) Why is it essential to remove weeds ?

(ii) Name two common weeds.

(iii) What values are exhibited by Surbhi here ?

(Baord 2014, Set - LFS3I7K, Set MNM9GZH)

Ans. (i) To take up nutrients and reduce the growth of crop.

(ii) *Xanthium, Parthenium, Cyperinus rotundus*

(iii) Value associated : family bonding, sharing knowledge.

1 + 1 + 1

(CBSE Marking Scheme, 2014)

Q. 4. A student visited a fish farm where he found Catla, Rohu, Mrigals, Common Carps and Grass Carps cultured in the same pond.

(a) Name the type of fish farming observed by the student.

(b) Mention the advantages of such a farming system.

(c) What is the main problem in such a form of fish farming ? How do farmers overcome such problems ?

Ans. (a) Composite fish culture.

(b) In such a system, a combination of five or six fish species is bred in a single fish pond. These species are selected so that they do not compete for food among them. As a result, food available in all parts of the pond is used. This increases the fish yield from the pond.

(c) Most of the fish breed in monsoon only and even if fish seed is collected from wild it can be mixed with other species as well. So major problem is lack of availability of good food.

This problem can be overcome by breeding these fishes using hormonal stimulation.

1 + 2 + 2

Q. 5. Shruti attended an agriculture workshop organised by her school. Her father also has an agricultural farm. She saw in the workshop the harmful effects of spraying pesticides on the crops. She came back to home and tried to convince her father to stop using pesticides.

(a) Mention the harmful effects of using pesticides as conveyed by Shruti to her father.

(b) What alternative method did she suggest her father for this ?

Ans. (a) Harmful Effects of Pesticides :

(i) Pesticides are chemicals that cannot be decomposed by microbes or humans. So, when the crops sprayed by pesticides are consumed by humans, they get stored in their system and create problems for them.

(ii) Pesticides are also poisonous for some plants. This affects the plant growth and plant yield.

(iii) Pesticides should be used in appropriate quantities. Large amounts can be very problematic.

(iv) Pesticides cause environmental pollution.

(b) Alternative Method : Organic Farming

Shruti encouraged her father to do organic farming, which is a farming system involving minimal use of chemicals as fertilizers, herbicides, pesticides etc. and with maximum input of organic manures.

4 + 1

Q. 6. Farmer 'X' planted Soyabean + Maize + Cowpeas in the same field simultaneously in a set row pattern. Farmer 'Y' planted cereal crop in one season and leguminous plants in next season on the same piece of land in preplanned succession.

(a) Name the cropping pattern used by farmers 'X' and 'Y'.

(b) State two advantages of different cropping patterns followed by farmers 'X' and 'Y' respectively.

Ans. (a) X – Inter-cropping pattern.

Y – Crop rotation.

(b) Inter-cropping ensures maximum utilization of the nutrients supplied and prevents pests and diseases from spreading to all plants belonging to one crop.

Crop rotation replenishes soil with different nutrients. Two or three crops can be grown in a year with good harvests.

1 + 2 + 2

Q. 7. Neha's mother is a good cook. She uses natural colours to give colours to food stuffs like she uses turmeric for yellow colour, spinach for green

colour and pomegranate for reddish colour. She always avoids synthetic food colours.

Answer the following questions based on above information :

- Name the technique used to separate pigments from natural colours.
- Write the principle of that technique.
- Explain the values that are displayed by Neha's mother.

Ans. (a) Chromatography.

(b) Different colours get separated due to dissolution in the same solvent and different rates of rising.

(c) Awareness, caring attitude for the family and a skillful person.

1 + 1 + 1

Q. 8. Sustainable agriculture involves practices such as organic farming, biological and natural control of pests, emphasis on watershed approach to conserve the soil and water, building of micro flora in close harmony with beneficial soil-inhabitants and complete resistance from the use of synthetic chemicals.

- How are the practices involved under sustainable agriculture beneficial ?
- What all practices do sustainable agriculture involve ?
- What is the disadvantage of using pesticides in agriculture ?

Ans. (a) Sustainable agriculture ensures pollution-free food production and continuous agriculture with least damage to ecosystem.

(b) Sustainable agriculture involves organic farming, biological and natural control of pests, emphasis on watershed approach to conserve the soil and water, building of micro flora in close harmony with beneficial soil-inhabitants and completely resisting the use of synthetic chemicals.

(c) Pesticides pollute the production from the crop plants and also the ecosystem.

1 + 1 + 1

Q. 9. Organic farming methods combine scientific knowledge of ecology and modern technology with traditional farming practices based on naturally occurring biological processes.

- How is organic farming different from conventional agriculture ?

(b) Name the field which studies organic farming method.

(c) How organic farming is beneficial and valuable ? (any 2)

Ans. (a) While conventional agriculture uses synthetic pesticides and water-soluble synthetically purified fertilizers, organic farming depends on natural pesticides.

(b) Agro ecology.

(c) Organic farming methods combine scientific knowledge of ecology and modern technology with traditional farming practices based on naturally occurring biological processes and helps in maintaining balance of ecosystem.

1 + 1 + 1

Q. 10. Honey is widely used and therefore bee-keeping for making honey has become an agricultural enterprise.

- How bee-keeping is creating value among farmers ?
- What additional products can be obtained from the bee hives ?
- How commercial production of honey can be increased ?

Ans. (a) Since bee-keeping needs low investments, farmers use it as an additional income generating activity.

(b) In addition to honey, the bee hives are a source of wax which are used in various medicinal preparations.

(c) It can be increased by rearing the Italian bee variety along with local varieties.

1 + 1 + 1

Q. 11. A farmer wants to practice a type of farming to increase the yield of his crops. He wants to grow leguminous crops along with non-leguminous so that he could reduce the use of chemical fertilizers.

- What values are displayed by the farmers in reducing the use of chemical fertilizers ?
- What is the advantage of growing leguminous crops along with non-leguminous crops ?
- What type of farming is this ?

Ans. (a) Farmer is eco-friendly and wants to minimize pollution caused by using chemical fertilizers.

(b) Growing leguminous crops along with non-leguminous increases fertility of soil and minimizes the risk of total crop failure.

(c) Intercropping.

1 + 1 + 1

Practical Based Questions

Multiple Choice Questions

(1 mark each)

Q. 1. Metanil yellow is added to arhar dal so that its :

(board 2015, Set-LOV7LN7)

- Colour and appearance gets improved
- Weight gets increased

(c) Taste gets improved

(d) Consumption becomes unfit.

Q. 2. To perform food test, students were asked to bring different food stuffs containing starch. They made

Q. 18. A sample of rice extract was taken in a test-tube and a drop of iodine was added to test for starch. The colour observed will be :

(Board Term I, 2012 Set-016)

- (a) yellow
- (b) blue
- (c) black
- (d) blue-black

Q. 19. To test the presence of adulterant metanil yellow in dal, we would get the correct result if :

(Board Term I, 2012 Set-019)

- (a) conc. HCl is added to the dal extract
- (b) water is added to the dal extract
- (c) conc. H_2SO_4 is added to the dal extract
- (d) conc. HNO_3 is added to the dal extract.

Q. 20. Ekta added 2 – 3 drops of iodine solution to potato extract. The colour change, which she is likely to observe is : (Board Term I, 2012 Set-020)

- (a) colour changes to brown
- (b) colour changes to blue black
- (c) colour changes to black
- (d) colour changes to deep orange

Q. 21. The colour change which would be observed when conc. hydrochloric acid is added to the extract of dal adulterated with metanil yellow is :

(Board Term I, 2012 Set-020)

- (a) colour of extract changes to deep pink
- (b) colour of extract changes to deep yellow
- (c) colour of extract disappears
- (d) colour of extract changes to deep orange

Q. 22. Metanil yellow is :

(Board Term I, 2012 Set-021)

- (a) a dye
- (b) yellow grain similar to arhar dal
- (c) a nutritional supplement
- (d) another type of dal

Q. 23. Out of the below mentioned groups of food items, the group which will not turn blue black when treated with iodine solution is :

(Board Term I, 2012 Set-028)

- (a) rice, potato, bread
- (b) bread, wheat, corn flour
- (c) rice, boiled potato, corn starch
- (d) dal, fish, meat

Q. 24. Rama washed a small amount of arhar dal in water. The water becomes yellow. She put a few drops of conc. HCl in test-tube containing yellow water. The sample turned pink. This shows that :

(Board Term I, 2012 Set-028)

- (a) dal is not adulterated
- (b) dal contains protein
- (c) dal is adulterated with metanil yellow
- (d) dal is coloured with turmeric

Q. 25. The colour of starch solution is :

(Board Term I, 2012 Set-031)

- (a) blue black
- (b) yellow brown
- (c) milky white
- (d) colourless

Q. 26. Which reagent gives blue colour with starch ?

(Board Term I, 2012 Set-033)

- (a) safranin
- (b) methylene blue
- (c) iodine
- (d) eosin

Q. 27. Four watch glasses with labels A, B, C, D respectively have common salt, sugar, sago powder, chalk powder. On adding two drops of iodine to the content of each watch glass, the one turning blue black will be :

(Board Term I, 2012 Set-034)

- (a) A
- (b) B
- (c) C
- (d) D

Q. 28. The food sample ideal for starch test is :

(Board Term I, 2012 Set-035)

- (a) sugar
- (b) rice
- (c) mustard
- (d) pulses

Q. 29. Shivani took 2 ml of food extract in a test-tube and added few drops of conc. hydrochloric acid to it. She observed magenta colour in the test-tube which indicates presence of :

(Board Term I, 2012 Set-040)

- (a) metanil yellow in the food extract
- (b) turmeric powder in the food extract
- (c) argemone oil in the food extract
- (d) saw dust in the food extract

Q. 30. A student on adding a solution A to potato extract observed conversion of colour of solution to blue black. Identify the compound A :

(Board Term I, 2012 Set-040)

- (a) distilled water
- (b) iodine solution
- (c) bromine solution
- (d) salt solution

Q. 31. The following statements describe the steps to detect the presence of metanil yellow in dal. One of the four statements given below is incorrect :

- (i) Take 2 ml of food extract.
- (ii) Grind 3-5 g of dal and prepare solution.
- (iii) Add 2-4 drops of conc. sulphuric acid
- (iv) Filter the contents and collect the filtrate.

The incorrect statement is :

(Board Term I, 2012 Set-041)

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

Q. 32. Nikhil performed the test for the presence of starch :

(Board Term I, 2012 Set-045)

- (a) by boiling a mixture of iodine solution, conc. HCl and food sample
- (b) by boiling food sample with NaOH and adding iodine solution
- (c) by adding a few drops of iodine solution to the food sample
- (d) by boiling food sample with iodine solution

Q. 33. A boy was rushing with a bottle of tincture iodine. Some iodine solution splashed on his yellow coloured, cotton shirt and also on the white table cloth. The stain on the table cloth was yellowish brown while that on his shirt was blue black. The most obvious scientific reason for this is that :

(Board Term I, 2012 Set-064)

- (a) shirt was dyed with metanil yellow
- (b) shirt was starched after washing but the table cloth was not
- (c) table cloth was starched but not the shirt
- (d) shirt has absorbed sweat

Q. 34. Metanil yellow is added to dal so as to :

(Board Term I, 2012 Set-075)

- (a) improve the taste
- (b) increase its weight

- (c) improve the colour and appearance
- (d) all of these

Q. 35. Four samples of arhar dal were taken in four test-tubes with some water in each and labelled A, B, C and D. A few drops of the following were added to these test-tubes : (Board Term I, 2012 Set-078)

- (i) HNO_3 to test-tube A
- (ii) HCl to test-tube B
- (iii) NaOH to test-tube C
- (iv) alcohol to test-tube D

In which of the following test-tubes will we be able to confirm the adulteration of dal with metanil yellow.

- | | |
|-----------------|-----------------|
| (a) test-tube A | (b) test-tube B |
| (c) test-tube C | (d) test-tube D |

Answers with Explanation

1. (a) Colour and appearance gets improved.
2. (b) turned blue black.
3. (d) Pulses to improve colour and appearance.
4. (b) Carbohydrates.
5. (a) the dal is free from adulterant.
6. (c) adding a few drops of iodine solution to food sample.
7. (d) Starch in test-tube A, Metanil yellow in test-tube B.
8. (d) Starch
9. (c) Observe colour choose by adding iodine solution.
10. (c) Potato contains starch.
11. (a) Iodine + starch gives blue – black colour.
12. (b) Conc. HCl is used to test metanil yellow in arhar dal.
13. (b) All are carbohydrates.
14. (b) Iodine is used to test starch in food stuffs.
15. (b) Potato is a carbohydrate in which starch is present.
16. (d) Metanil yellow (*aq*) + $\text{HCl} \rightarrow$ Pink colour.
17. (a) On adding HCl to sample, pink colour shows the presence of metanil yellow.
18. (d) Iodine solution gives blue colour with starch.
19. (a) To test the presence of metanil yellow in the sample of dal, HCl is added to the sample.
20. (b) Potato extract contains starch which gives blue black colour with iodine solution.
21. (a) Colour of extract changed to deep pink.
22. (a) Metanil yellow is a dye that improves the colour and appearance.
23. (d) Dal, fish, meat are protein rich food.
24. (c) On adding HCl to sample pink colour shows the presence of metanil yellow.
25. (b) Colour of iodine solution is yellow brown.
26. (c) Iodine solution gives blue colour with starch.
27. (c) Sago powder contains starch.
28. (b) Rice is a starch rich food.
29. (a) On adding HCl to the food stuff, magenta or deep pink colour confirms the presence of metanil yellow in the food extract.
30. (b) Presence of starch can be tested by adding a few drops of iodine solution to the food sample.
31. (c) To test the presence of metanil yellow in the sample of dal, HCl is added to the sample.
32. (c) Presence of starch can be tested by adding a few drops of iodine solution to the food sample.
33. (b) Blue black colour of the shirt is due to the presence of starch in it.
34. (c) Metanil yellow is a dye that improves the colour and appearance.
35. (b) To test the presence of metanil yellow in the sample of dal, HCl is added to the sample.

Short Answer Type Questions (2 marks each)

Q. 1. In an experiment to test starch and metanil yellow, mention the materials required for this experiment.

Ans. The materials required are :

Potato, pigeon pea, iodine solution, concentrated hydrochloric acid, petridish, test tube, knife and a dropper.

Q. 2. How starch is tested in this experiment ?

Ans. Starch is a carbohydrate that produces blue colour when brought in contact with the iodine solution. 2

Q. 3. In this experiment, how metanil yellow is tested in pigeon pea ?

Ans. Metanil yellow in pigeon pea turns into pink colour when it reacts with the concentrated hydrochloric acid.

Q. 4. Name the adulterant of Arhar dal. Why it is harmful for us ?

Ans. The adulterant of Arhar dal is metanil yellow. It is harmful for us as it causes paralysis. **1 + 1**

Q. 5. In the experiment, mention the two solutions used for testing starch and metanil yellow ?

Ans. (i) To test starch, iodine solution is used.
(ii) To test metanil yellow, conc. hydrochloric acid is used. **1 + 1**



KNOW THE LINKS

- en.wikipedia.org/wiki/Food
- food.oregonstate.edu
- www.slideshare.net
- www.thefoodresource.com
- www.agmarknet.nic.in



UNIT – I

**Matter : Its
Nature and
Behaviour**

CHAPTER

1

MATTER IN OUR SURROUNDINGS

EXERCISE – 1.1

I. Choose the best correct option for Questions. 1–3 :

Q. 1. Which one of the following is an incorrect statement ?

- (a) Cooling is produced during melting
- (b) The temperature changes steadily on heating
- (c) The melting point of ice is 0°C
- (d) Once melting starts, the temperature stays at 0°C until all the ice has melted.

Q. 2. Melting is :

- (a) an endothermic process
- (b) an exothermic process
- (c) both of these
- (d) none of these

Q. 3. When heat is supplied to a solid substance :

- (a) the kinetic energy of the particles increases.
- (b) the potential energy of the particles increases.
- (c) the kinetic energy of the particles decreases.
- (d) the potential energy of the particles decreases.

Answers

1. (b) 2. (a) 3. (a)

EXERCISE – 1.2

II. Choose the best correct option in the following questions :

Q. 1. Which of the following changes represent sublimation ?

- (a) solid \rightarrow liquid (b) solid \rightarrow gas
- (c) liquid \rightarrow gas (d) gas \rightarrow liquid

Q. 2. Gases do not have :

- (a) high compressibility
- (b) high fluidity
- (c) high density
- (d) large volume

Q. 3. Evaporation :

- (a) takes place below melting point
- (b) is a bulk phenomenon
- (c) takes place below boiling point
- (d) is a surface phenomenon

Q. 4. Particles of a liquid :

- (a) are most ordered
- (b) move randomly
- (c) have large intermolecular spaces
- (d) can slip and slide over each other

Q. 5. Which of the following pairs will not exhibit diffusion ?

- (a) hydrogen, oxygen (b) oxygen, water
- (c) salt, sand (d) sugar, water

Q. 6. Which of the following is not a property of solids ?

- (a) Fixed shape and volume
- (b) Interparticle spaces are minimum
- (c) Particles can move freely within a limited space
- (d) Forces of attraction between the particles are maximum

Q. 7. The solid that would sublime on heating is :

- (a) wax (b) solid carbon dioxide
- (c) ice (d) butter

Q. 8. Butter may be evaporated by :

- (a) heating and compression
- (b) heating and decompression
- (c) cooling and decompression
- (d) cooling and compression

Q. 9. Melting points of four solids A, B, C and D are 78°C , 262°C , 100°C and 168°C . Inter particle forces of attraction are in the order :

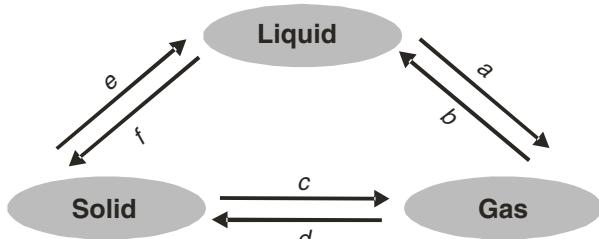
- (a) A > C > D > B (b) B > C > D > A
- (c) A > D > C > B (d) B > D > C > A

Answers

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

EXERCISE – 1.3

III. Study the figure given below for inter conversion of state of matter carefully and answer the questions that follow :



- Q. 1. Name the process marked as a, b, c, d, e, f.
- Q. 2. To which state of matter a liquid changes on increasing its temperature ?
- Q. 3. What change do we expect on increasing pressure and lowering temperature of a gas ?
- Q. 4. When a liquid is cooled, it may change into a new state of matter. Name that state.
- Q. 5. What is sublimation ?

Answers

1. (a) vaporisation, (b) condensation, (c-d) sublimation, (e) fusion, (f) solidification.
2. Vapour.
3. Condensation may occur.
4. Solid.
5. Change of solid directly into gas without changing into liquid state (or vice versa) is called sublimation.



CHAPTER 2

IS MATTER AROUND US PURE ?

EXERCISE – 2.1

Activity

- Take some camphor or ammonium chloride. Crush it and put it in a china dish.
- Put an inverted funnel over the china dish.
- Put a cotton plug on the stem of the funnel.
- Now, heat slowly and observe.

I. Answer the following questions :

Q. 1. Which separation technique was used for the separation of salt and ammonium chloride.

Ans. Sublimation.

Q. 2. Why was this technique used ?

Ans. Ammonium chloride sublimates directly. On heating it does not change into liquid state.

Q. 3. Why can't we use filtration technique for separation of this mixture ?

Ans. Both substance can pass through filter.

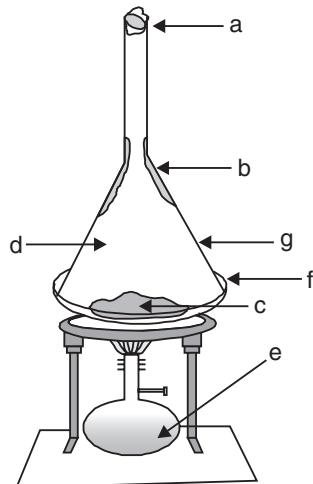
Q. 4. Name two more substances which undergo sublimation.

Ans. (i) Naphthalene. (ii) Camphor.

Q. 5. Suggest the sequence of separation technique you will use for separation of a mixture of camphor, common salt and sand.

Ans. (i) Sublimation, (ii) Distillation.

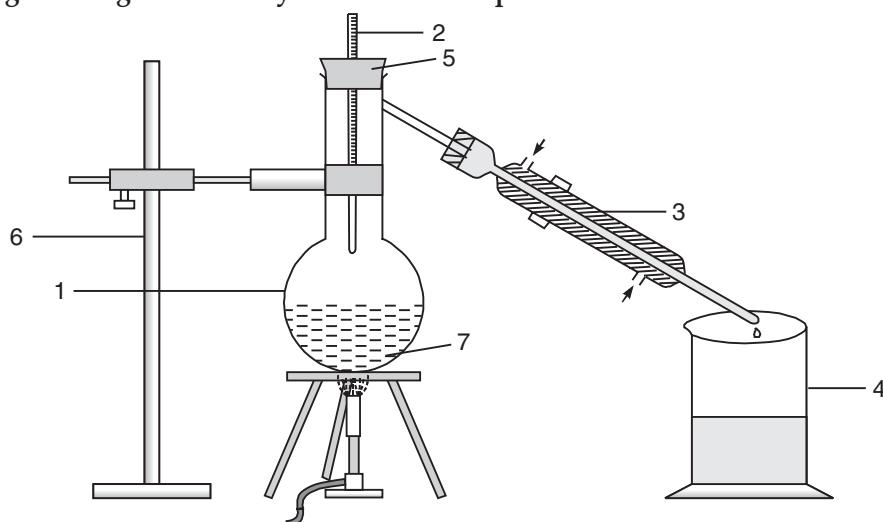
Q. 6. Label the diagram given below.



- Ans.
- (a) Cotton plug
 - (b) Solidified ammonium chloride
 - (c) Mixture of ammonium chloride and salt
 - (d) Vapour of ammonium chloride
 - (e) Burner
 - (f) China dish
 - (g) Conical flask.

EXERCISE – 2.2

II. Look at the given diagram carefully and answer the questions that follow :



Q. 1. The process of separation of a mixture shown in the diagram is called :

Ans. Distillation method.

Q. 2. The above procedure is used to separate a mixture of two..... liquids with sufficient difference in their

Ans. (i) highly soluble, (ii) boiling points.

Q. 3. Label the areas marked 1-7 in the diagram.

Ans. (1) Distillation flask (2) Thermometer
 (3) Water condenser (4) Acetone
 (5) Plug (6) Stand
 (7) Solution of water and acetone.

EXERCISE – 2.3

III. Solve the following numerical :

Q. 1. A solution contains 60 g of common salt in 240 g of water. Calculate the concentration in terms of mass by mass percentage of the solution.

Ans. Mass percentage of a solution

$$= \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100$$

$$= \frac{60 \text{ g}}{(240 + 60) \text{ g}} \times 100$$

$$= \frac{60}{300} \times 100 = 20\%$$

Q. 2. 10 g of sugar is present in 1 litre of sugar solution. Calculate the concentration in terms of mass by volume percentage of a solution.

Ans. Concentration in terms of mass by volume % of a solution

$$= \frac{\text{Mass of solute}}{\text{Mass of solution(ml)}} \times 100$$

$$= \frac{10 \times 100}{1000 \text{ ml}} = 1\%$$

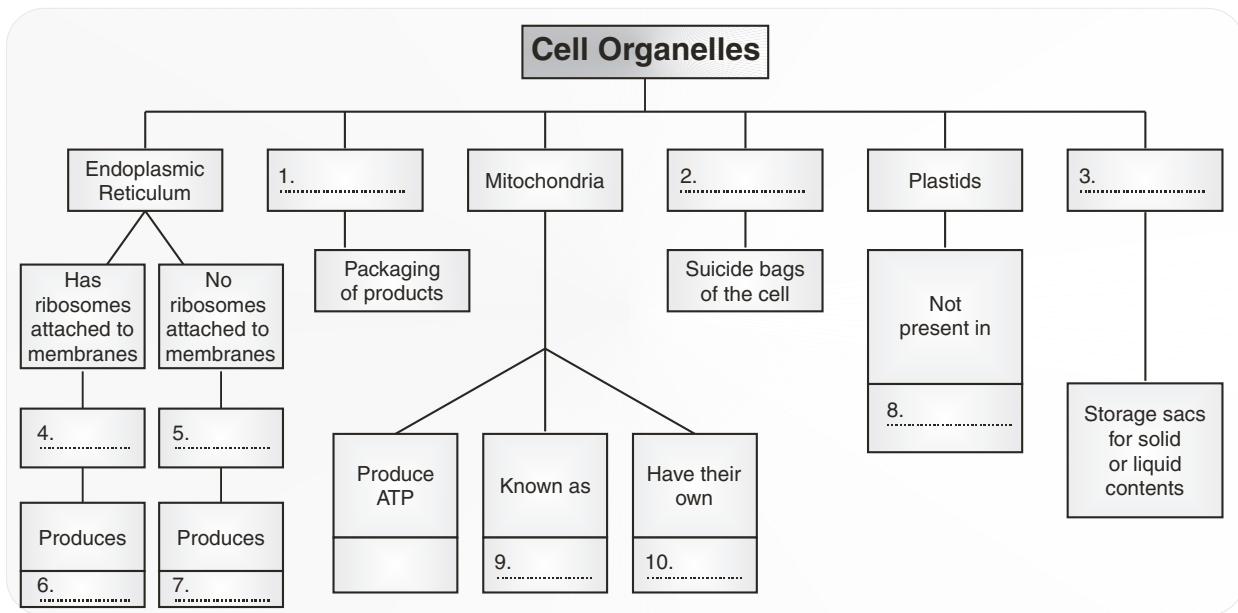


UNIT - II**Organization in the Living World****CHAPTER****3****CELL—A BASIC UNIT OF LIFE****EXERCISE – 3.1**

I. Instructions : Given below is an incomplete flow-chart on cell organelles.

Some boxes / spaces in the flow-chart have been left blank.

Complete the flow-chart adding terms / names / functions as and where required.

**Answers**

- | | | | |
|-----------------|-----------------------|--------------|-----------------|
| 1. Golgi body, | 2. Lysosome, | 3. Vacuoles, | 4. RER, |
| 5. SER, | 6. Protein, | 7. Lipids, | 8. Animal cell, |
| 9. Power house, | 10. Genetic material. | | |

EXERCISE – 3.2

III. Instructions : Select the correct option from the four different choices given for each question.

Q. 1. Gaseous exchange in cells takes place by :

- (a) Osmosis
- (b) Exocytosis
- (c) Diffusion
- (d) Endocytosis

Q. 2. A cell may swell up and even burst if :

- (a) The concentration of water molecules within the cell is higher than the concentration of water molecules in the surrounding medium.

(b) The concentration of water molecules in the surrounding medium is higher than the concentration of water molecules within the cell.

(c) The concentration of water molecules is same in the cell and in the surrounding medium.

(d) It is a plant cell and surrounded by a hypotonic solution.

Q. 3. Chromosomes are made up of :

- (a) DNA and Protein
- (b) RNA and Protein
- (c) DNA and RNA
- (d) Protein

- Q.4.** The process of plasmolysis in plant cell may be defined as :
- Breakdown/bursting of plasma membrane in a hypotonic medium.
 - Shrinkage of cytoplasm in hypertonic medium.
 - Breakdown / bursting of cytoplasm membrane in a hypertonic medium.
 - Shrinkage of plasma in hypotonic medium.
- Q.5.** Amoeba acquires its food through a process known as :
- Endocytosis
 - Exocytosis
 - Plasmolysis
 - Both Exocytosis and Endocytosis
- Q.6.** Prokaryotes have an undefined nuclear region which is known as :
- Nucleus
 - Nucleoid
 - Nucleolus
 - Nucleic acid
- Q.7.** A cell organelle that is not surrounded by a membrane is :
- Golgi apparatus
 - Ribosome
 - Chloroplast
 - Endoplasmic reticulum
- Q.8.** Which of the following is not a function of cell wall ?
- (a) Cell wall provides structural strength.
 (b) Cell walls enable the cells to withstand greater changes in surrounding medium than animal cells.
 (c) Cell wall permits the cells to withstand very dilute (hypotonic) external media without bursting.
 (d) Cell walls enable the cells to exchange gases and minerals.
- Q.9.** Which of the following is a common feature of mitochondria and plastids ?
- Presence of DNA and Ribosomes
 - Ability to produce ATP
 - Deeply folded inner membrane
 - Presence of matrix called stroma
- Q.10.** Which cell organelle is actively involved in membrane biogenesis ?
- ER
 - Golgi apparatus
 - Lysosomes
 - Vacuoles

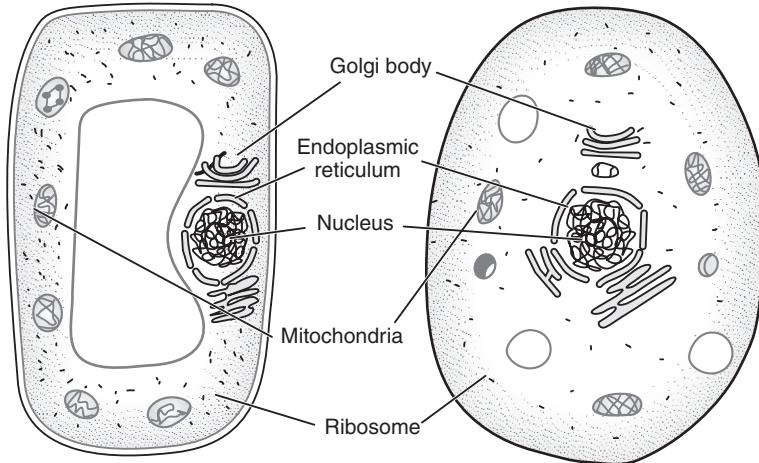
Answers

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

EXERCISE – 3.3

II. Instructions : Given below are the diagrams representing plant cell and an animal cell. Label any five organelles common in plant cell and animal cell.

Ans.



(Note : Students should label 5 organelles which are common in both types of cell.)

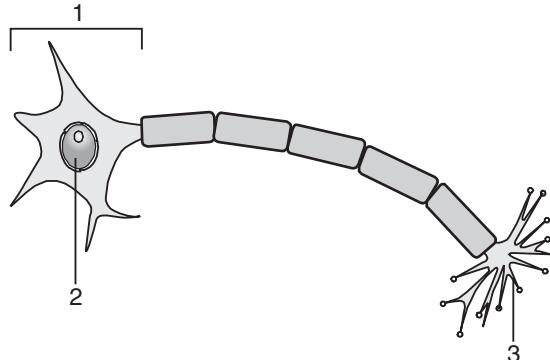


CHAPTER 4

TISSUES, ORGANS, ORGAN SYSTEM, ORGANISM

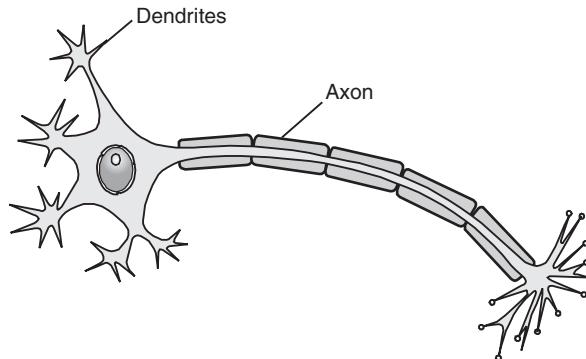
EXERCISE – 4.1

- I. Instructions :** Study the diagram given below and then answer the questions in the space provided in not more than one sentence.



- Q. 1.** Complete the diagram by drawing the missing part.

Ans. 1.



- Q. 2.** Identify the parts numbered 1, 2 and 3.

- Ans.** (a) Cyton
(b) Nucleus
(c) Telodendria.

- Q. 3.** What is the term given to the gap between two nerve cells?

Ans. Synapse.

EXERCISE – 4.2

- II. Instructions :** Select the correct option from the four different choices given for each question.

- Q. 1.** Growth of the stem increases due to :

- (a) Apical Meristem
(b) Vertical Meristem

- (c) Lateral Meristem

- (d) Intercalary Meristem

- Q. 2.** Which of the following statements is incorrect ?

- (a) Some tissues in plants divide throughout the life
(b) Animals have more dead tissues as compared to plants
(c) Cell growth in animals is more uniform as compared to plants
(d) There is no demarcation of dividing and non-dividing regions in animals

- Q. 3.** The length of the stem increases due to :

- (a) Apical Meristem (b) Vertical Meristem
(c) Lateral Meristem (d) Intercalary Meristem

- Q. 4.** Which of the following are the characteristic features of cells of meristematic tissue ?

- (a) Actively dividing cells with dense cytoplasm, thick cell walls and prominent nuclei
(b) Actively dividing cells with dense cytoplasm, thin cell walls and no vacuoles
(c) Actively dividing cells with thin cytoplasm, thick cell walls and prominent nuclei
(d) Actively dividing cells with thin cytoplasm, thin cell walls and no vacuoles

- Q. 5.** Some parts of the plant are flexible due to the presence of :

- (a) Parenchyma (b) Collenchyma
(c) Meristematic tissue (d) Sclerenchyma

- Q. 6.** Which of the following is not a function of epidermis ?

- (a) Conduction of water
(b) Protection from mechanical injury
(c) Gaseous exchange
(d) Transpiration

- Q. 7.** Which of the following parts does not have cartilage ?

- (a) Nose (b) Kidney
(c) Ear (d) Trachea

- Q. 8.** Given below is a list of different types of muscles in human body :

- | | |
|---------------|---------------|
| (i) Smooth | (ii) Striated |
| (iii) Cardiac | (iv) Skeletal |

Which of the above mentioned muscles are termed as involuntary ?

- (a) (i) & (ii) (b) (i) & (iii)
(c) (ii) & (iii) (d) (ii) & (iv)

Q. 9. Which of the following elements of xylem tissue helps in sideways conduction of water ?

- (a) Xylem tracheids (b) Xylem parenchyma
(c) Vessels (d) Xylem fibres

Q. 10. In the human body, fats are stored in :

- (a) Areolar tissue (b) Adipose tissue
(c) Epithelial tissue (d) Cartilage

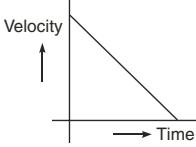
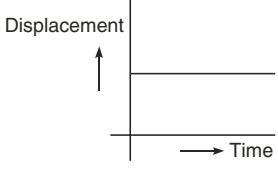
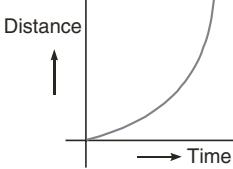
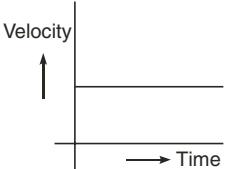
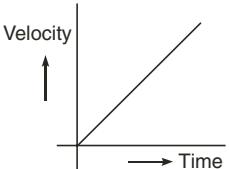
Answers

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



UNIT – III**Motion, Force and Work****CHAPTER****5****MOTION****EXERCISE – 4.1**

I. Instructions : Observe the given graph and information in column I and column II respectively, and match the two :

S. No.	Column I	S. No.	Column II
(a)		(i)	Constant velocity
(b)		(ii)	Non-uniform speed
(c)		(iii)	Body at rest
(d)		(iv)	Uniform acceleration
(e)		(v)	Uniform retardation

Answers

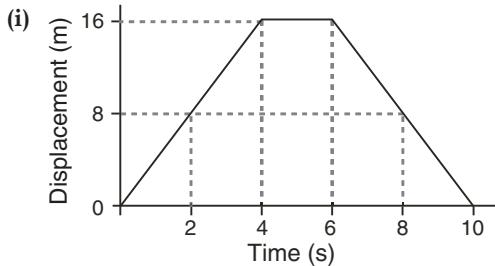
(a) → (v), (b) → (i), (c) → (ii), (d) → (iii), (e) → (iv).

EXERCISE – 5.2

II. Instructions : Read the given time (t) vs. displacement(s) data carefully and answer the questions that follow :

Time (t) in seconds	Displacement (s) in metres
0	0
2	8
4	16
6	16
8	8
10	0

- (i) Sketch a displacement-time graph for this motion.
- (ii) Sketch a distance-time graph for the same motion.
- (iii) For which time intervals the body possesses :
 - (a) uniform retardation
 - (b) constant velocity.
- (iv) What will be the displacement of the body at :
 - (a) $t = 35$
 - (b) $t = 75$
- (v) Give one example of this kind of motion in everyday life situations.

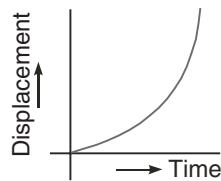
Answers

- (iii) (a) 4 to 6 second
(b) 0 to 4 second
- (iv) (a) 0
(b) 0
(v) Cycling.

EXERCISE – 5.3

III. Instructions : Read the following questions carefully and put a tick mark (✓) on the most correct answer.

- Q. 1. The given graph represents a body moving with :



- (a) constant velocity
- (b) constant acceleration
- (c) constant retardation
- (d) infinite velocity

Q. 2. When the distance travelled by a body is directly proportional to time, it is travelling with :

- (a) uniform acceleration
- (b) non-uniform acceleration
- (c) constant speed
- (d) variable speed

Q. 3. The distance covered by a car moving at a speed of 30 km/hour in 15 minutes is :

- (a) 0.75 km
- (b) 7.5 km
- (c) 75 km
- (d) 750 km

Q. 4. The velocity of a body moving at an initial velocity of 20 m/s and having an acceleration of 4 m/s^2 after 2 s will be :

- (a) 24 m/s
- (b) 28 m/s
- (c) 32 m/s
- (d) 40 m/s

Q. 5. Which of the following equations is an equation of motion of a body :

- (a) $F = ma$
- (b) $p = mv$
- (c) $v^2 - u^2 = 2as$
- (d) $Ft = mv - mu$

Q. 6. The slope of velocity-time graph of motion of a body represents :

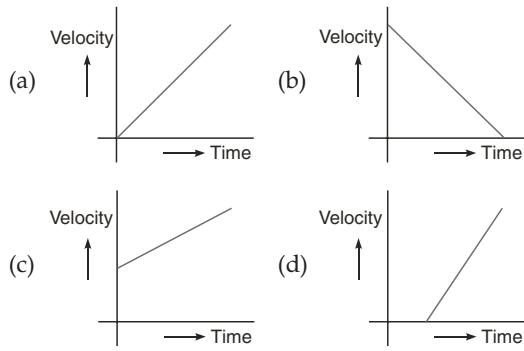
- (a) distance
- (b) displacement
- (c) speed
- (d) acceleration

Q. 7. The velocity of a car increases from 36 km/hour to 108 km/hour in 10s. Its acceleration is :

- (a) 2 m/s^2
- (b) 3 m/s^2
- (c) 20 m/s^2
- (d) 30 m/s^2

Q. 8. When a body is moving with constant acceleration and its initial velocity is not zero, its velocity time graph is :

- Q. 1. The given graph represents a body moving with :



Q. 9. A ball is gently dropped from a height of 20 m. If its velocity increases uniformly at the rate of 10 m/s^2 , after what time it will strike the ground ?

- | | |
|-----------|-----------|
| (a) 0.1 s | (b) 1.0 s |
| (c) 0.2 s | (d) 2.0 s |

Q. 10. A body moving uniformly along a circular path has :

- (a) constant velocity \times because direction keeps on changing
- (b) constant speed
- (c) variable speed
- (d) same direction of motion

Answers

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



CHAPTER

6

FORCE AND LAWS OF MOTION

EXERCISE – 6.1

I. Q.1. Read the given terms / situations given in columns A and B carefully and match the two :

S. No.	Column A	S. No.	Column B
(a)	Push	(i)	Taking out a note book from a table drawer
(b)	Pull	(ii)	Using a bow and an arrow
(c)	Stretch	(iii)	A ball rolling down an incline
(d)	Acceleration	(iv)	Opening a door to get into a room.
(e)	Squeeze	(v)	Batting
(f)	Change in direction	(vi)	Brushing teeth

Q. 2. State one situation each from some ‘daily-life situation’ where a force :

- (a) causes a ‘slowing down’.
- (b) only tends to start motion.

Answers

- | | |
|--------------------------|--------------|
| 1. (a) → (iv) | (b) → (i) |
| (c) → (ii) | (d) → (iii) |
| (e) → (vi) | (f) → (v) |
| 2. (a) Switching off fan | (b) Cycling. |

EXERCISE – 6.2

II. Read the given information carefully and answer the questions that follow :

A hockey ball, of mass 200 g, travelling from west to east, at 10 m/s is struck by a hockey stick. As a result, the ball gets turned back and now has a speed of 5 m/s. The ball and the hockey stick were in contact for 0.2s.

- (i) Calculate the initial and final momentum of the ball.
- (ii) State the direction of momentum in each case.
- (iii) Calculate the rate of change of momentum of the ball.
- (iv) What are the SI units of (a) momentum (b) rate of change of momentum ?
- (v) Calculate the force exerted by the hockey stick on the ball and state its direction.

Answers

- (i) Initial momentum = mu
 $= 200 \times 10 = 2000 \text{ gm-m/s}$
 or
 $= 2 \text{ kg-m/s}$
- Final momentum = mv
 $= -200 \times 5 = -1000 \text{ gm-m/s}$
 or
 $= -1 \text{ kg-m/s}$
- (ii) In first case, west to east.
 In second case, east to west.
- (iii) Rate of change of momentum
 $= (\text{Final momentum} - \text{Initial momentum})/\text{Time Taken}$
 $= -1 - 2/0.2 = -15 \text{ kg-ms}^{-2}$
- (iv) (a) kg-ms^{-1} or kg-ms^{-1} (b) kg-ms^2
- (v) Force exerted by hockey = $\frac{-3 \text{ kg-m/s}}{0.2 \text{ s}} = -15 \text{ N}$
 (- mark denotes the negative acceleration)



CHAPTER

7

GRAVITATION

EXERCISE – 7

- I. Newton's Universal Law of Gravitation is expressed mathematically as :

$$F = G \frac{m_1 m_2}{d^2}$$

Answer the following questions based on this law :

- (i) What is the meaning of the word 'Universal' in this law ?
- (ii) This law holds good for any two bodies in the universe. Then why you or your friend sitting near each other does not feel any force of attraction ?
- (iii) Will the force of attraction between same two bodies be same or different when these are, in turn, kept on (i) earth (ii) moon ?
- (iv) In what ratio will the force of attraction between same two bodies change when the distance between them is
 - (a) halved ?
 - (b) tripled ?
- (v) In what ratio will the force of attraction change when mass of each of these bodies is halved ?

Answers

- (i) Universal means that it is applicable to all bodies, whether the bodies are big or small, whether they are celestial or terrestrial.
- (ii) It is due to very less mass of the you and your friend. Also, the distance between the two is negligible or too less.
- (iii) Different (a) On earth, attraction is heavier.
(b) On moon, attraction is lower.
- (iv) (a) Becomes double.
(b) Becomes $\frac{1}{3}$.
- (v) Force of attraction will be $\frac{1}{4}$.



EXERCISE – 8.1

I. Choose the correct option :

$\frac{1}{2} \times 10$

Q. 1. To solve the food problem of the country, which among the following is important ?

- (a) Easy access of people to the food grain
 - (b) People should have money to purchase the grains
 - (c) Increased production and storage of food grains
 - (d) All of the above

Q. 2. Which of the following statements are correct ?

- (i) Hybridization means crossing between genetically dissimilar plants.
 - (ii) Cross between two varieties is called as inter-specific hybridization.
 - (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 hybridization.

(a) (i) & (iii) **(b)** (iii) & (iv)
(c) (ii) & (iv) **(d)** (ii) & (iii)

Q. 3. Which of the following is incorrect about manure ?

- (a) Manures contain large quantities of organic matter and small quantities of nutrients
 - (b) In clayey soils, manures help in drainage and avoiding water logging.
 - (c) Manures increase the water holding capacity in sandy soil.
 - (d) Green manure is also known as vermi-compost.

Q. 4. Poultry farming is undertaken for :

- (a) Egg and feather production
 - (b) Feather and chicken meat
 - (c) Egg and chicken meat
 - (d) Milk and egg

Q. 5. Which of the following is not a weed ?

- Q. 6. Which of the following is not a cropping pattern useful in increasing food production ?**

- (a) Mixed cropping (b) Hybridization
(c) Intercropping (d) Crop rotation

Q. 7. Milk production from cows and buffaloes depends on which of the following factors ?

- (i) Lactation period
 - (ii) Type of food given to the animal
 - (iii) The country in which the animal is present
 - (iv) The breed of the cattle

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

Q. 8. Which of the following is an Italian bee variety?

- (a) *Apis cerana indica* (b) *Apis mellifera*
 (c) *Anis dorsata* (d) *Anis florea*

Q. 9. Which of the following combinations are most suitable for composite fish culture ?

- (a) Surface feeders and bottom feeders
 - (b) Surface feeders, middle zone feeders and bottom feeders
 - (c) Middle zone feeders and bottom feeders
 - (d) Surface feeders only

Q. 10. Which of the following contain macro-nutrients only ?

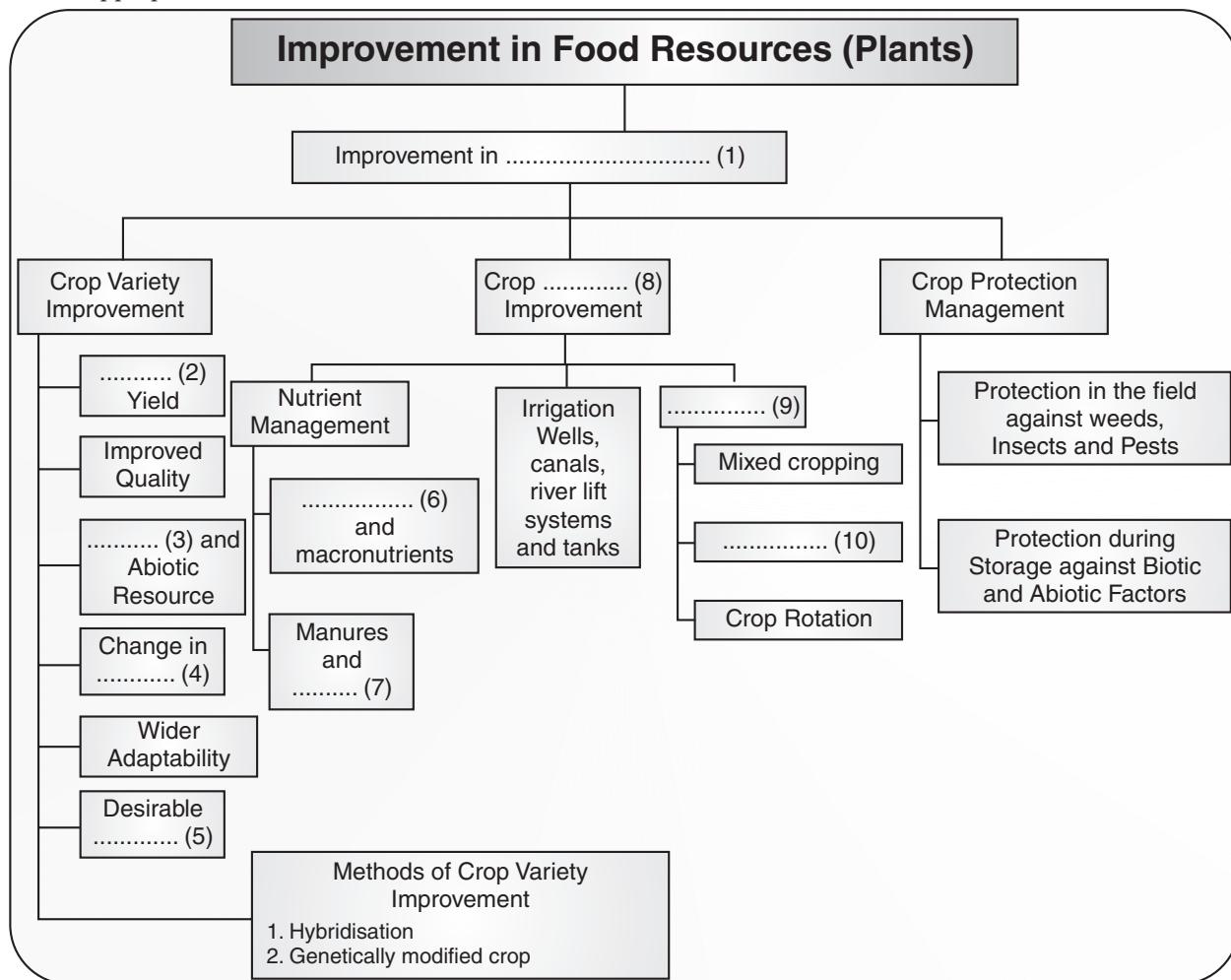
- (a) Calcium, sulphur and zinc
 - (b) Nitrogen, phosphorous and potassium
 - (c) Calcium, magnesium and copper
 - (d) Nitrogen, iron and chlorine

Answers

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

EXERCISE – 8.2

II. Instructions : Identify the missing steps / processes / examples in the flowchart given below and complete it using the appropriate words.

**Answers**

- | | | | |
|--------------------------|----------------------|-----------------|-----------------------|
| (1) Crop Yields | (2) Higher | (3) Biotic | (4) Maturity duration |
| (5) Agronomic characters | (6) Micronutrients | (7) Fertilizers | (8) Production |
| (9) Crop Patterns | (10) Inter cropping. | | |

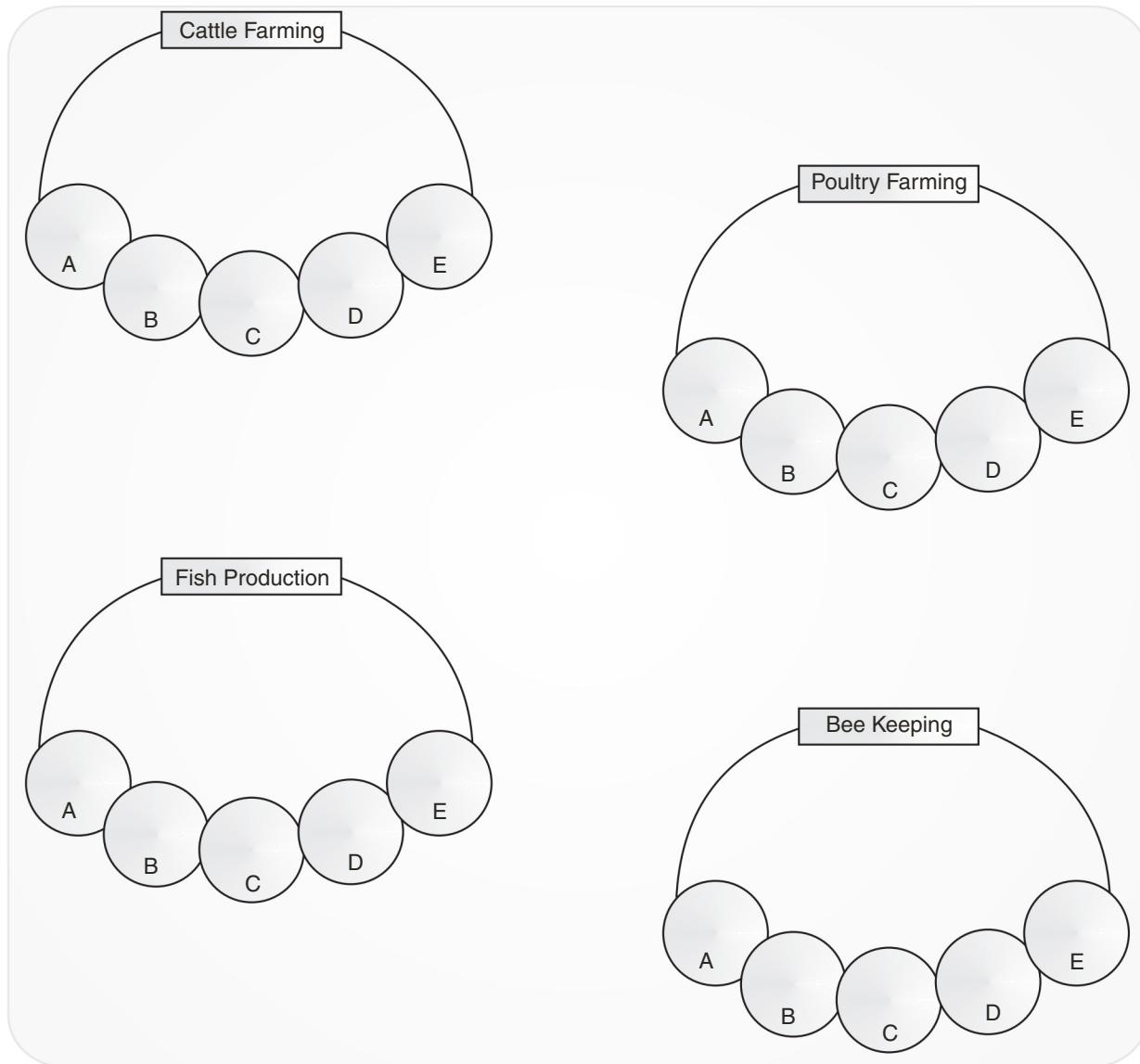
EXERCISE – 8.3

III. Instructions : Given below are outline structures of some 'Bead Necklaces' and a list of characters placed in different categories. Each necklace is given a name that is actually a 'term' important for Food Production. You have to pick one character from each category to list the features of a group. In this way, you will 'string the beads' and the necklace will be complete when all the beads have been allotted characters from each category.

Categories	A	B	C	D	E
	For milk and Drought labour	Layers and broilers	Fowl	Dwarf parent preferred for commercial chick production	Mullets and Bhetki
	For egg production and chicken meat	Marine and fresh water varieties	<i>Peneaus monodon</i>	Lactation period is important while selecting the right breed	Aseel and Leghorn

	Cheap source of animal protein obtained from water	Dairy and draught animals	<i>Apis dorsata, Apis mellifera</i>	Large schools are located in open sea using satellites and eco-sounders; Capture and culture methods are also used	Jersey, Red Sindhi
	For production of Honey	Local and Italian variety	<i>Bos indicus and Bos bubalis</i>	Value or quality of product depends upon pasturage	Rock bee and little bee

2½ × 4

**Answers**

Cattle farming	A	For milk and drought labour
	B	Dairy and draught animals
	C	<i>Bos indicus and Bos bubalis</i>
	D	Lactation period is important while selecting the right breed.
	E	Jersey, Red Sindhi

Poultry farming	A	For egg production and chicken meat
	B	Layers and broilers
	C	Fowl
	D	Dwarf parent preferred for commercial chick production
	E	Aseel and leghorn
Fish production	A	Cheap source of animals protein obtained from water
	B	Marine and fresh water varieties
	C	<i>Paneaus monodon</i>
	D	Large schools are located in open sea using satellites and eco-sounders; Capture and culture methods are also used.
	E	Mullets and Bhetki
Bee keeping	A	For production of Honey
	B	Local and <i>Italian</i> Variety
	C	<i>Apis dorsata, Apis mellifera</i>
	D	Value or quality of product depends on pasturage.
	E	Rock bee and little bee.

