

10

Arivaali

SCIENCE

Guide

X STANDARD

✧ June-2025 ; April-2026 Questions: Page-190

✧ All Public Exam. Answers: Page-(iv)



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PREFACE

The every learning teacher friends and the ever cheerful Students ! Welcome you all !

The book-back evaluation questions from the Text Book are answered and arranged in this book under the headings like 'Choose the Most Suitable Answer', 'Fill Ups', 'True or False', 'Match', 'Assertion and Reason', 'Short Answers', 'Long Answers', 'Problems', etc.

The questions that were asked in the Board Examinations are shown by the markings such as **SEP 2020**, **SEP 2021**, **MAY 2022**, **AUG 2022**, **APR 2023**, **JUN 2023**, **APR 2024**, **JUN 2024**, **APR 2025**, **JUN 2025** and **APR 2026**.

The important questions from the past Board Examinations which are not available in the Text Book book-back Evaluation are also answered and arranged under the respective headings in each unit as Additional Questions in this book.

This book has been designed in such a way that it can be used by both the student community and the teaching faculty with their coordination. If you find any difficulty in using this book, kindly let us know about it and give the chance to rectify the same in the future editions. Thank you

With Best Wishes

Arivaali Teachers' Team.

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1 Marks

2 Marks

10th Science All Public Examinations - Arivaali Guide Analysis

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4 Marks

10th Science All Public Examinations - Arivaali Guide Analysis

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Marks	75/75	75/75	75/75	75/75	75/75	75/75	75/75	75/75	75/75	75/75	75/75

8 Marks

Laws of Motion

1

CHOOSE THE MOST SUITABLE ANSWER

APR 2024

Physics-1

- Inertia of a body depends on
 (a) weight of the object (b) acceleration due to gravity of the planet
 (c) mass of the object (d) Both a & b
Answer: (c) mass of the object
- Impulse is equals to
 (a) rate of change of momentum (b) rate of force and time
 (c) change of momentum (d) rate of change of mass
Answer: (c) change of momentum
- Newton's III law is applicable
 (a) for a body is at rest (b) for a body in motion
 (c) both a & b (d) only for bodies with equal masses
Answer: (c) both a & b
- Plotting a graph for momentum on the Y-axis and time on X-axis, slope of momentum-time graph gives
 (a) Impulsive force (b) Acceleration (c) Force (d) Rate of force
Answer: (c) Force
- In which of the following sport the turning of effect of force used?
 (a) swimming (b) tennis (c) cycling (d) hockey
Answer: (c) cycling
- The unit of 'g' is ms^{-2} . It can be also expressed as
 (a) cm s^{-1} (b) N kg^{-1} (c) $\text{N m}^2 \text{kg}^{-1}$ (d) $\text{cm}^2 \text{s}^{-2}$
Answer: (b) N kg^{-1}
- One kilogram force equals
 (a) 9.8 dyne (b) $9.8 \times 10^4 \text{ N}$ (c) $98 \times 10^4 \text{ dyne}$ (d) 980 dyne
Answer: (c) $98 \times 10^4 \text{ dyne}$
- The mass of a body is measured on planet Earth as M kg. When it is taken to a planet of radius half that of the Earth then its value will be _____ kg
 (a) 4 M (b) 2 M (c) M/4 (d) M
Answer: (d) M

APR 2025

9. If the Earth shrinks to 50% of its real radius its mass remaining the same, the weight of a body on the Earth will **APR 2026**

(a) decrease by 50% (b) increase by 50% (c) decrease by 25% (d) increase by 300%

Answer: (d) increase by 300%

10. To project the rockets which of the following principle(s) is /(are) required? **SEP 2021** **AUG 2022**

(a) Newton's third law of motion (b) Newton's law of gravitation **JUN 2023**

(c) law of conservation of linear momentum (d) both a and c **JUN 2024** **JUN 2025**

Answer: (d) both a and c

FILL UPS

1. To produce a displacement _____ is required.

Answer: Force

2. Passengers lean forward when sudden brake is applied in a moving vehicle. This can be explained by _____.

Answer: Inertia of Motion

3. By convention, the clockwise moments are taken as _____ and the anticlockwise moments are taken as _____.

Answer: Negative, Positive

4. _____ is used to change the speed of car.

Answer: Gear

5. A man of mass 100 kg has a weight of _____ at the surface of the Earth.

Answer: 980 N

TRUE OR FALSE (CORRECT IF FALSE)

1. The linear momentum of a system of particles is always conserved.

Answer: False

In the absence of an external force the linear momentum of a system of particles is conserved.

2. Apparent weight of a person is always equal to his actual weight.

Answer: False

Apparent weight of a person is **not necessarily** equal to his actual weight.

3. Weight of a body is greater at the equator and less at the polar region.

Answer: False

Weight of a body is **less** at the equator and **greater** at the polar region.

4. Turning a nut with a spanner having a short handle is so easy than one with a long handle.

Answer: False

Turning a nut with a spanner having a **long** handle is so easy than one with a **short** handle.

5. There is no gravity in the orbiting space station around the Earth. So the astronauts feel weightlessness.

Answer: False

No normal force acts on the astronauts by the spacestation as both astronauts and spacestation are accelerated (with the same value of acceleration) towards the centre of the earth. So the astronauts feel weightlessness.

MATCH

Column I

- (a) Newton's I law
- (b) Newton's II law
- (c) Newton's III law
- (d) Law of conservation of Linear momentum

Column II

- propulsion of a rocket
- Stable equilibrium of a body
- Law of force
- Flying nature of bird

Answer:

Column I

- (a) Newton's I law
- (b) Newton's II law
- (c) Newton's III law
- (d) Law of conservation of Linear momentum

Column II

- Stable equilibrium of a body
- Law of force
- Flying nature of bird
- propulsion of a rocket

ASSERTION AND REASON

- (a) Both the assertion and the reason are true and the reason is the correct explanation of assertion.
- (b) Both the assertion and the reason are true, but the reason is not the correct explanation of the assertion.
- (c) Assertion is true, but the reason is false.
- (d) Assertion is false, but the reason is true.

1. **Assertion** : The sum of the clockwise moments is equal to the sum of the anticlockwise moments.

Reason : The principle of conservation of momentum is valid if the external force on the system is zero.

Answer: (b) Both the assertion and the reason are true, but the reason is not the correct explanation of the assertion.

2. **Assertion** : The value of 'g' decreases as height and depth increases from the surface of the Earth.

Reason : 'g' depends on the mass of the object and the Earth.

Answer: (c) Assertion is true, but the reason is false.

SHORT ANSWERS

1. Define inertia. Give its classification.

AUG 2022 | APR 2023

- (i) **Inertia:** The inherent property of a body to resist any change in its state of rest or the state of uniform motion, unless it is influenced upon by an external unbalanced force, is known as inertia.
- (ii) **Types:**
1. Inertia of rest
 2. Inertia of motion
 3. Inertia of direction

2. Classify the types of force based on their application.

AUG 2022

- (i) Like parallel forces
- (ii) Unlike parallel forces

3. Differentiate mass and weight.

MAY 2022

	Mass	Weight
i	Mass is the quantity of matter contained in a body.	Weight of a body is the gravitational force exerted on it.
ii	Unit: kilogram (kg)	Unit: Newton (N)

4. Define moment of a couple.

JUN 2024

- (i) Moment of a couple is measured by the product of any one of the forces and the perpendicular distance between the line of action of two forces.
- (ii) i.e., $M = F \times S$

5. State the principle of moments.

APR 2025

- (i) The algebraic sum of the moments in the clockwise direction is equal to the algebraic sum of the moments in the anticlockwise direction.
- (ii) $F_1 \times d_1 = F_2 \times d_2$

6. State Newton's second law.

MAY 2022

- (i) The force acting on a body is directly proportional to the rate of change of linear momentum of the body and the change in momentum takes place in the direction of the force.
- (ii) i.e., $F \propto \frac{mv - mu}{t}$

7. Why a spanner with a long handle is preferred to tighten screws in heavy vehicles?

- (i) When the handle of the spanner is long, the force required to turn the body is less.
- (ii) So, a spanner with a long handle is preferred to tighten screws in heavy vehicles.

Atoms and Molecules



CHOOSE THE MOST SUITABLE ANSWER

- Which of the following has the smallest mass?
(a) 6.023×10^{23} atoms of He (b) 1 atom of He
(c) 2 g of He (d) 1 mole atoms of He
Answer: (b) 1 atom of He
- Which of the following is a triatomic molecule?
(a) Glucose (b) Helium (c) Carbon dioxide (d) Hydrogen
Answer: (c) Carbon dioxide
- The volume occupied by 4.4 g of CO_2 at S.T.P
(a) 22.4 litre (b) 2.24 litre (c) 0.24 litre (d) 0.1 litre
Answer: (b) 2.24 litre
- Mass of 1 mole of Nitrogen atom is
(a) 28 amu (b) 14 amu (c) 28 g (d) 14 g
Answer: (d) 14 g
- Which of the following represents 1 amu?
(a) Mass of a C – 12 atom (b) Mass of a hydrogen atom
(c) $1/12^{\text{th}}$ of the mass of a C – 12 atom (d) Mass of O – 16 atom
Answer: (c) $1/12^{\text{th}}$ of the mass of a C – 12 atom
- Which of the following statement is incorrect?
(a) One gram of C – 12 contains Avogadro's number of atoms.
(b) One mole of oxygen gas contains Avogadro's number of molecules.
(c) One mole of hydrogen gas contains Avogadro's number of molecules.
(d) One mole of electrons stands for 6.023×10^{23} electrons.
Answer: (c) One mole of hydrogen gas contains Avogadro's number of molecules.
- The volume occupied by 1 mole of a diatomic gas at S.T.P is
(a) 11.2 litre (b) 5.6 litre (c) 22.4 litre (d) 44.8 litre
Answer: (c) 22.4 litre

8. In the nucleus of ${}_{20}\text{Ca}^{40}$, there are
(a) 20 protons and 40 neutrons (b) 20 protons and 20 neutrons
(c) 20 protons and 40 electrons (d) 40 protons and 20 electrons

Answer: (b) 20 protons and 20 neutrons

9. The gram molecular mass of oxygen molecule is

AUG 2022

- (a) 16 g (b) 18 g (c) 32 g (d) 17 g

Answer: (c) 32 g

10. 1 mole of any substance contains _____ molecules.

APR 2024

- (a) 6.023×10^{23} (b) 6.023×10^{-23} (c) 3.0115×10^{23} (d) 12.046×10^{23}

Answer: (a) 6.023×10^{23}

Additional Questions:

11. The gram molecular mass of water is

APR 2023

- (a) 2 g (b) 16 g (c) 18 g (d) 8 g

Answer: (c) 18 g

FILL UPS

1. Atoms of different elements having _____ mass number, but _____ atomic numbers are called isobars.

Answer: same, different

2. Atoms of one element can be transmuted into atoms of other element by _____.

Answer: artificial transmutation

3. The sum of the numbers of protons and neutrons of an atom is called its _____.

Answer: mass number

4. Relative atomic mass is otherwise known as _____.

Answer: Standard Atomic Weight

5. The average atomic mass of hydrogen is _____ amu.

Answer: 1.008

6. If a molecule is made of similar kind of atoms, then it is called _____ atomic molecule. **MAY 2022**

Answer: homo

7. The number of atoms present in a molecule is called its _____.

Answer: atomicity

8. One mole of any gas occupies _____ ml at S.T.P

Answer: 22,400

9. Atomicity of phosphorous is _____.

Answer: 4

TRUE OR FALSE (CORRECT IF FALSE)

1. Two elements sometimes can form more than one compound.

Answer: True

2. Noble gases are Diatomic.

Answer: False

Noble gases are monoatomic.

3. The gram atomic mass of an element has no unit.

Answer: False

The gram atomic mass of an element has unit.

4. 1 mole of Gold and Silver contain same number of atoms.

Answer: True

5. Molar mass of CO_2 is 42 g.

Answer: False

Molar mass of CO_2 is 44 g.

MATCH

- | | |
|----------------------------|--------------|
| 1. 8 g of O_2 | - 4 moles |
| 2. 4 g of H_2 | - 0.25 moles |
| 3. 52 g of He | - 2 moles |
| 4. 112 g of N_2 | - 0.5 moles |
| 5. 35.5 g of Cl_2 | - 13 moles |

JUN 2024

Answer:

1. 8 g of O_2 - 0.25 moles
2. 4 g of H_2 - 2 moles
3. 52 g of He - 13 moles
4. 112 g of N_2 - 4 moles
5. 35.5 g of Cl_2 - 0.5 moles

ASSERTION AND REASON

- (i) A and R are correct, R explains the A.
- (ii) A is correct, R is wrong.
- (iii) A is wrong, R is correct.
- (iv) A and R are correct, R doesn't explain A.

1. **Assertion (A)** : The Relative Atomic mass of aluminium is 27.

Reason (R) : An atom of aluminium is 27 times heavier than $\frac{1}{12}$ th of the mass of the C – 12 atom.

Answer: (i) A and R are correct, R explains the A.

2. **Assertion (A)** : The Relative Molecular Mass of Chlorine is 35.5 a.m.u.

Reason (R) : The natural abundance of Chlorine isotopes are not equal.

Answer: (iii) A is wrong, R is correct.

SHORT ANSWERS

1. **Define : Relative atomic mass.**

AUG 2022 | JUN 2023 | APR 2026

- (i) Relative atomic mass of an element is the ratio between the average mass of its isotopes to $\frac{1}{12}$ th part of the mass of a carbon-12 atom.
- (ii)
$$Ar = \frac{\text{Average mass of the isotopes of the element}}{\frac{1}{12}\text{th of the mass of one Carbon - 12 atom}}$$

2. **Write the different types of isotopes of oxygen and its percentage abundance.**

Isotopes	% Abundance
${}_8^{16}O$	99.757
${}_8^{17}O$	0.038
${}_8^{18}O$	0.205

3. **Define : Atomicity. Give an example.** [SEP 2021] [MAY 2022] [AUG 2022] [APR 2023] [JUN 2025]

- (i) The number of atoms present in the molecule is called its 'atomicity'.

$$\text{Atomicity} = \frac{\text{Molecular Mass}}{\text{Atomic Mass}}$$

- (ii) Example: The atomicity of Oxygen (O_2) is 2.

4. **Give any two examples for heterodiatomic molecules.**

[AUG 2022]

- (i) Hydrogen Chloride (HCl)
(ii) Carbon monoxide (CO)

5. **What is Molar volume of a gas?**

One mole of any gas occupies 22.4 litre or 22,400 ml at S.T.P. This volume is called as molar volume.

Additional Questions:

6. **Write any four applications of "Avogadro's Law".**

[SEP 2020] [APR 2023] [APR 2025]

- (i) It helps in the determination of atomicity of gases.
(ii) Molecular formula of gases can be derived using Avogadro's law
(iii) It determines the relation between molecular mass and vapour density.
(iv) It helps to determine gram molar volume of all gases.

7. **Consolidate the major differences between atoms and molecules.**

[MAY 2022]

	Atom	Molecule
i	An atom is the smallest particle of an element.	A molecule is the smallest particle of an element or compound.
ii	Atom does not exist in free state except in noble gas.	Molecule exists in a free a state.
iii	Except some of noble gas, other atoms are highly reactive.	Molecules are less reactive.
iv	Atom does not have a chemical bond.	Atoms in a molecule are held by chemical bonds.

8. **Under same conditions of temperature and pressure, if you collect 3 litre of O_2 , 5 litre of Cl_2 and 6 litre of H_2 , (A) Which has the highest number of molecules? (B) Which has the lowest number of molecules?**

[APR 2024]

(A) 6 litre of H_2 has the highest number of molecules.

(B) 3 litre of O_2 has the lowest number of molecules.

Reason: The volume of the gas is directly proportional to the number of molecules of the gas.

LONG ANSWERS

1. Give the salient features of "Modern atomic theory".

SEP 2020 | AUG 2022 | APR 2024 | JUN 2024

- (i) An atom is no longer indivisible.
- (ii) Atom is the smallest particle that takes part in a chemical reaction.
- (iii) The mass of an atom can be converted into energy ($E = mc^2$).
- (iv) Atoms may not always combine in a simple whole number ratio.
- (v) Atoms of one element can be transmuted into atoms of other elements. In other words, atom is no longer indestructible.
- (vi) Atoms of the same element may have different atomic mass.
- (vii) Atoms of different elements may have same atomic masses.

2. Derive the relationship between Relative molecular mass and Vapour density. JUN 2025

- (i) **Relative molecular mass (Hydrogen scale):** The relative molecular mass of a gas or vapour is the ratio between the mass of one molecule of the gas or vapour to mass of one atom of Hydrogen.
- (ii) **Vapour density:** Vapour density is the ratio of the mass a certain volume of a gas or vapour, to the mass of an equal volume of hydrogen, measured under the same conditions of temperature and pressure.

$$\text{Vapour Density (V.D)} = \frac{\text{Mass of a given volume of gas or vapour at S.T.P}}{\text{Mass of the same volume of hydrogen}}$$

$$\text{V.D of a gas of } n \text{ molecules} = \frac{\text{Mass of 'n' molecules of a gas or vapour at S.T.P}}{\text{Mass of 'n' molecules of hydrogen}}$$

$$\text{V.D of gas of 1 molecule} = \frac{\text{Mass of 1 molecule of a gas or vapour at S.T.P}}{\text{Mass of '1' molecule of hydrogen}}$$

$$\text{V.D of diatomic hydrogen} = \frac{\text{Mass of 1 molecule of a gas or vapour at S.T.P}}{2 \times \text{Mass of 1 atom of hydrogen}} \quad \text{———— (i)}$$

Relative molecular mass (hydrogen scale) =

$$\frac{\text{Mass of 1 molecules of a gas or vapour at S.T.P}}{\text{Mass of 1 atom of hydrogen}} \quad \text{———— (ii)}$$

$$\text{Substitute Equation (ii) in Equation (i) V.D.} = \frac{\text{Relative molecular mass}}{2}$$

 $\therefore$ Relative molecular mass = $2 \times$ vapour density.

PROBLEMS

1. Find the percentage of nitrogen in ammonia (NH_3).

$$\begin{aligned} \text{Molar mass of } \text{NH}_3 &= (1 \times \text{atomic mass of Nitrogen}) + (3 \times \text{atomic mass of Hydrogen}) \\ &= (1 \times 14) + (3 \times 1) = 14 + 3 = 17 \text{ g.} \end{aligned}$$

$$\% \text{ of Nitrogen in } \text{NH}_3 = \frac{\text{mass of Nitrogen}}{\text{molar mass of Ammonia}} \times 100 = \frac{14}{17} \times 100 = \frac{1400}{17} = 82.3\%$$

2. Calculate the number of water molecule present in one drop of water which weighs 0.18 g.

$$\begin{aligned}\text{Molar weight of water (H}_2\text{O)} &= (2 \times \text{atomic number of Hydrogen}) + (1 \times \text{atomic number of Oxygen}) \\ &= (2 \times 1) + (1 \times 16) = 2 + 16 = 18 \text{ g}\end{aligned}$$

$$\text{Number of molecules of water} = \frac{\text{Mass of water}}{\text{Molar mass of water}} = \frac{0.18}{18} = 0.01 \text{ mole}$$

$$\text{Number of molecules in 1 mole of water } 6.023 \times 10^{23}$$

$$\therefore \text{Number of molecules in 0.01 mole of water} = 0.01 \times 6.023 \times 10^{23} = 6.023 \times 10^{21}$$

3. $\text{N}_2 + 3 \text{H}_2 \rightarrow 2 \text{NH}_3$ (The atomic mass of nitrogen is 14, and that of hydrogen is 1)
1 mole of nitrogen (___ g) + 3 moles of hydrogen (___ g) $\rightarrow$ 2 moles of ammonia (___ g)

$$\begin{array}{c} \text{1 mole of Nitrogen (28 g)} \\ \downarrow \\ \text{3 moles of Hydrogen (6 g)} \\ \downarrow \\ \text{2 moles of Ammonia (34 g)} \end{array} \quad [\because \text{N}_2 = 2 \times \text{N} = 2 \times 14 = 28]$$

$$[\because 3\text{H}_2 = 3 \times \text{H} \times 2 = 3 \times 1 \times 2 = 6]$$

$$[\because 2\text{NH}_3 = 2\{\text{N} + (\text{H} \times 3)\} = 2\{14 + (1 \times 3)\} = 2\{17\} = 34]$$

4. Calculate the number of moles in (i) 27 g of Al

(ii) 1.51×10^{23} molecules of NH_4Cl

JUN 2024

APR 2024

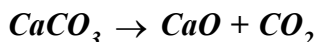
- (i) 27 g of Al

$$\text{Mole} = \frac{\text{Mass of element}}{\text{Atomic mass of the element}} = \frac{27}{27} = 1 \text{ mole} (\because \text{Atomic mass of Aluminium} = 27)$$

- (ii) 1.51×10^{23} molecules of NH_4Cl

$$\text{Mole} = \frac{\text{Number of molecules}}{\text{Avogadro Number}} = \frac{1.51 \times 10^{23}}{6.023 \times 10^{23}} = 0.25 \text{ moles}$$

5. Calcium carbonate is decomposed on heating in the following reaction



- (i) How many moles of Calcium carbonate are involved in this reaction?

- (ii) Calculate the gram molecular mass of calcium carbonate involved in this reaction.

- (iii) How many moles of CO_2 are there in this equation?

- (i) 1 mole

$$[\because \text{CaCO}_3 = (1 \times \text{Ca}) + (1 \times \text{C}) + (\text{O} \times 3)]$$

- (ii) 100 g.

$$= (1 \times 40) + (1 \times 12) + (16 \times 3)$$

- (iii) 1 mole

$$= 40 + 12 + 48$$

$$= 100 \text{ g}$$

6. How many grams are there in the following?

- (i) 2 moles of hydrogen molecule, H_2 (ii) 3 moles of chlorine molecule, Cl_2

- (iii) 5 moles of sulphur molecule, S_8 (iv) 4 moles of phosphorous molecule, P_4

$$\text{Mass} = \text{Mole} \times \text{Molecular mass}$$

$$(i) \text{ Mass} = 2 \times 2 = 4 \text{ g} \quad (\because \text{Molecular mass of } \text{H}_2 = 2 \times 1 = 2)$$

$$(ii) \text{ Mass} = 3 \times 71 = 213 \text{ g} \quad (\because \text{Molecular mass of } \text{Cl}_2 = 2 \times 35.5 = 71)$$

$$(iii) \text{ Mass} = 5 \times 256 = 1280 \text{ g} \quad (\because \text{Molecular mass of } \text{S}_8 = 8 \times 32 = 256)$$

$$(iv) \text{ Mass} = 4 \times 124 = 496 \text{ g} \quad (\because \text{Molecular mass of } \text{P}_4 = 4 \times 31 = 124)$$

7. Calculate the % of each element in calcium carbonate. (Atomic mass: C-12, O-16, Ca-40)

Molar mass of $\text{CaCO}_3 = (1 \times 40) + (1 \times 12) + (3 \times 16) = 40 + 12 + 48 = 100 \text{ g}$. **JUN2023**

$$\% \text{ of Calcium in } \text{CaCO}_3 = \frac{40}{100} \times 100 = 40\%$$

$$\% \text{ of Carbon in } \text{CaCO}_3 = \frac{12}{100} \times 100 = 12\%$$

$$\% \text{ of Oxygen in } \text{CaCO}_3 = \frac{48}{100} \times 100 = 48\%$$

8. Calculate the % of oxygen in $\text{Al}_2(\text{SO}_4)_3$. (Atomic mass: Al-27, O-16, S-32)

Molar mass of $\text{Al}_2(\text{SO}_4)_3 = (2 \times 27) + (3 \times 32) + (12 \times 16) = 54 + 96 + 192 = 342 \text{ g}$.

$$\% \text{ of Oxygen in } \text{Al}_2(\text{SO}_4)_3 = \frac{192}{342} \times 100 = 56.14\%$$

9. Calculate the % relative abundance of B -10 and B -11, if its average atomic mass is 10.804 amu.

Let B-10 = $x\%$; B-11 = $(100 - x)\%$.

Average Atomic mass = 10.804 amu

$$\frac{10x + 11(100 - x)}{100} = 10.804$$

$$10x + 1100 - 11x = 1080.4$$

$$x = 1100 - 1080.4 = 19.6$$

$$100 - x = 100 - 19.6 = 80.4$$

$$\therefore \text{B-10} = 19.6\% ; \text{B-11} = 80.4\%$$

Additional Questions:**10. Calculate the percentage of sulphur in H_2SO_4 .****APR 2023**

Molar mass of $\text{H}_2\text{SO}_4 = (1 \times 2) + (32 \times 1) + (16 \times 4) = 2 + 32 + 64 = 98 \text{ g}$.

$$\% \text{ of S in } \text{H}_2\text{SO}_4 = \frac{32}{98} \times 100 = 32.65\%$$

11. Calculate the molecular mass of CO_2 .**SEP 2021 | JUN2024**

Atomic mass of C = 12 ; Atomic mass of O = 16

Molar mass of $\text{CO}_2 = (12 \times 1) + (16 \times 2) = 12 + 32 = 44 \text{ g}$.

12. Find the mass percentage composition of methane (CH_4).**APR 2025**

Molecular mass of $\text{CH}_4 = 12 + 4 = 16 \text{ g}$.

$$\text{Mass \% of carbon} = \frac{12}{16} \times 100 = 75\%$$

$$\text{Mass \% of hydrogen} = \frac{4}{16} \times 100 = 25\%$$

12

Plant Anatomy and Plant Physiology

CHOOSE THE MOST SUITABLE ANSWER

- Casparian strips are present in the _____ of the root. JUN 2023 | APR 2025
 (a) cortex (b) pith (c) pericycle (d) endodermis
Answer: (d) endodermis
- The endarch condition is the characteristic feature of MAY 2022 | AUG 2022 | APR 2024
 (a) root (b) stem (c) leaves (d) flower APR 2026
Answer: (b) stem
- The xylem and phloem arranged side by side on same radius is called _____.
 (a) radial (b) amphivasal (c) conjoint (d) None of these
Answer: (c) conjoint
- Which is formed during anaerobic respiration? SEP 2020
 (a) Carbohydrate (b) Ethyl alcohol (c) Acetyl CoA (d) Pyruvate
Answer: (b) Ethyl alcohol
- Kreb's cycle takes place in APR 2023 | JUN 2025
 (a) chloroplast (b) mitochondrial matrix
 (c) stomata (d) inner mitochondrial membrane
Answer: (b) mitochondrial matrix
- Oxygen is produced at what point during photosynthesis ?
 (a) when ATP is converted to ADP (b) when CO_2 is fixed
 (c) when H_2O is splitted (d) All of these
Answer: (c) when H_2O is splitted

FILL UPS

- The innermost layer of Cortex in root is called _____.
Answer: Endodermis
- Xylem and phloem are arranged in an alternate radii constitute a vascular bundle called _____.
Answer: radial bundle

3. Glycolysis takes place in _____.

Answer: Cytoplasm

4. The source of O_2 liberated in photosynthesis is _____.

Answer: H_2O

5. _____ is ATP factory of the cells.

Answer: Mitochondria

TRUE OR FALSE (CORRECT IF FALSE)

1. Phloem tissue is involved in the transport of water in plant.

Answer: False

Xylem tissue is involved in the transport of water in plant.

2. The waxy protective covering of a plant is called as cuticle.

Answer: True

3. In monocot stem cambium is present in between xylem and phloem.

Answer: False

In dicot stem cambium is present in between xylem and phloem.

4. Palisade parenchyma cells occur below upper epidermis in dicot root.

Answer: False

Palisade parenchyma cells occur below upper epidermis in dicot leaf.

5. Mesophyll contains chlorophyll.

Answer: True

6. Anaerobic respiration produces more ATP than aerobic respiration.

Answer: False

Anaerobic respiration produces less ATP than aerobic respiration.

MATCH

- | | | |
|----------------|---|-----------------------|
| 1. Amphicribal | - | <i>Dracaena</i> |
| 2. Cambium | - | Translocation of food |
| 3. Amphivasal | - | Fern |
| 4. Xylem | - | Secondary growth |
| 5. Phloem | - | Conduction of water |

Answer:

1. Amphicribal - Fern
2. Cambium - Secondary growth
3. Amphivasal - *Dracaena*
4. Xylem - Conduction of water
5. Phloem - Translocation of food

SHORT ANSWERS**1. What is collateral vascular bundle?**

A vascular bundle in which xylem lies towards the centre and phloem lies towards the periphery is called collateral vascular bundle.

2. Where does the carbon that is used in photosynthesis come from?

Atmospheric Carbon-di-oxide

3. What is the common step in aerobic and anaerobic pathway?

Glycolysis

4. Name the phenomenon by which carbohydrates are oxidized to release ethyl alcohol.

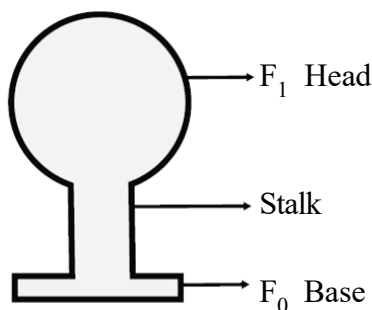
Anaerobic respiration

5. Give an account on vascular bundle of dicot stem.

Vascular bundles of dicot stem are conjoint, collateral, endarch and open.

6. Write a short note on mesophyll.**JUN 2025**

- (i) The tissue present between the upper and lower epidermis is called mesophyll.
- (ii) It is differentiated into Palisade parenchyma and Spongy parenchyma in a dicot leaf.

7. Draw and label the structure of oxysomes.**JUN2023 | JUN2024 | JUN 2025**

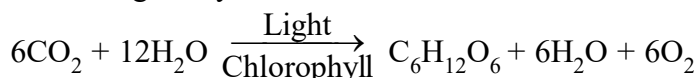
8. Name the three basic tissues system in flowering plants.

APR 2023 | APR 2026

- (i) Dermal or Epidermal tissue system
- (ii) Ground tissue system
- (iii) Vascular tissue system

9. What is photosynthesis and where in a cell does it occur? SEP 2021 | JUN 2024 | APR 2026

- (i) Photosynthesis (photo = light ; synthesis = to build) is a process by which autotrophic organisms like green plants, algae and chlorophyll containing bacteria utilize the energy from sunlight to synthesize their own food.



- (ii) Photosynthesis occurs in green parts of the plant such as leaves, stems and floral buds.

10. What is respiratory quotient? SEP 2021 | MAY 2022 | AUG 2022 | APR 2024 | APR 2026

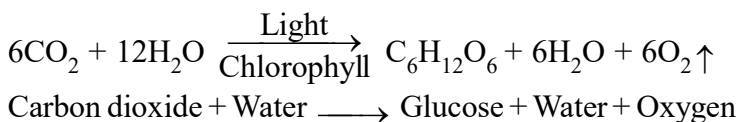
- (i) **Respiratory quotient:** The ratio of volume of carbon dioxide liberated and the volume of oxygen consumed during respiration.
- (ii) i.e., $\text{RQ} = \frac{\text{Volume of CO}_2 \text{ liberated}}{\text{Volume of O}_2 \text{ consumed}}$

11. Why should the light dependent reaction occur before the light independent reaction? APR 2024

- (i) **Light reaction:** Photosynthetic pigments absorb the light energy and convert in into chemical energy ATP and NADPH₂.
- (ii) **Biosynthetic phase:** During this reaction CO₂ is reduced into carbohydrates with the help of light generated ATP and NADPH₂.
- (iii) Hence, the light dependent reaction occur before the light independent reaction.

12. Write the reaction for photosynthesis?

MAY 2022 | JUN 2025



13. The reactions of photosynthesis make up a biochemical pathway.

(A) What are the reactants and products for both light and dark reactions.

(B) Explain how the biochemical pathway of photosynthesis recycles many of its own reactions and identify the recycled reactants.

(A)		Light reaction	Dark reaction
	Reactants	Photosynthetic pigments	CO ₂
	End products	ATP, NADPH ₂	Carbohydrates

- (B) (i) ♦ The end products ADP, NADP of the light independent reaction are the reactants of the light dependent reaction.
 ♦ ATP and NADPH₂ formed from light reaction are further converted to ADP and NADP through Calvin cycle.
 ♦ Both ADP and NADP are recycled back into the light reaction.
- (ii) Recycled reactants - ADP and NADP.

14. Where do the light dependent reaction and the Calvin cycle occur in the chloroplast.

- (i) **Light dependent reaction (Hill reaction):** It takes place in the thylakoid membrane (grana) of the chloroplast.
- (ii) **Light independent reaction (Calvin cycle):** It takes place in the stroma of the chloroplast.

Additional Questions:

15. What are the factors affecting photosynthesis?

AUG 2022 | APR 2023

- (i) Internal Factors
- Pigments
 - Leaf age
 - Accumulation of carbohydrates
 - Hormones
- (ii) External Factors
- Light
 - Carbon dioxide
 - Temperature
 - Water
 - Mineral elements

LONG ANSWERS

1. Differentiate the following

(a) Monocot root and Dicot root

SEP 2020 | APR 2025

(b) Aerobic and Anaerobic respiration

SEP 2021 | AUG 2022 | APR 2025

(a)	Tissues	Dicot root	Monocot root
(i)	Number of Xylem	Tetrarch	Polyarch
(ii)	Cambium	Present	Absent
(iii)	Secondary Growth	Present	Absent
(iv)	Pith	Absent	Present

(b)	Aerobic Respiration	Anaerobic Respiration
(i)	Aerobic respiration takes place with the help of oxygen.	Anaerobic respiration takes place without oxygen.
(ii)	It occurs most in plants and animals.	It occurs in plants and in some bacteria.
(iii)	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + ATP$	$C_6H_{12}O_6 \rightarrow 2CO_2 + 2C_2H_5OH + \text{Energy(ATP)}$

2. *Describe and name three stages of cellular respiration that aerobic organisms use to obtain energy from glucose.*



Stages of Aerobic respiration:

- Glycolysis (Glucose respiration):** It is the breakdown of one molecule of glucose (6 carbon) into two molecules of pyruvic acid (3 carbon). It takes place in cytoplasm of the cell. It is the first step of both aerobic and anerobic respiration.
- Krebs cycle:** It occurs in the mitochondrial matrix. At the end of glycolysis, 2 molecules of pyruvic acid enter into the mitochondria. The oxidation of pyruvic acid into CO_2 and water take place through this cycle. It is also called Tricarboxylic Acid (TCA) cycle.
- Electron Transport Chain:** It is accomplished through a system of electron carrier complex called electron transport chain (ETC) located on the inner membrane of the mitochondria. $NADH_2$ and $FADH_2$ molecules formed during glycolysis and Krebs cycle are oxidised to NAD^+ and FAD^+ to release the energy via electrons. The electrons as they move through the system, release energy which is trapped by ADP to synthesize ATP. This is called oxidative phosphorylation. In this process, O_2 the ultimate acceptor of electrons gets reduced to water (H_2O).

3. *How does the light dependent reaction differ from the light independent reaction? What are the end product and reactants in each? Where does each reaction occur within the chloroplast?*

		Light dependent Reaction	Light Independent Reaction
(i)	Type of reaction	It requires sunlight (Hill reaction)	It does not require sunlight. (Calvin cycle)
(ii)	Reactants	Photosynthetic pigments	CO_2
(iii)	End products	ATP, $NADPH_2$	Carbohydrates
(iv)	Place of occurrence	Thylakoid membrane of the chloroplast.	Stroma of the chloroplast.

GOVT. BOARD EXAM QUESTION PAPER : X - STD : JULY-2025

Time Allowed : 3.00 Hours]

SCIENCE

[Maximum Marks: 75

PART - I

Note: (i) Answer **all** the questions. $12 \times 1 = 12$
(ii) Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

1. _____ principle(s) is /are used in rocket projection.
(a) Newton's third law of motion (b) Newton's law of gravitation
(c) Law of conservation of linear momentum (d) Both (a) and (c)
2. If the power of a lens is $-4D$, then its focal length is
(a) 4 m (b) -40 m (c) -0.25 m (d) -2.5 m
3. SI unit of resistance is
(a) mho (b) joule (c) ohm (d) ohm-meter
4. When the body is exposed to about _____, it leads to death.
(a) 100 R (b) 200 R (c) 400 R (d) 600 R
5. The number of Periods and Groups in the Periodic table are _____.
(a) 6,16 (b) 7,17 (c) 8,18 (d) 7,18
6. Solubility of NaCl in 100 g water is 36 g. If 25 g of salt is dissolved in 100 ml of water how much more salt is required for saturation?
(a) 12 g (b) 11 g (c) 16 g (d) 20 g
7. Calculate the pH of a solution in which the concentration of the hydrogen ions is 1.0×10^{-8} mol litre $^{-1}$.
(a) 6 (b) 9 (c) 8 (d) 14
8. Pusa Komal is a disease resistant variety of
(a) sugarcane (b) rice (c) cow pea (d) maize
9. Kreb's cycle takes place in
(a) chloroplast (b) mitochondrial matrix
(c) stomata (d) inner mitochondrial membrane
10. The _____ units form the backbone of the DNA.
(a) Deoxyribose sugar (b) Phosphate (c) Nitrogenous bases (d) Sugar phosphate
11. Polyphagia is a condition seen in
(a) Obesity (b) Diabetes mellitus (c) Diabetes insipidus (d) AIDS
12. _____ is used to create category of blocks.
(a) Block palette (b) Block Menu (c) Script area (d) Sprite

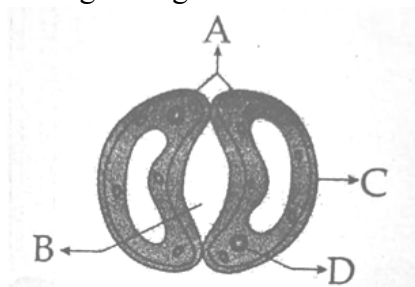
PART - II

Note: Answer **any seven** questions. Question No. 22 is **compulsory**.

 $7 \times 2 = 14$

13. Distinguish between real gas and ideal gas.
-

14. Define : Atomicity.
15. Fill in the blanks.
 - (i) _____ forms the basis of modern Periodic table.
 - (ii) The chief ore of Aluminium is _____.
16. How do detergents cause water pollution?
17. Identify the part A, B, C, D in the given figure.



18. What are Chemical Messengers?
19. Define: Triple Fusion.
20. How can you determine the age of the fossils?
21. Enumerate the importance of forests.
22. What will be the frequency of the sound having 0.20 m as its wavelength, when it travels with a speed of 331 ms^{-1} ?

PART - III

Note: Answer **any seven** questions. Question NO. 32 is **compulsory**.

$7 \times 4 = 28$

23. List any four properties of Light.
24. Explain the experiment of measuring the real and apparent expansion of a liquid with a neat diagram.
25. (a) What are the medical applications of Echo?
(b) Name four animals, which can sense ultrasonic vibrations.
26. (a) State Soddy and Fajan's displacement law.
(b) Give any two uses of radio isotopes in the field of Agriculture?
27. Derive the relationship between Relative Molecular Mass and Vapour Density.
28. Differentiate Soaps and Detergents.
29. (a) How does leech suck blood from the host?
(b) How is diastema formed in rabbit?
30. (i) Define Stimulus.
(ii) Name the parts of the hind brain.
31. How do rainwater harvesting structures recharge groundwater?
32. (a) Write the structural formula for Cyclobutane.
(b) The Molecular formula of an alcohol is $\text{C}_4\text{H}_{10}\text{O}$. The locant number of its $-\text{OH}$ group is 2.
(i) Draw its structural formula (ii) Give its IUPAC name (iii) Is it Saturated or Unsaturated?

PART - IV

Note: Answer **all** the questions. Draw diagrams wherever **necessary**.

$3 \times 7 = 21$

33. (a) (i) State the Universal Law of Gravitation and derive its mathematical equation.
(ii) Give any two applications of Universal Law of Gravitation.

OR

- (b) (i) What are the advantages of LED TV over the normal TV?
(ii) List the merits of LED bulb.

34. (a) Write notes on various factors affecting solubility.

OR

- (b) Explain the factors influencing the rate of a Chemical reaction.

35. (a) (i) Write the reaction for photosynthesis?
(ii) Draw and label the structure of oxysomes.
(iii) Write a short note on mesophyll.

OR

- (b) (i) Explain the types of Chromosomes based on the position of Centromere.
(ii) Discuss the importance of biotechnology in the field of Medicine.

-oOo-

GOVT. BOARD EXAM QUESTION PAPER : X - STD : APRIL-2026

Time Allowed : 3.00 Hours]

SCIENCE

[Maximum Marks: 75

PART - I

Note: (i) Answer **all** the questions.

$12 \times 1 = 12$

- (ii) Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

- If the earth shrinks to 50% of its real radius its mass remaining the same, the weight of a body on the Earth will
(a) decrease by 50% (b) increase by 50% (c) decrease by 25% (d) increase by 300%
- Magnification of a convex lens is
(a) Positive (b) Negative
(c) Either positive or negative (d) Zero
- In a simple circuit, why does the bulb glow when you close the switch?
(a) The switch produces electricity (b) Closing the switch completes the circuit
(c) Closing the switch breaks the circuit (d) The bulb is getting charged
- In the nuclear reaction ${}_6X^{12} \xrightarrow{\alpha \text{ decay}} {}_Z Y^A$, the value of A and Z is
(a) 8, 6 (b) 8, 4
(c) 4, 8 (d) Cannot be determined with given data
- The basis of modern periodic law is _____.
(a) Atomic number (b) Atomic mass
(c) Isotopic mass (d) Number of neutrons

6. Solubility of NaCl in 100 ml water is 36 g. If 25 g of salt is dissolved in 100 ml of water how much more salt is required for Saturation?
(a) 12 g (b) 11 g (c) 16 g (d) 20 g
7. Powdered CaCO_3 reacts more rapidly than flaky CaCO_3 because of _____.
(a) large surface area (b) high pressure (c) high concentration (d) high temperature
8. Which of the following pairs can be the successive members of a homologous series?
(a) C_3H_8 and C_4H_{10} (b) C_2H_2 and C_2H_4
(c) CH_4 and C_3H_6 (d) $\text{C}_2\text{H}_5\text{OH}$ and $\text{C}_4\text{H}_8\text{OH}$
9. The endarch condition is the characteristic feature of
(a) root (b) stem (c) leaves (d) flowers
10. The loss of one or more Chromosome in a ploidy is called _____.
(a) Tetraploidy (b) Aneuploidy (c) Euploidy (d) Polyploidy
11. Excessive consumption of alcohol leads to
(a) Loss of memory (b) Cirrhosis of liver
(c) State of hallucination (d) Suppression of brain function
12. Which is used to edit programs?
(a) Inkscape (b) script editor (c) stage (d) sprite

PART - II

Note: Answer **any seven** questions. Question No. **22** is **Compulsory**.

$7 \times 2 = 14$

13. State Boyle's Law.
14. Define: Relative atomic mass.
15. What is rust? Give the equation for formation of rust.
16. Name the simplest Ketone and give its structural formula.
17. Why is the circulation in man referred to as double circulation?
18. Write the differences between endocrine and exocrine gland.
19. How can menstrual hygiene be maintained during menstrual days?
20. Why is Archaeopteryx considered to be a connecting link?
21. Match the following:
- | | |
|--------------------|------------------------|
| 1. Bio gas | - energy saving |
| 2. Natural gas | - CO_2 |
| 3. Green House gas | - Renewable energy |
| 4. CFL Bulbs | - Non-renewable energy |
22. A source producing a sound of frequency 500 Hz is moving towards a listener with a velocity of 30 ms^{-1} , The speed of the sound is 330 ms^{-1} in air. What will be the frequency heard by the listener?

PART - III

Note: Answer **any seven** questions. Question No. **32** is **Compulsory**.

$7 \times 4 = 28$

23. (a) List any two properties of light.
(b) Draw a ray diagram to show the image formed by a convex lens when the object is placed between F and 2F.

24. (a) Distinguish between Linear and Areal expansion.
(b) What is co-efficient of Real expansion?
25. What are the factors that affect the velocity of sound in gases ?
26. (i) In Japan, after the Second World War some of the new born children are having congenital diseases. Why?
(ii) Give any two uses of radio isotopes in the field of agriculture.
27. (a) Identify the bond between H and F in HF molecule.
(b) What property forms the basis of identification ?
(c) How does the property vary in Periods and in Groups?
28. How is ethanoic acid prepared from ethanol? Give the chemical equation.
29. (i) Why are the rings of cartilages found in trachea of Rabbit?
(ii) List out any two parasitic adaptations in Leech.
30. Classify Neurons based on its structure.
31. Enumerate the importance of Forest.
32. A container whose capacity is 70 ml is filled with a liquid up to 50 ml. Then, the liquid in the container is heated. Initially, the level of the liquid falls from 50 ml to 48.5 ml. Then we heat more, the level of the liquid rises to 51.2 ml. Calculate the apparent and real expansion.

PART - IV

Note: Answer **all** the questions. Draw diagrams wherever necessary. $3 \times 7 = 21$

33. (a) (i) What are the types of inertia ? Give an example for each type.
(ii) While catching a cricket ball, the fielder lowers his hands backwards. Why?
- OR
- (b) (i) Three resistors of $1\ \Omega$, $2\ \Omega$ and $4\ \Omega$ are connected in parallel in a circuit. If a $1\ \Omega$ resistor draws a current of 1A, find the current through the other two resistors.
(ii) State Ohm's Law.
34. (a) (i) What is meant by binary solution?
(ii) Give an example each for (1) Gas in liquid (2) Solid in liquid (3) Solid in solid (4) Gas in gas
(iii) What is aqueous and non-aqueous solution? Give an example.
- OR
- (b) (i) Explain the types of double displacement reactions with examples.
(ii) Calculate the pH of 1.0×10^{-4} molar solution of HNO_3 .
35. (a) (i) Name the three basic tissues system in flowering plants.
(ii) What is Photosynthesis and where in a cell does it occur?
(iii) What is Respiratory Quotient?
- OR
- (b) (i) Why did Mendel select pea-plant for-his experiments?
(ii) What are Okazaki fragments?
(iii) DNA consists of two _____ chains.