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EC SCIENCE

10

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Less Strain Score More

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PREFACE

Students with average IQ always struggle to cope up studies. They always seek for the best, sources to learn and score high marks.

The pattern of the question being asked in the exams has changed dramatically and the difficulty level has also increased considerably. To succeed in board exams and to actualize your dream, you are required to prepare strategically and study in a focused manner.

Loyola serves the above cited purpose in perfect manner.

➢ Specially designed for coaching students of different levels.

   (Slow learners, average and above average students)

➢ Lot of additional questions are given for toppers

➢ The EC Science is prepared with due care on the lines of the Govt. Examination Valuation, the easy method of studying. The lesson and the perfect way of answering the questions.

➢ The answers are well prepared, briefly and easily for the students to study without any difficulty and stress.

➢ Simplified text matter

➢ Focused on coverage of textbook.

➢ MCQ's are framed based on new pattern.

➢ Comprehensive questions are designed for average and above average students based on key points.

Wish you All the Best

Contents

Govt. Exam - April 2023

Time Allowed: 3.00 Hrs	**10th SCIENCE**	Maximum Marks: 75

PART - I

Note : i) Answer All the questions.

ii) Choose the most appropriate answer from the given four alternatives and write the option code and the corresponding answer.   **12 x 1 = 12**

1. Magnification of a convex lens is always:
   a) Positive   b) Negative
   c) Either positive (or) negative   d) Zero

2. In which of the following reaction, the mass number decreases by four of the daughter nucleus?
   a) α decay   b) β decay   c) γ decay   d) neutron decay

3. The gram molecular mass of water is:
   a) 2 g   b) 16 g   **c) 18 g**   d) 8 g

4. Which of the following is the universal solvent?
   a) Acetone   b) Benzene   **c) Water**   d) Alcohol

5. The secondary suffix used in IUPAC nomenclature of an aldehyde is _____.
   a) − ol   b) − oic acid   **c) − al**   d) − one

6. The heart of amphibians possess _____ chambers.
   a) 3   b) 4   c) 2   d) 5

7. Kreb's cycle takes place in _____.
   a) chloroplast   **b) mitochondrial matrix**
   c) stomata   d) inner mitochondrial membrane

8. Bipolar neurons are found in:
   a) retina of eye   b) cerebral cortex   c) embryo   d) respiratory epithelium

9. Syngamy results in the formation of _____.
   a) zoospores   b) conidia   **c) zygote**   d) chlamydospores

10. Match the following:
    (1) Sarcoma   -   (i) Excessive hunger
    (2) Carcinoma   -   (ii) Excessive thirst
    (3) Polydipsia   -   (iii) Connective tissue cancer
    (4) Polyphagia   -   (iv) Stomach cancer
    a) (1) - (iii), (2) - (iv), (3) - (ii), (4) - (i)   **b) (1) - (iv), (2) - (iii), (3) - (i), (4) - (ii)**
    c) (1) - (i), (2) - (iii), (3) - (iv), (4) - (ii)   d) (1) - (iv), (2) - (i), (3) - (ii), (4) - (iii)

11. 9 : 3 : 3 : 1 ratio is due to:
    a) Segregation   b) Crossing over
    c) Independent assortment   d) Recessiveness

12. The term Ethnobotany was coined by:
    a) Khorana   **b) J.W. Harshberger**   c) Ronald Ross   d) Hugo de Vries

PART - II

Answer any seven questions. Question No. 22 is Compulsory.   **7 x 2 = 14**

13. Define inertia. Give its classification.   `Unit 1`
14. Why does the sky appear blue in colour?   `Unit 2`
15. Define one Calorie.   `Unit 3`
16. Mention any two applications of Avogadro's Law.   `Unit 7`
17. List out the parasitic adaptations in leech.   `Unit 13`
18. What are the structures involved in the protection of brain?   `Unit 15`

19. Identify the parts A, B, C and D in the given figure.   **Unit 17**
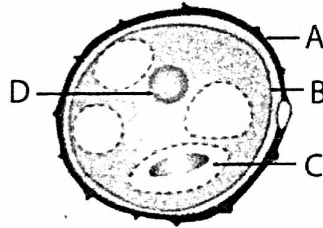
20. Define genetic engineering.   **Unit 20**
21. What is Sprite?   **Unit 23**
22. Calculate the amount of energy released when a radioactive substance undergoes fusion and results in a mass defect of 2 kg.   **Unit 6**

PART - III

Answer any seven questions. Question No. 32 is Compulsory.   **7x4=28**

23. Deduce the equation of force using Newton's Second Law of Motion.   **Unit 1**
24. Differentiate the eye defects: Myopia and Hypermetropia.   **Unit 2**
25. (a) What do you understand by the term Ultrasonic Vibration?   **Unit 5**
    (b) What is meant by reflection of sound?   **Unit 5**
26. (a) What is an amalgam? Give an example.   **Unit 8**
    (b) Mention any two uses of copper.   **Unit 8**
27. Explain the mechanism of cleansing action of soap.   **Unit 11**
28. (a) Name the three basic tissue systems in a flowering plant.   **Unit 12**
    (b) What are the factors affecting photosynthesis?   **Unit 12**
29. Enumerate the functions of blood.   **Unit 14**
30. How do rainwater harvesting structures recharge ground water?   **Unit 22**
31. (a) What do you understand by the term phenotype and genotype?   **Unit 18**
    (b) What are allosomes?   **Unit 18**
32. (a) Calculate the pH of 0.01 M solution of HNO_3.   **Unit 10**
    (b) A solution is prepared by dissolving 25 g sugar in 100 g of water. Calculate the mass percentage of solute.   **Unit 9**

PART - IV

Answer all the questions. Draw diagrams wherever necessary.   **3 x 7 = 21**

33. a) (i) State Joule's Law of Heating.   **Unit 4**
       (ii) An alloy of nickel and chromium is used as the heating element. Why? **Unit 4**
       (iii) How does a fuse wire protect electrical appliances?   **Unit 4**
                                  (OR)
    b) (i) What is a longitudinal wave?   **Unit 5**
       (ii) What is nuclear reactor? Explain its essential parts with their functions. **Unit 6**
34. a) (i) Define: Atomicity.   **Unit 7**
       (ii) Calculate the percentage of sulphur in H_2SO_4.   **Unit 7**
       (iii) In what way hygroscopic substances differ from deliquescent substances. **Unit 9**
                                  (OR)
    b) (i) Differentiate reversible and irreversible reaction.   **Unit 10**
       (ii) What is neutralization reaction? Give an example.   **Unit 10**
       (iii) Give any three characteristics of homologous series.   **Unit 11**
35. a) (i) Which hormone induces parthenocarpy in tomatoes?   **Unit 16**
       (ii) Why is thyroid hormone referred as 'personality hormone'?   **Unit 16**
       (iii) Explain Lamarck's theories of evolution.   **Unit 19**
                                  (OR)
    b) (i) Which enzyme cuts DNA at specific sites?   **Unit 18**
       (ii) Name two maize hybrids rich in amino-acid, lysine.   **Unit 20**
       (iii) Explain smoking hazards and the harmful effects of tobacco.   **Unit 21**
                                  - oOo-

Govt. Supplementary Exam - August 2022

Time Allowed: 3.00 Hrs	10th SCIENCE	Maximum Marks: 75

Instruction: (1) Check the question paper for fairness of printing.
If there is any lack of fairness, inform the Hall Supervisor immediately.
(2) Use **Blue** or **Black** ink to write and underline and pencil to draw diagrams

Note: This question paper contains **four** Parts.

PART - I

Note: (i) Answer **all** the questions.　　　　　　　　　　　　　　　　**14 x 1 = 14**
(ii) Choose the most appropriate answer from the given **four** alternatives and write the option code and the corresponding answer.

1. To project the rockets which of the following principle(s) is/ (are) required?
(a) Newton's Third Law of Motion　　　　　　(b) Newton's Universal Law of Gravitation
(c) Law of Conservation of Linear Momentum　**(d) Both (a) and (c)**

2. The gram molecular mass of oxygen is :
(a) 16 g　　　　　　(b) 18g　　　　　　**(c) 32 g**　　　　　　(d) 17 g

3. _____ is an important metal to form amalgam.
(a) Ag　　　　　　**(b) Hg**　　　　　　(c) Mg　　　　　　(d) Al

4. Kilowatt hour is the unit of:
(a) Resistivity　　　　(b) Conductivity　　　**(c) Electrical energy** (d) Electrical power

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. During transpiration, there is loss of :
(a) Carbon dioxide　　(b) Oxygen　　　　**(c) Water**　　　　(d) Carbon monoxide

7. Which one of the following hormones is naturally not found in plants?
(a) 2, 4-D　　　　(b) GA3　　　　　(c) Gibberellin　　　(d) IAA

8. World 'No Tobacco Day' is observed on :
(a) May 31　　　　(b) June 6　　　　(c) April 22　　　　(d) October 2

9. Which of the following is/are a fossil fuel?
(i) Tar　　　　　　(ii) Coal　　　　　　(iii) Petroleum
(a) (i) only　　　　(b) (i) and (ii) only　**(c) (ii) and (iii) only** (d) All of the above

10. Identify the exocrine gland.
(a) Pituitary gland　(b) Adrenal gland　　**(c) Salivary gland**　(d) Thyroid gland

11. The endarch condition is the special characteristic feature of :
(a) Root　　　　　　**(b) Stem**　　　　(c) Leaves　　　　(d) Flower

12. The heart of fishes possess _____ chambers.
(a) 3　　　　　　(b) 4　　　　　　**(c) 2**　　　　　　(d) 5

PART - II

**Note :** Answer **any seven** questions. Question no. **22** is compulsory.　　　**7x2=14**

13. Classify the types of force based on their application.　　　　　　`Unit 1`
14. State Snell's Law.　　　　　　　　　　　　　　　　　　　　　`Unit 2`
15. Define one Calorie.　　　　　　　　　　　　　　　　　　`Unit 3`
16. Classify the following substances into deliquescent, hygroscopic.　　`Unit 9`
(a) Conc. Sulphuric acid　(b) Copper Sulphate Penta hydrate　　(c) Silica gel
(d) Calcium Chloride　(e) Gypsum Salt
17. Why fossil fuels are to be conserved?　　　　　　　　　　　`Unit 22`

7

18. Identify the parts A, B, C and D.   **Unit 17**
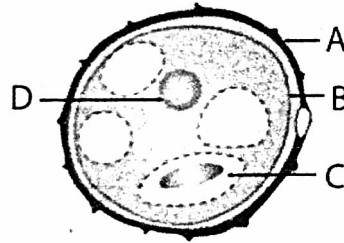
19. What do you understand by the term Phenotype and Genotype?   **Unit 18**
20. Why are thyroid hormones referred as 'personality hormone'?   **Unit 16**
21. Why is the colour of the blood red?   **Unit 14**
22. A person with myopia can see objects placed at a distance of 4 m. If he wants to see objects at a distance of 20 m, what should be the focal length and power of the concave lens he must wear?   **Unit 2**

PART - III

Note : Answer **any seven** questions. Question no. **32** is compulsory.   **7x4=28**

23. Differentiate the eye defects: Myopia and Hypermetropia.   **Unit 2**
24. Describe Rocket Propulsion.   **Unit 1**
25. Write any four features of natural and artificial radiation.   **Unit 6**
26. Differentiate reversible and irreversible reactions.   **Unit 10**
27. What happens when the salt $MgSO_4.7H_2O$ is heated? Write the equation.   **Unit 9**
28. (i) What is respiratory quotient?   **Unit 12**
    (ii) What are the factors affecting photosynthesis?
29. Differentiate Aerobic and Anaerobic respiration.   **Unit 12**
30. What are the contributing factors for obesity?   **Unit 21**
31. Define Ethnobotany and write its importance.   **Unit 19**
32. Calculate the resistance of a conductor through which a current of 2 A passes, when the potential difference between its ends is 30 V.   **Unit 4**

PART - IV

Note : Answer **all** the questions. Draw diagrams wherever necessary.   **3x7=21**

33. (a) (i) Define inertia.   **Unit 1**
        (ii) Explain the types of inertia with examples.   **Unit 1**

OR

    (b) State Newton's Laws of Motion.   **Unit 1**
34. (a) (i) Define Relative Atomic Mass.   **Unit 7**
        (ii) Define Atomicity.   **Unit 7**
        (iii) Give any two examples for heterodiatomic molecules.   **Unit 7**

OR

    (b) Give the salient features of "Modern atomic theory".   **Unit 7**
35. (a) (i) What is transpiration?   **Unit 14**
        (ii) Give the importance of transpiration.

OR

    (b) (i) List the functions of blood.   **Unit 14**
        (ii) Draw the pictures of Granulocytes.

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UNIT 1 — LAWS OF MOTION

	Important Formula		**Unit**
1	Momentum	mass x velocity $P = m \times v$	Kg ms^{-1}
2	Torque	Force x Perpendicular distance between the fixed point and the line of action of the force $\tau = F \times d$	Nm
3	Moment of a couple	Force x Perpendicular distance between the line of action of forces. $M = F \times S$	Nm
4	Principle of moments	Moment in clockwise direction $=$ Moment in anti-clockwise moments $F_1 \times d_1 = F_2 \times d_2$	
5	Force	Mass x acceleration $F = m \times a$	N (or) Kg ms^{-2}
6	Impulse	$J = F \times t$	Kg ms^{-1} (or) Ns
7	Mass of the earth	$M = \dfrac{gR^2}{G}$	-
8	Newton's Universal law of gravitation	$F = \dfrac{GMm}{R^2}$	-
9	Acceleration due to gravity	$g = \dfrac{GM}{R^2}$	-
10	Weight	mass x acceleration due to gravity $W = m \times g$	N
11	Acceleration	$a = \dfrac{v - u}{t}$	ms^{-2}
12	Resultant force, $F_{net} = F_1 + F_2$ (Parallel forces acting in the same direction)		-
13	Resultant force, $F_{net} = F_1 - F_2$ (If $F_1 > F_2$) $F_{net} = F_2 - F_1$ (If $F_2 > F_1$) (Parallel unequal forces acting in the opposite direction)		-
14	Law of conservation of linear momentum	$m_1 v_1 + m_2 v_2 = m_1 u_1 + m_2 u_2$	-

PART - I TEXTBOOK EVALUATION

I. Choose the correct answer.

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   **Ans: c) mass of the object**

2. Impulse is equals to   **PTA-1**
   a) rate of change of momentum
   b) rate of force and time
   c) change of momentum
   d) rate of change of mass

Ans: c) change of momentum

3. 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

Ans: c) both a & b

4. 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

Ans: c) Force

5. In which of the following sport the turning of effect of force used
   a) swimming   b) tennis   c) cycling   d) hockey   **Ans: c) cycling**

6. The unit of 'g' is ms^{-2}. It can be also expressed as
   a) cms^{-1} b) Nkg^{-1} c) $Nm^2 kg^{-1}$ d) $cm^2 s^{-2}$ **Ans: b) Nkg^{-1}**

7. One kilogram force equals to
   a) 9.8 dyne   b) 9.8×10^4 N   c) 98×10^4 dyne   d) 980 dyne

Ans: c) 98×10^4 dyne

8. 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   **Ans: d) M**

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

Ans: d) increase by 300%

Solution: Acceleration due to gravity= $\dfrac{GM}{R^2}$

if earth shrink to 50% of Real radius

$R' = \dfrac{R}{2}$

$g' = \dfrac{GM}{(R/2)^2} = \dfrac{4\,GM}{R^2}$

$g' = 4g$

% change of weight of the object

$= \dfrac{mg' - mg}{mg} \times 100$

$= \dfrac{g' - g}{g} \times 100$

$= \dfrac{4g - g}{g} \times 100$

$= \dfrac{3g}{g} \times 100$

$\boxed{\% \text{ increase of weight} = 300\%}$

10. **To project the rockets which of the following principle(s) is /(are) required?** `GMQ` `Sep- 2021` `Aug- 2022`
   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   **Ans: d) both a and c**

II. Fill in the blanks.	Answers
1. To produce a displacement _____ is required	**force**
2. Passengers lean forward when sudden brake is applied in a moving vehicle. This can be explained by _____	**inertia of motion**
3. By convention, the clockwise moments are taken as _____ and the anticlockwise moments are taken as _____.	**negative, positive**
4. _____ is used to change the speed of car. **(Text Book Pg.05)**	**Gear**
5. A man of mass 100 kg has a weight of _____ at the surface of the Earth. **Solution:** Weight of the man of the surface W = mg ; W = 100 x 9.8 ; $W = 980N$	**980 N**

III. State whether the following statements are true or false. Correct the statement if it is false

1. The linear momentum of a system of particles is always conserved.
   Ans: False - In the absence of external force, the linear momentum of a system of particle is always conserved

2. Apparent weight of a person is always **equal** to his actual weight.
   Ans: False - Apparent weight of a person is **not equal** to his actual weight.

3. Weight of a body is **greater** at the equator and **less** at the polar region.
   Ans: 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.
   Ans: False - Turning a nut with a spanner **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.
   Ans: False - The space station and astronauts have equal acceleration, they are under free fall condition, So the astronaut and space station are in the state of weightlessness.

IV. Match the Following   `PTA-1`

	Column - I	Column - II	Answers
a	Newton's I law	Propulsion of a rocket	**Stable equilibrium of a body**
b	Newton's II law	Stable equilibrium of a body	**Law of force**
c	Newton's III law	Law of force	**Flying nature of bird**
d	Law of conservation of Linear momentum	Flying nature of bird	**Propulsion of a rocket**

V. Assertion & Reasoning

Mark the correct choice as
   a) If both the assertion and the reason are true and the reason is the correct explanation of assertion.
   b) If 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.
    Ans : b) If 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.
    Ans : c) Assertion is true, but the reason is false.

VI. Answer briefly

1. **Define inertia. Give its classification.**   `Aug 2022` `April 2023`
    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 called inertia.
    Types of inertia : a) Inertia of rest   b) Inertia of motion   c) Inertia of direction

2. **Classify the types of force based on their application.**   `Aug 2022`
    Based on the direction force can be classified into two types as :
    a) Like parallel forces   b)   Unlike parallel forces.

3. **If a 5 N and a 15 N forces are acting opposite to one another. Find the resultant force and the direction of action of the resultant force**
    F_1 = 5N, F_2 = 15N
    Resultant force F = $F_2 - F_1$ $\therefore F_2 > F_1$
                                = 15 – 5
                                = 10 N
    The direction of resultant force act along the direction of force 15N

4. **Differentiate mass and weight.** `May 2022`

S.No.	Mass	Weight
1	The quantity of matter contained in the body.	The gravitational force exerted on it due to earth's gravity.
2	SI unit is kilogram (Kg)	SI unit is newton (N)

5. **Define moment of a couple.**
    1. The Rotating effect of a couple is known as moment of a couple.
    2. Moment of a couple (M) = Force (F) × Perpendicular distance between the line of action of forces (S). $\boxed{M = F \times S}$ Unit: Nm

6. **State the principle of moments.**
    ➢ In equilibrium, the algebraic sum of the moments in the clockwise direction is equal to the algebraic sum of the moments in the anticlockwise direction.
    ➢ Moment in clockwise direction = moment in anticlockwise direction . $\boxed{F_1 \times d_1 \quad = F_2 \times d_2}$

7. **State Newton's second law.**   `GMQ` `May 2022`
    ➢ The force acting on a body is directly proportional to the rate of change of linear momentum of the body.
    ➢ The change in momentum takes place in the direction of force. $\boxed{F = m \times a}$

8. **Why a spanner with a long handle is preferred to tighten screws in heavy vehicles?**
    ➢ A spanner with a long handle give high torque with less force. $\boxed{\tau = F \times d}$
    ➢ So tighten screws in heavy vehicles is easy with using long handle spanner.

9. **While catching a cricket ball the fielder lowers his hands backwards. Why?**
    Longer interval of time results in lesser impulse on his hands.

10. **How does an astronaut float in a space shuttle?**
> Since space station and astronauts have equal acceleration, and huge orbital velocity they are under free fall condition.
> Hence, astronauts are in the state of weightlessness and seem floating.

VII. Solve the given problems

1. **Two bodies have a mass ratio of 3:4 The force applied on the bigger mass produces an acceleration of 12 ms^{-2}.What could be the acceleration of the other body, if the same force acts on it.**

   Sol : $m_1 : m_2 = 3 : 4$, Take $m_1 = 3$ m , $m_2 = 4$ m

   $a_2 = 12$ ms^{-2}, $a_1 = ?$

   Force F = ma

   Here $m_1 a_1 = m_2 a_2$

   $3ma_1 = 4m \times 12$

   $a_1 = \dfrac{4 \times 12}{3}$

   $\boxed{a_1 = 16 \text{ ms}^{-2}}$

2. **A ball of mass 1 kg moving with a speed of 10 ms^{-1} rebounds after a perfect elastic collision with the floor. Calculate the change in linear momentum of the ball.**

   Sol : Mass = 1 kg, u = 10 ms^{-1} , v = –10 ms^{-1}

   Initial momentum   = mu
                           = 1×10 = 10 kg ms^{-1}

   Final momentum   = mv
                           = 1×(–10)= – 10kg ms^{-1}

   Change in momentum   = Δp = mv – mu
                           = –10 –10

   $\boxed{\Delta p = -20 \text{ kg ms}^{-1}}$

3. **A mechanic unscrew a nut by applying a force of 140 N with a spanner of length 40 cm. What should be the length of the spanner if a force of 40 N is applied to unscrew the same nut?**

   Sol : Force to unscrew nut one (F_1) = 140 N

   Force to unscrew nut two (F_2) = 40N

   Length of spanner one (l_1) = 40 cm = 0.4m

   Length of spanner two (l_2) = ?

   When Equating the torque in both the cases, the length of spanner two will be $F_1 l_1 = F_2 l_2$

   $140 \times 0.4 = 40 \times l_2$

   $l_2 = \dfrac{140 \times 04}{40}$

   $= \dfrac{56}{40}$

   $l_2 = 1.4$m

   $\boxed{\text{The length of the spanner two } (l_2) = 1.4\text{m}}$

4. **The ratio of masses of two planets is 2:3 and the ratio of their radii is 4:7 Find the ratio of their accelerations due to gravity.**

   Sol : Mass ratio $M_1 : M_2 = 2 : 3$,

   radii ratio $R_1 : R_2 = 4 : 7$, ratio of g = ?

   $g_1 = \dfrac{GM_1}{R_1^2} ; g_2 = \dfrac{GM_2}{R_2^2}$

   $g_1 : g_2 = \dfrac{\cancel{G} M_1}{R_1^2} \div \dfrac{\cancel{G}M_2}{R_2^2}$

   $g_1 : g_2 = \dfrac{M_1}{M_2} \dfrac{R_2^2}{R_1^2}$

   $= \dfrac{2 \times (7)^2}{3 \times (4)^2}$

   $= \dfrac{2 \times 49}{3 \times 16}$

   $= \dfrac{98}{48} = \dfrac{49}{24}$

   $\boxed{\text{The ratio of } g_1 : g_2 = 49 : 24}$

VIII. Answer in detail.

1. **What are the types of inertia? Give an example for each type.**   `PTA-3` `Aug 2022`

   1. Inertia of rest :

   > The resistance of a body to change its state of rest is called inertia of rest.
   > **(Eg.)** When you vigorously shake the branches of a tree some leaves and fruits are detached and fall down.

2. Inertia of motion :
➢ The resistance of a body to change its state of motion is called inertia of motion.
➢ **(Eg.)** An athlete runs some distance before jumping. Jump to longer and higher.
3. Inertia of direction :
➢ The resistance of a body to change its direction of motion is called inertia of direction.
➢ **(Eg.)** When you make sharp turn while driving a car you tend to lean side ways.

(For Slow Learner Students)

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 called inertia.
Types:
1. **Inertia of rest :** Resistance of a body to change its state of rest. E.g. Fall down the ripe fruits.
2. **Inertia of motion :** Resistance of a body to change its state of motion.
             E.g. An athlete runs some distance before jumping
3. **Inertia of direction :** Resistance of a body to change its direction of motion.
             E.g. When you make sharp turn while driving a car.

2. State Newton's laws of motion?   Sep - 2021   Aug 2022
1. **First law :** Every body continues to be in its state of rest or state of uniform motion along a straight line unless it is acted upon by some external force.
2. **Second law :**
➢ The force acting on a body is directly proportional to the rate of change of linear momentum of the body.
➢ Change in momentum takes place in the direction of the force. $\boxed{F = ma}$
3. **Third law :** For every action, there is an equal and opposite reaction. They always act on two different bodies. $\boxed{F_A = -F_B}$

(For Slow Learner Students)

1. **First law :** Every body continues to be in its state of rest or state of uniform motion along a straight line unless it is acted upon by some external force.
2. **Second law :**
➢ The force acting on a body is directly proportional to the rate of change of linear momentum of the body. $\boxed{F = ma}$
3. **Third law :** For every action, there is an equal and opposite reaction.

3. Deduce the equation of a force using Newton's second law of motion.   April 2023

➢ The force is directly proportional to rate of change of momentum.
➢ It is also called law of force.
  Mass of moving body   =   m
  Initial speed   =   u
  Final speed   =   v
  Interval of time   =   t
➢ Initial momentum of the body $P_i = mu$
➢ Final momentum of the body $P_f = mv$
➢ Change in momentum $\Delta p = P_f - P_i$
             $\Delta p = mv - mu$
➢ By Newton's Second Law of motion.

$$F \quad \alpha \quad \frac{\text{Change in momentum}}{\text{time}}$$

$$F \quad \alpha \quad \frac{mv - mu}{t}$$

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

(k – proportionality constant, k = 1 for all system)

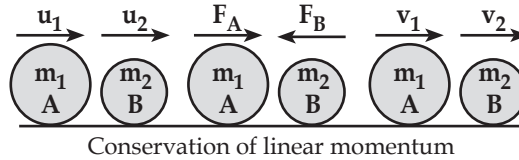$$F = \frac{m(v - u)}{t} \qquad \left[\because \frac{(v - u)}{t} = a \right]$$

Since acceleration a = $\frac{(v - u)}{t}$

$F = m \times a$

$$\boxed{\text{Force = mass × acceleration}}$$

4. State and prove the law of conservation of linear momentum. `GMQ`

Law : There is no change in the linear momentum of a system of bodies as long as no net external force acts on them.

$$\xrightarrow{u_1}\ \xrightarrow{u_2}\ \xrightarrow{F_A}\ \xleftarrow{F_B}\ \xrightarrow{v_1}\ \xrightarrow{v_2}$$

| m_1 A | m_2 B | m_1 A | m_2 B | m_1 A | m_2 B |

Conservation of linear momentum

Proof :

➤ Let two bodies A and B have mass m_1 and m_2 with initial velocity u_1 and u_2 and $u_1 > u_2$

➤ During interval of time t, they tend to have collision final velocity will be v_1 and v_2.

By Newton's Second Law :

Force on body B due to A, $F_A = m_2 \dfrac{(v_2 - u_2)}{t}$

Force on body A due to B, $F_B = m_1 \dfrac{(v_1 - u_1)}{t}$

By Newton's Third Law : $F_B = -\ F_A$

$$m_1 \dfrac{(v_1 - u_1)}{t}\ =\ -\ m_2 \dfrac{(v_2 - u_2)}{t}$$

$$m_1 v_1 - m_1 u_1\ =\ -\ m_2 v_2 + m_2 u_2$$

$$m_1 v_1 + m_2 v_2\ =\ m_1 u_1 + m_2 u_2$$

➤ In absence of an external force, the algebraic sum of the momentum after collision is numerically equal to algebraic sum of the momentum before collision.

5. Describe rocket propulsion. `PTA-4` `Sep-2020` `Aug 2022`

Rocket propulsion :

a) Propulsion of rockets is based on the **Law of conservation of linear momentum** and **Newton's III law** of motion.

b) Rockets are filled with a **fuel** in the propellant tank.

c) When the rocket is fired, the fuel is burnt and a **hot gas is ejected** with a high speed from the nozzle of the rocket.

d) An **equal and opposite reaction** force is produced in the **combustion chamber,** which makes the rocket project forward.

e) In motion, the **mass** of the rocket slowly **decreases**, until the fuel is completely burnt out.

f) There is **no net external force** acting on it, so the linear momentum of the system is conserved.

g) The **mass** of the rocket **decreases with altitude,** It results in a slow increase in velocity of the rocket.

h) It reaches a velocity, which is just enough to escape from the gravitational pull of the Earth. This velocity is called **escape velocity.**

(For Slow Learner Students)

a) Based on the **Law of conservation of linear momentum** and **Newton's III law** of motion.

b) Filled with a **fuel** in the propellant tank.

c) When the fuel is burnt high motion is produced.

e) This motion helps to propel the rocket forward.

f) Velocity increases as mass decreases.

6. **State the universal law of gravitation and derive its mathematical expression**

Newton's universal law of gravitation states that,

➤ Every particle of matter in this universe attracts every other particle with a force.

➤ This force is directly proportional to the product of their masses and inversely proportional to the square of distance between the centers of these masses.

➤ The direction of force acts along the line joining the masses.

1. Force between the masses is always attractive.

A m_1 $\xrightarrow{F_1}$ $\xleftarrow{F_2}$ m_2 B

$|\longleftarrow r \longrightarrow|$

Gravitational force between masses
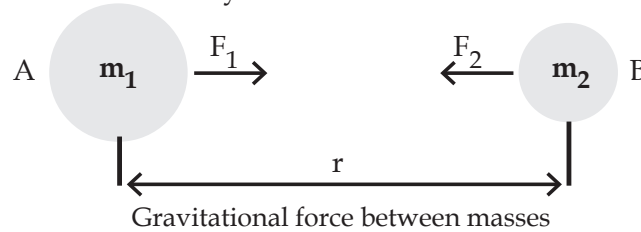
2. Let m_1 and m_2 be the masses of A and B at r 'metre' in space

➤ Force $F \alpha\, m_1 \times m_2$

$$F \alpha\, \frac{1}{r^2}$$

➤ On combining above two expression.

$$F \alpha\, \frac{m_1 \times m_2}{r^2}$$

$$F = \frac{Gm_1 m_2}{r^2}$$

➤ G is the universal gravitational constant. It's value in SI unit is $6.674 \times 10^{-11} \text{Nm}^2\text{kg}^{-2}$

7. **Give the applications of universal law gravitation.**

➤ Dimensions of heavenly bodies can be measured using gravitation law. **i.e** Mass of earth, radius of earth, acceleration due to gravity etc. can be calculated accurately.

➤ Helps in discovering new stars and planets.

➤ Irregularity in the motion of star called "wobble" leads disturbance in the motion of planet nearby. In this condition mass of star can be calculated.

➤ Helps to explain germination of roots due to the property of geotropism.

➤ Helps to predict the path of the astronomical bodies.

(For Slow Learner Students)

➤ To measure the dimensions of heavenly bodies.

➤ To accurately calculate Earth's mass, radius and g.

➤ To discover the new stars and planets

➤ It helps to predict the path of the astronomical bodies.

➤ To calculate the mass of star.

IX. HOT Questions

1. Two blocks of masses 8 kg and 2 kg respectively lie on a smooth horizontal surface in contact with one other. They are pushed by a horizontally applied force of 15 N. Calculate the force exerted on the 2 kg mass.

m_1 = 8kg; m_2 = 2kg; total mass m = m_1 + m_2

m = 10kg

F_1 = 15 N, F_2 = ?

Sol: $F_2 = \dfrac{m_2 F_1}{m_1 + m_2} = \dfrac{2 \times 15}{8+2} = 30/10$

$\boxed{F_2 = 3N}$

2. A heavy truck and bike are moving with the same kinetic energy. If the mass of the truck is four times that of the bike, then calculate the ratio of their momenta.
(Ratio of momenta = 2 : 1)

Sol: Kinetic energy of the heavy truck

$$K.E_t = \frac{1}{2} m_t v_t^2$$

Kenetic energy of the bike

$$K.E_b = \frac{1}{2} m_b v_b^2$$

$$\frac{1}{2} m_t v_t^2 = \frac{1}{2} m_b v_b^2$$

$$\frac{v_t^2}{v_b^2} = \frac{m_b}{m_t}$$

$$[\because m_t = 4m_b]$$

$$= \frac{m_b}{4m_b} = \frac{1}{4}$$

$$\frac{v_t}{v_b} = \sqrt{\frac{1}{4}} = \frac{1}{2}$$

Ratio of the momenta

$$P_t = m_t v_t$$
$$P_b = m_b v_b$$

$$\frac{P_t}{P_b} = \frac{4 m_b v_t}{m_b v_b}$$

$$= 4 \times \frac{1}{2}$$

$$\frac{P_t}{P_b} = \frac{2}{1}$$

$$\boxed{P_t : P_b = 2 : 1}$$

3. **"Wearing helmet and fastening the seat belt is highly recommended for safe journey"** Justify your answer using Newton's laws of motion.

➢ Wearing helmet and fastening the seat belt is highly recommended for safe journey.
➢ When vehicle is moving we are in state of motion. If the vehicle stops suddenly we lean forward. Here **Newton's Law of inertia** takes place.
➢ The resistance of body to change its state of motion. This is inertia of motion.
➢ To avoid physical cause we wear helmet and fastening seat belt.

PART II - PTA, GMQ & GOVT. QUESTION AND ANSWERS

I. One Mark Questions

1. F be the force between the two bodies placed at a certain distance. If the distance between them is doubled then the gravitational force F will be ____   **PTA-5**
a) 2F   b) F/2   c) F/4   d) 4F   **Ans: c) F/4**

2. The force required to produce an acceleration of $1 cms^{-2}$ on a body of mass 1g is   **PTA-6**
a) 1N   b) 10N   c) 10^2 dyne   d) 1 dyne   **Ans: d) 1 dyne**

II. 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 assertion.
c) Assertion is true but the reason is false.   d) Both the assertion and the reason are false.

1. **Assertion** : When a person swims he pushes the water using the hands backwards and the water pushes the person in the forward direction.

Reason : For every action there is an equal and opposite reaction.   **PTA-3**

Ans : a) Both assertion and the reason are true and the reason is the correct explanation of assertion.

III. Short Answer questions (2 Marks)

1. **Use the analogy to fill the blank.**   **PTA-4**
a) Opening a door : Moment of force, opening a water tap : **Moment of a couple**
b) Pushing a bus by a group of people : Like parallel forces, Tug of war : **unlike parallel forces.**

2. **Why do the apples weigh more at poles than at equator?**   `PTA-3`
   ➢ Weight of a body varies from one place to another place on the earth.
   ➢ Since it depends on the acceleration due to gravity of the earth (g), weight of a body is more at the poles than at the equatorial region.
   ➢ So the apples weigh more at poles than at equator.

3. **Write short notes on gears.**   `Sep-2020`
   ➢ A gear is a circular wheel with teeth around its rim.
   ➢ It helps to change the speed of rotation of a wheel by changing the torque and helps to transmit power

IV. Answer in detail (4 Marks)

1. **i) Shock absorbers are used in luxury buses. Why?**
    ii) A weight of a man is 686N on the surface of the earth. Calculate the weight of the same person on moon ('g' value of a moon is 1.625 ms^{-2})
    iii) Name the law of motion used in flying of birds. Give another example for the same law.   `PTA-2`

    i) For the comfort purpose, shock absorbers are used to absorb or damp the shocks or unwanted oscillations of the bus due to damaged roads.

    i) $W = mg = 686$ N
    $m = \dfrac{w}{g} = \dfrac{686}{9.8}$
    $m = 70$ kg
    $\therefore W = mg$
    $= 70 \times 1.625$
    $W = 113.75$N

    iii) **Newtons III law of motion**
    For every action, there is an equal and opposite reaction. Another example is Rocket propulsion.

2. **A body of mass m is initially moving with a velocity U. When a force F acts on the body it picks up velocity V in t second so that the acceleration a is produced. Using this data derive the relation between the force, mass and acceleration.**   `PTA-5`

    According to Newton second law, " 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.

    It is also called as **'law of force'**
    Let 'm' be the mass of a moving body, moving along a straight line with an initial speed 'u'

After a time interval of 't', the velocity of the body changes to 'v' due to the impact of an unbalanced external force F.

➢ Initial momentum of the body P_i = mu
➢ Final momentum of the body P_f = mv
➢ Change in momentum $\Delta p = P_f - P_i$
$$\Delta p = mv - mu$$
➢ **By Newton's Second Law of motion.**

$$F \quad \alpha \quad \frac{\text{Change in momentum}}{\text{time}}$$

$$F \quad \alpha \quad \frac{mv - mu}{t}$$

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

(k – proportionality constant, k = 1 for all system)

$$F = \frac{m(v-u)}{t} \qquad \left[\therefore \frac{(v-u)}{t} = a\right]$$

Since acceleration a = $\dfrac{(v-u)}{t}$
$F = m \times a$

$$\boxed{\text{Force = mass × acceleration}}$$

3. **At what height from the centre of the earth surface, the acceleration due to gravity will be 1/4th of its value on the surface of the earth.**   `PTA-6`
    Data : Height from the centre of the Earth,
    $R' = R + h$
    The acceleration due to gravity at that height,
    $g' = g/4$
    Formula : $g = GM/R^2$, $g' = GM/R'^2$

    $$\frac{g}{g'} = \left(\frac{R'}{R}\right)^2 = \left(\frac{R+h}{R}\right)^2 = \left(1 + \frac{h}{R}\right)^2$$

    $$4 = \left(1 + \frac{h}{R}\right)^2$$

UNIT 7 — ATOMS AND MOLECULES

	Important Formula	
1	Relative Atomic mass	$A_r = \dfrac{\text{Average mass of the isotopes of the element}}{1/12\text{th of the mass of one carbon - 12 atom}}$
2	Number of moles	$= \dfrac{\text{Mass}}{\text{Atomic mass}}$ $= \dfrac{\text{Mass}}{\text{Molecular mass}}$ $= \dfrac{\text{Number of atoms}}{6.023 \times 10^{23}}$ $= \dfrac{\text{Number of molecules}}{6.023 \times 10^{23}}$
3	Relative molecular mass	$2 \times$ Vapour density
4	Vapour Density (V.D)	$\dfrac{\text{Mass of a given volume of gas (or) vapour at STP}}{\text{Mass of the same volume of hydrogen}}$
5	Atomicity	$\dfrac{\text{Molecular mass}}{\text{Atomic mass}}$

PART I - TEXTBOOK EVALUATION

I. Choose the best answer.

1. **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
   Ans. b) 1 atom of He

2. **Which of the following is a triatomic molecule?**   **PTA-1 & GMQ**
   a) Glucose   b) Helium   c) Carbon dioxide   d) Hydrogen
   Ans: c) Carbon dioxide

3. **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
   Ans: b) 2.24 litre

4. **Mass of 1 mole of Nitrogen atom is**
   a) 28 amu   b) 14 amu   c) 28 g   d) 14 g   **Ans: d) 14g**

5. **Which of the following represents 1 amu?**
   a) Mass of a C - 12 atom
   b) Mass of a hydrogen atom
   c) $1/12^{th}$ of the mass of a C - 12 atom
   d) Mass of O - 16 atom
   Ans: c) $1/12^{th}$ of the mass of a C - 12 atom

6. **Which of the following statement is incorrect?**
   a) 12 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 atoms
d) One mole of electrons stands for 6.023×10^{23} electrons.

Ans: c) One mole of hydrogen gas contains Avogadro's number of atoms

7. **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

   Ans: c) 22.4 litre

8. **In the nucleus of $_{20}Ca^{40}$,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

   Ans: b) 20 protons and 20 neutrons

9. **The gram molecular mass of oxygen molecule is**   `Aug 2022`
   a) 16g   b) 18g   c) 32g   d) 17g   **Ans: c) 32g**

10. **1 mole of any substance contains _____ molecules.**
    a) 6.023×10^{23} b) 6.023×10^{-23}
    c) 3.0115×10^{23} d) 12.046×10^{23} **Ans: a) 6.023×10^{23}**

SOLUTION - I. Choose the best answer.

1. a) 6.023×10^{23} atoms of the He = 4 g   b) 1 atom of He = $\dfrac{4}{6.023 \times 10^{23}}$ g
   c) 2g of He = 2g   d) 1 mole atoms of He = 4g   **Ans: b) 1 atom of He**

2. a) Glucose = $C_6H_{12}O_6$ = Poly atomic   b) Helium = He=mono atomic
   c) Carbondioxide = CO_2 = triatomic   d) Hydrogen = H_2= diatomic.

   Ans: c) Carbon dioxide

3. 44 g CO_2 occupies 22.4.lit

   4.4 g CO_2 occupies $\dfrac{22.4}{44}$ x 4.4 = 2.24 lit   **Ans: b) 2.24 litre**

4. Mass of 1 mole of Nitrogen atom = gram atomic mass of nitrogen
   $$= 14 \text{ g}$$ **Ans: d) 14g**

5. **Ans. c) 1/12th of the mass of a C - 12 atom = 1 amu**

6. Correct Statement.
   a) One gram atom of C - 12 contains Avogadro's number of atoms
   c) One mole of hydrogen gas contains Avogadro's number of molecules.   **Ans: both (a) & (c)**

7. Volume occupied by 1 mole of any gas at STP = $\dfrac{\text{mole}}{\text{molar volume}}$ = 22.4 litre.   **Ans: c) 22.4 litre**

8. Atomic number = No of protons = 20
   Mass number - Atomic number = No of neutrons = 40 - 20 = 20

   Ans: b) 20 protons and 20 neutrons

9. gram molecular mass of oxygen molecule (O_2) = 2 x Atomic mass of oxygen = 2 x 16 = 32g.

   Ans: c) 32g

10. 1 mole of any substance = Avogadro number of molecules = 6.023×10^{23} **Ans: a) 6.023×10^{23}**

Loyola   EC – 10th Science

II. Fill in the blanks	Answers
1. Atoms of different elements having ____ mass number, but ____ atomic numbers are called isobars.	same, different
2. Atoms of one element can be transmuted into atoms of other element by ____	Ans: neutrons
3. The sum of the numbers of protons and neutrons of an atom is called its _____	mass number
4. Relative atomic mass is otherwise known as _____	Standard atomic weight
5. The average atomic mass of hydrogen is _____ amu.	1.008 amu
6. If a molecule is made of similar kind of atoms, then it is called _____ atomic molecule. **PTA-6**	homo
7. The number of atoms present in a molecule is called its ___. **PTA-4**	atomicity
8. One mole of any gas occupies _____ ml at S.T.P.	22,400
9. Atomicity of phosphorous is ____.	4

III. Match the following					Answers	
1.	1	8 g of O_2	a	4 moles	b	0.25 moles
	2	4 g of H_2	b	0.25 moles	c	2 moles
	3	52 g of He	c	2 moles	e	13 moles
	4	112 g of N_2	d	0.5 moles	a	4 moles
	5	35.5 g of Cl_2	e	13 moles	d	0.5 moles

SOLUTION - Match the following

$$\text{Number of moles} = \frac{\text{mass}}{\text{atomic mass or molecular mass}}$$

1. 8 g of O_2 $= \dfrac{8}{32} = 0.25$ mole		2. 4 g of H_2 $= \dfrac{4}{2} = 2$ moles
3. 52 g of He $= \dfrac{52}{4} = 13$ moles		4. 112 g of N_2 $= \dfrac{112}{28} = 4$ moles
5. 35.5 g of Cl_2 $= \dfrac{35.5}{71} = 0.5$ mole		

IV. True or False : (If false give the correct statement)

1. Two elements sometimes can form more than one compound.   **Ans : True**
2. Noble gases are **Diatomic**   **Ans : False** - Noble gases are **mono atomic**
3. The gram atomic mass of an element has **no unit.**
   Ans : False - The gram atomic mass of an element has unit **(gram)**
4. 1 mole of Gold and Silver contain same number of atoms.   **Ans : True**
5. Molar mass of **CO_2 is 42g**   **Ans: False -** Molar mass of **CO_2 is 44g (CO_2 = 12 + 2 × 16 = 44g)**

V. Assertion and Reason

Answer the following questions using the data given below:
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 explains A.

Loyola   EC – 10th Science

1. **Assertion** : The Relative Atomic mass of aluminium is 27
   Reason   : An atom of aluminium is 27 times heavier than 1/12th of the mass of the C-12 atom.
   Ans: i) A and R are correct, R explains the A

---

2. **Assertion** : The Relative Molecular Mass of Chlorine is 35.5 amu. **PTA-3**
   Reason   : The natural abundance of Chlorine isotopes are not equal.

   Correct Assertion : The Relative **atomic mass** of chlorine is 35.5 amu.

   Ans: (iii) A is wrong, R is correct

VI. Short answer questions

1. **Define : Relative atomic mass.**   **PTA-3** **Aug 2022**
   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.

   $$A_r = \frac{\text{Average mass of the isotopes of the element}}{\frac{1}{12^{th}} \text{ of the mass of one Carbon - 12 atom}}$$

(For Slow Learner Students)
$$A_r = \frac{\text{Average mass of the isotopes of the element}}{\frac{1}{12^{th}} \text{ of the mass of one Carbon - 12 atom}}$$

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

Isotope	% abundance
$_8O^{16}$	99.757
$_8O^{17}$	0.038
$_8O^{18}$	0.205

3. **Define : Atomicity**   **Sep - 21** **May 2022** **Aug 2022** **April 2023**
   The number of atoms present in one molecule is called its atomicity.

4. **Give any two examples for heterodiatomic molecules.**   **Aug 2022**
   (1) Hydrogen Chloride (HCl),(2) Carbon Monoxide (CO)

5. **What is molar volume of a gas?**
   ➢ One mole of any gas occupies 22.4 litre S.T.P
   ➢ This volume is called as molar volume

6. **Find the percentage of nitrogen in ammonia.**   **PTA-1**

   Molecular formula of ammonia   = NH$_3$
   Molar mass of ammonia   = 14 + (3 × 1) = 17
   Percentage of nitrogen in ammonia   = $\frac{14}{17}$ x 100= 82.35%

(For Slow Learner Students)
Percentage of nitrogen in ammonia = $\frac{14}{17}$ x 100= 82.35%

VII. Long Answer Questions.

1. **Calculate the number of water molecule present in one drop of water which weighs 0.18 g.**
   - Avogadro number = 6.023×10^{23}
   - Given Mass = 0.18g
   - Molecular weight of water (H_2O) = (2×atomic number of H) + (1×atomic number of O)

     = (2× 1) + (1×16) = 2+16   **April 2023**

     = 18g

   Number of molecules = $\dfrac{\text{Avogadro number} \times \text{mass}}{\text{Gram molecular mass}}$

   Number of molecules in one drop of water = $\dfrac{6.023 \times 10^{23} \times 0.18}{18}$

   = $6.023 \times 10^{23} \times 0.01$

   $\boxed{= 0.06023 \times 10^{23}}$

2. **$N_2 + 3H_2 \rightarrow 2NH_3$**
   (The atomic mass of nitrogen is 14, and that of hydrogen is 1)
   1 mole of nitrogen (...... g) + 3 moles of hydrogen (....... g) → 2 moles of ammonia (...... g)
   - 1 mole of nitrogen = 1×14g (Atomic mass of nitrogen = 14
   - 3 moles of hydrogen = 3×1g (Atomic mass of hydrogen = 1)
   - 2 moles of ammonia $2NH_3$ = 2 × 14 + 2 (1×3)

     = 28 + 2 × 3 = 28 + 6

     = 34g

   So, the equation is $N_2 + 3H_2 \rightarrow 2NH_3$

   $(14)2 + (3)2 \rightarrow 34$

   $28g + 6g \rightarrow 34g$
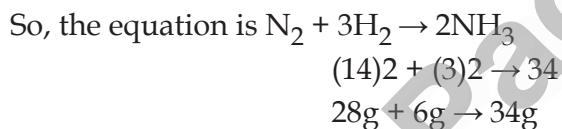
   1 mole of nitrogen **(28g)** + 3 moles of hydrogen **(6g)** → 2 moles of ammonia **(34g)**

3. **Calculate the number of moles in**   **PTA-5**

   i) **27g of Al**   ii) **1.51x10^{23} molecules of NH$_4$ Cl**

   i) Number of moles = $\dfrac{\text{Mass}}{\text{Atomic mass(or)Molar mass}}$

   = $\dfrac{27}{27}$ (∴ Atomic mass of aluminium = 27)

   $\boxed{= 1 \text{ mole}}$

   (ii) number of moles = $\dfrac{\text{number of molecules in NH}_4 \text{ Cl}}{\text{Avogadro number}}$

   NH_4Cl = $\dfrac{1.51 \times 10^{23}}{6.023 \times 10^{23}} \Rightarrow \dfrac{1}{4}$

   $\boxed{= 0.25 \text{ mole}}$

4. **Give the salient features of " Modern atomic theory".** `PTA-5` `Sep-20` `Aug 2022`
    1. An atom is no longer indivisible.
    2. Atoms of the same element may have different atomic mass (Isotopes).
    3. Atoms of different elements may have same atomic masses (Isobars).
    4. Atoms of one element can be transmuted into atoms of other elements by artificial transmutation ie. atoms is no longer indestructible.
    5. Atoms may not always combine in a simple whole number ratio.
    6. Atom is the smallest particle that takes part in a chemical reaction.
    7. The mass of an atom can be converted into energy. ($E = mc^2$).

(For Slow Learner Students)

1. An atom is no longer indivisible.
2. Atom is a smallest particle
3. The mass of an atom can be converted into energy.
4. Atoms may not always combine in a simple form.

---

5. **Derive the relationship between Relative molecular mass and Vapour density.** `GMQ, PTA-6,`

$$\text{Relative molecular mass of a gas or vapour} = \frac{\text{Mass of one molecule of the gas or vapour}}{\text{Mass of 1 atom of hydrogen.}} \rightarrow (1)$$

$$\text{(V.D) Vapour density of a gas or vapour} = \frac{\text{Mass of a given volume of gas or vapour at STP}}{\text{Mass of same volume of hydrogen}}$$

According to Avogadro's law, equal volume of all gases contain equal number of molecules.
Let the number of molecules in one volume = n

$$\therefore \text{V.D at STP} = \frac{\text{Mass of n molecules of a gas or vapour at STP}}{\text{Mass of n molecule of hydrogen}}$$

cancelling n which is common

$$\text{V.D} = \frac{\text{Mass of 1 molecule of a gas or vapour at STP}}{\text{Mass of 1 molecule of hydrogen}}$$

since hydrogen is diatomic.

$$\text{V.D} = \frac{\text{Mass of 1 molecule of a gas or vapour at STP}}{\text{Mass of 2 atoms of hydrogen}}$$

$$\text{V.D} = \frac{\text{Mass of 1 molecule of a gas or vapour at STP}}{2 \times \text{Mass of 1 atom of hydrogen}} \rightarrow (2)$$

Substituting equation (1) in equation (2)

$$\text{V.D} = \frac{\text{Relative molecular mass of a gas or vapour}}{2}$$

$\therefore 2 \times \text{V.D} = $ Relative molecular mass of a gas or vapour. **(or)**
Relative molecular mass of a gas or vapour = 2 x Vapour density of a gas.

(For Slow Learner Students)

$$\text{Vapour density} = \frac{\text{Mass of a given volume of gas}}{\text{Mass of same volume of hydrogen}}$$

According to Avogadro's law,

$$\therefore \text{Vapour density} = \frac{\text{Mass of n molecules of a gas}}{\text{Mass of n molecule of hydrogen}}$$
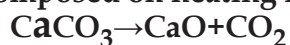
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since hydrogen is diatomic.

$$\text{Vapour density} = \frac{\text{Mass of 1 molecule of a gas}}{2\times\text{Mass of 1 atom of hydrogen}}$$

$$2\times\text{Vapour density} = \frac{\text{Mass of 1 molecule of gas}}{\text{Mass of 1 atom of hydrogen}} \rightarrow (2)$$

∴ 2×Vapour density = Relative molecular mass

VIII. Hot question

1. **Calcium carbonate is decomposed on heating in the following reaction.**
$$CaCO_3 \rightarrow CaO + CO_2$$
   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?**
   Ans : (i) One mole

   (ii) Atomic mass of Ca = 40; C = 12, O = 16

   gram molecular mass of $CaCO_3$ = 1 × Ca + 1× C + 3× O
                             = (1×40) + (1×12) + (3 x 16)
                             = 40 + 12 + 48 = 100g
                             = 100 g

   (iii) One mole

IX. Solve the following problems

1. **How many grams are there in the following?**   `PTA-4`
   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**
       Mass = No.of moles x Atomic mass (or) Molar mass.
       [∵Molecular mass H_2 = 2× 1=2; Cl_2 = 2×35.5 = 71; S_8 = 8×32 = 256; P_4 = 4×31 = 124]
   i)   Mass of 2 moles of H_2 = 2 × 2 = 4g   ii) Mass of 3 moles of Cl_2 = 3 × 71 = 213g
   iii) Mass of 5 moles of S_8= 5 × 256 = 1280g   iv) Mass of 4 moles of P_4 = 4 × 124 = 496g

2. **Calculate the % of each element in calcium carbonate. (Atomic mass: C-12, O-16, Ca-40)**   `PTA-2`
   Molar mass = Sum of atomic masses of all the elements in the compound.
   Molar mass of $CaCO_3$ = 40 + 12 + (3 × 16) =100g

   $$\text{% of an element} = \frac{\text{Total mass of the element in the compound}}{\text{Molar mass of the compound}} \text{ x 100}$$

   ∴ % of carbon = $\frac{12}{100}$ x 100 = $\boxed{12\%}$

   % of calcium = $\frac{40}{100}$ x 100 = $\boxed{40\%}$

   % of Oxygen = $\frac{40}{100}$ x 100 = $\boxed{48\%}$

3. **Calculate the % of Oxygen in $Al_2(SO_4)_3$ (Atomic mass : Al-27, O-16,S-32)**   `PTA-2`
   Molar mass = Sum of atomic masses of all the elements in the compound.
   Molar mass of $Al_2(SO_4)_3$
       = (2 × 27) + (3 x 32) + (12 × 16)
       = 54 + 96 + 192
       = 342 g

% of an element

$$= \frac{\text{Total mass of the element in the compound}}{\text{Molar mass of the compound}} \times 100$$

$$= \frac{192}{342} \times 100$$

$$\boxed{= 56.14\%}$$

---

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

Let % relative abundance of B -10 = x

∴ % relative abundance of B -11 = (100-x)

Average atomic mass of B = $\dfrac{\begin{array}{l}\text{Mass of 1}^{st}\text{ isotope. \% abundance of 1}^{st}\text{ isotope } + \\ \text{Mass of 2}^{nd}\text{ isotope. \% abundance of 2}^{nd}\text{ isotope}\end{array}}{100}$

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

$10.804 = \dfrac{10x + 1100 - 11x}{100}$

$10.804 \times 100 = 1100 - x$

$1080.4 \qquad = 1100 - x$

$\qquad x \quad = 1100 - 1080.4$

$\qquad x \quad = 19.6\%$

∴ % relative abundance of B -10 = x = $\boxed{19.6\%}$

% relative abundance of B -11 = (100 - x)

= 100-19.6 = $\boxed{80.4\%}$

PART II - PTA, GMQ & GOVT. QUESTIONS AND ANSWERS

I. One Mark Questions.

1. **If a molecule is made of similar kind of atoms, then it is called**   `PTA-6`
   a) mono atomic molecule   b) hetero atomic molecule
   c) homo atomic molecule   d) poly atomic molecule   **Ans : c) homo atomic molecule**

---

2. **Analyse the following and choose the correct statement(s)**   `PTA-4`
   i)   An electron has considerable mass
   ii)   A hetero atomic molecule is formed from different kinds of atoms.
   iii) Mass number and atomic mass of an element are same
   a)   i, ii and iii are correct   b)   i and iii are correct
   c)   only ii is correct   d)   only iii is correct   **Ans : c) only ii is correct**

---

3. Atoms of different elements having same number of _____ are   **Ans : neutrons**
   called isotones.   `PTA-4`

II. Answer in detail (4 Marks)

1. **Write any two applications of "Avogadro's law"**   `Sep-2020` `April 2023`
   Write the applications of Avogadro's hypothesis.
   ➤   It explains Gay - Lussac's law.
   ➤   It helps in the determination of atomicity of gases.
   ➤   It helps to derive molecular formula of gases
   ➤   It determines the relationship between molecular mass and vapour density.
   ➤   It helps to determine gram molar volume of all gases (ie 22.4 litre at STP)

UNIT 12 PLANT ANATOMY AND PLANT PHYSIOLOGY

PART I - TEXTBOOK EVALUATION

I. Choose the correct answer.

1. Casparian strips are present in the _____ of the root. **GMQ**
   a) cortex   b) pith   c) pericycle   d) endodermis
   Ans: d) endodermis

2. The endarch condition is the characteristic feature of **May 2022** **Aug 2022**
   a) root   b) stem   c) leaves   d) flower   **Ans: b) stem**

3. The xylem and phloem arranged side by side on same radius is called _____.
   a) radial   b) amphivasal
   c) conjoint   d) None of these   **Ans: c) conjoint**

4. Which is formed during anaerobic respiration? **GMQ** **Sep.2020**
   a) Carbohydrate   b) Ethyl alcohol
   c) Acetyl CoA   d) Pyruvate   **Ans: b) Ethyl alcohol**

5. Kreb's cycle takes place in **PTA-3** **April 2023**
   a) chloroplast   b) mitochondrial matrix (stroma)
   c) stomata   d) inner mitochondrial membrane
   Ans: b) mitochondrial matrix (stroma)

6. Oxygen is produced at what point during photosynthesis? **PTA-4**
   a) when ATP is converted to ADP   b) when CO_2 is fixed
   c) when H_2O is splitted   d) All of these   **Ans: c) when H_2O is splitted**

II. Fill in the blanks.

		Answers
1.	The innermost layer of cortex in root is called _____	**Endodermis**
2.	Xylem and phloem are arranged in an alternate radii constitute a vascular bundle called _____.	**Radial Bundles**
3.	Glycolysis takes place in _____	**cytoplasm**
4.	The source of O_2 liberated in photosynthesis is _____	**water**
5.	_____ is ATP factory of the cells	**Mitochondria**

III. State whether the statements are true or false. Correct the false statement.

1. **Phloem** tissue is involved in the transport of **water** in plant.
   Ans: False - Phloem tissue is involved in the transport of **food** in plant (or)
   Xylem tissue is involved in the transport of water in plant.

2. The waxy protective covering of a plant is called as cuticle.   **Ans: True**

3. In **monocot** stem cambium is present in between xylem and phloem.
   Ans: False - In **dicot** stem cambium is present in between xylem and phloem.

4. Palisade parenchyma cells occur below upper epidermis in dicot **root**.
   Ans: False - Palisade parenchyma cells occur below upper epidermis in dicot **leaf**.

5. Mesophyll contains chlorophyll.   **Ans: True**

6. **Anaerobic** respiration produces **more** ATP than aerobic respiration.

Ans: False - Anaerobic respiration produces **less** ATP than aerobic respiration.

IV. Match the Following

	Column A		Column B		Answers
1	Amphicribal	a	Dracaena	**c**	**Fern**
2	Cambium	b	Translocation of food	**d**	**Secondary growth**
3	Amphivasal	c	Fern	**a**	**Dracaena**
4	Xylem	d	Secondary growth	**e**	**Conduction of water**
5	Phloem	e	Conduction of water	**b**	**Translocation of food**

V. Answer in a sentence.

1. **What is collateral vascular bundle?**
In this collateral bundle xylem lies towards the centre and phloem lies towards the periphery. It is called collateral vascular bundle

2. **Where does the carbon that is used in photosynthesis come from?**
Carbon di- oxide taken from atmosphere.

3. **What is the common step in aerobic and anaerobic pathway?**
Glycolysis (Glucose splitting)

4. **Name the phenomenon by which carbohydrates are oxidized to release ethyl alcohol.**
Anaerobic respiration (Fermentation)
eg : yeast

VI. Short answer questions.

1. **Give an account on vascular bundle of dicot stem.**
Vascular bundle.
➢ It is made up of xylem and phloem.
➢ Vascular bundles are arranged in the form of a ring around the pith, known as **Eustele.**
1. **Conjoint & collateral**: In the vascular bundles phloem and xylem lie on the same radius it is conjoint and xylem lies towards the centre and pholem lies towards the periphery so it is **conjoint collateral.**
2. **Endarch:** Protoxylem lies towards the centre this arrangement is known as **Endarch**.

3. **Open:** When cambium lies between xylem and phloem. It is known as **open** vascular bundle.

(For Slow Learner Students)
Vascular bundle.
➢ It is made up of xylem and phloem.
➢ Vascular bundles are arranged in the form of a ring around the pith.
➢ Consists of conjoint, collateral, open and endarch xylem.

2. **Write a short note on mesophyll.**
Mesophyll (Meso = middle ; Phyll = leaf)
The tissue present between upper and lower epidermis of a leaf is called mesophyll. In dorsiventral leaf, the mesophyll is differentiated into palisade parenchyma and spongy parenchyma.
a. Palisade parenchyma
The cells seen below the upper epidermis are elongated without intercellular spaces, with more number of chloroplasts - and perform photosynthesis.
b. Spongy parenchyma.
➢ Seen below the palisade parenchyma tissue.
➢ It is made up of almost spherical or oval and irregularly arranged cells, with inter-cellular spaces and help in gaseous exchange.

(For Slow Learner Students)
➢ The tissue present between upper and lower epidermis of a leaf is called mesophyll.
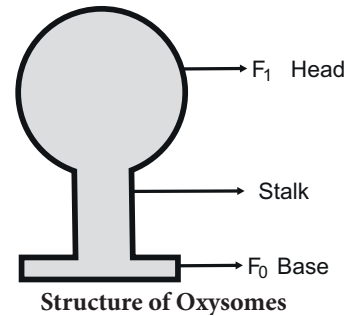
a. Palisade parenchyma

The cells seen below the upper epidermis are elongated without intercellular spaces,

b. Spongy parenchyma.

Seen below the palisade parenchyma tissue.

3. **Draw and label the structure of oxysomes.**

OXYSOME - STRUCTURE (F_1 PARTICLE).

F_1 Head

Stalk

F_0 Base

Structure of Oxysomes

4. **Name the three basic tissues system in flowering plants.** `April 2023`

   i) Dermal or Epidermal tissue system.   ii) Ground tissue system.
   iii) Vascular tissue system.

5. **What is photosynthesis and where in a cell does it occur?** `PTA-3` `Sep - 21`

   Photosynthesis: Photosynthesis 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.

   $$6CO_2 + 12\,H_2O \xrightarrow[\text{Chlorophyll}]{\text{Light}} C_6H_{12}O_6 + 6H_2O + 6O_2 \uparrow$$
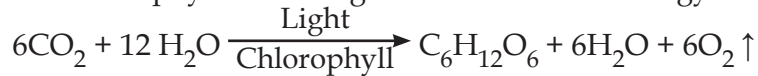
   Chloroplast is the place of photosynthesis in a plant cell.

(For Slow Learner Students)
Green plants to synthesize their own food by using chlorophyll and sunlight is called photosynthesis. It takes place in the chloroplast of the cell.

6. **What is respiratory quotient?** `PTA-1` `Sep - 21` `May 2022` `Aug 2022`

   ➤ Respiratory quotient is the ratio of volume of carbondioxide liberated, and the volume of oxygen consumed during respiration.

   $$RQ = \frac{\text{Volume of } CO_2 \text{ liberated}}{\text{Volume of } O_2 \text{ Consumed}}$$
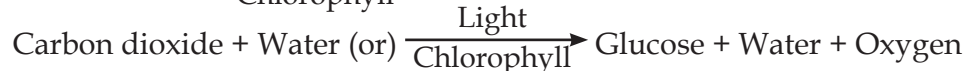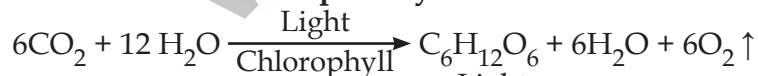
(For Slow Learner Students)
$$RQ = \frac{\text{Volume of } CO_2 \text{ liberated}}{\text{Volume of } O_2 \text{ Consumed}}$$

7. **Why should the light dependent reaction occur before the light independent reaction?**

   ➤ The light independent reactions use light energy to make ATP and $NADPH_2$ to form glucose from the light dependent reactions.
   ➤ Light independent reactions use the energy (ATP) derived from the light dependent reactions.
   ➤ So, the light dependent reaction occur before the light independent reaction.

8. **Write the reaction for photosynthesis?** `May 2022`

   $$6CO_2 + 12\,H_2O \xrightarrow[\text{Chlorophyll}]{\text{Light}} C_6H_{12}O_6 + 6H_2O + 6O_2 \uparrow$$

   Carbon dioxide + Water (or) $\xrightarrow[\text{Chlorophyll}]{\text{Light}}$ Glucose + Water + Oxygen

VII. Long answer questions.

1. **Differentiate the following.** `GMQ`   `Aug 2022`

   a) Monocot root and Dicot root `Sep - 20`   **b) Aerobic and Anaerobic respiration** `Sep - 21`

a)	Tissues	Monocot root	Dicot root
1	Number of Xylem	Polyarch	Tetrarch

2	Cambium	Absent	Present (during secondary growth)
3	Secondary growth	Absent	Present
4	Pith or medulla	Present	Absent (Present in young roots)
5	Conjunctive Tissues	Sclerenchyma	Parenchyma
6	Example	Maize	Bean

b)	Aerobic Respiration	Anaerobic Respiration Aug 2022
1	Organic food is completely oxidised with the help of oxygen.	Organic food is broken down in the absence of oxygen.
2	Glucose is broken down into carbon dioxide, water.	Glucose is converted into ethanol or lactate.
3	Lot of energy is produced	Very small quantity of energy is produced
4	It is a complex process.	It is a simpler process.
5	Example : Higher plants	Example : Bacteria and yeast
6	$C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + (ATP)$	$C_6H_{12}O_6 \rightarrow 2CO_2 + 2C_2H_5OH + (ATP)$

	(For Slow Learner Students)	
a)	**Tissues**	**Monocot root**	**Dicot root**

a)	Tissues	Monocot root	Dicot root
1	Number of Xylem	Polyarch	Tetrarch
2	Secondary growth	Absent	Present
3	Pith or medulla	Present	Absent
4	Conjunctive Tissue	Sclerenchyma	Parenchyma
5	Example	Maize	Bean

b)	Aerobic Respiration	Anaerobic Respiration Aug 2022
1	Need of oxygen	No need of oxygen
2	Glucose is broken down into Carbon dioxide and water	Glucose is converted into ethanol
3	Lot of energy is produced	Very small quantity of energy is produced

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

The biochemical process occurring within cell where the food is oxidized to obtain energy is known as cellular respiration.

Overall reaction : $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + ATP$

Stages of Aerobic respiration - has 3 steps

a) **Glycolysis (Glucose splitting)**
  ➢ It takes place in **cytoplasm** of the cell.
  ➢ It is the breakdown of one molecule of glucose into two molecules of **pyruvic acid**.
  ➢ First step of both aerobic and anaerobic respiration.

b) **Krebs cycle (T-C-A Cycle)**
  ➢ Occur in **Mitochondrial matrix**
  ➢ 2 molecules of Pyruvic acid $\rightarrow CO_2 + H_2O$
  ➢ It is a cyclical reaction produces many Tricarboxylic acid intermediates so it is known as TCA cycle.

c) **Electron Transport chain (ETC)**
  ➢ Occur in the inner membrane of mitochondria.
  ➢ $NADH_2$ & $FADH_2$ molecules formed during glycolysis and krebs cycle - get oxidised to NAD^+ & FAD^+ & release the energy via electrons.
  ➢ The electrons, as they move through the ETC system release energy - in the form of ATP (This is known as **Oxidative phosphorylation**)
  ➢ In this process, oxygen the ultimate acceptor electron gets reduced to water

(For Slow Learner Students)

The biochemical process occurring within cell where the food is oxidized to obtain energy is known as cellular respiration.

a) **Glycolysis (Glucose splitting)**
  1. It is the breakdown of one molecule of glucose into two molecules of **pyruvic acid**.
  2. It takes place in **cytoplasm** of the cell.

b) **Krebs cycle (T-C-A Cycle)**
  ➢ Occur in **Mitochondrial matrix**
  ➢ 2 molecules of Pyruvic acid $\rightarrow CO_2 + H_2O$
  ➢ This cyclic reaction also called Tri Carboxylic Acid cycle. (TCA)

c) **Electron Transport chain (ETC)**
  ➢ Occur in the inner membrane of mitochondria.
  ➢ $NADH_2$ & $FADH_2$ oxidized and releases energy is the form of ATP
  ➢ This type of ATP formation is called oxydative phosphorylation.

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?**

   Ans : a) Difference between Light dependent and Light independent reactions.

	Light dependent reaction	Light independent Reaction
1	It needs sunlight	It does not need sunlight.
2	This reaction use light energy to make ATP and $NADPH_2$	This reaction use the energy derived from light dependent reactions to form glucose.
3	**Place of occurance:** It takes place in the thylakoid membrane (grana) of the chloroplast.	**Place of occurance:** It takes place in the stroma of the chloroplast

b) Reactants and End products.

Reactants		End products
Light dependent	Photosynthetic pigment, light, H_2O	ATP, $NADPH_2$, $O_2\uparrow$, H_2O
Light independent	CO_2, ATP, $NADPH_2$	Glucose

c) Place of occurrence
Light Dependent : Thylakoid membrane (grana) of the chloroplast
Light Independent : Stroma of the chloroplast

(For Slow Learner Students)

i) Light dependent Reaction and Light independent reaction:

	Light dependent reaction	Light independent Reaction
1	It needs sunlight	It does not need sunlight.
2	Occurs in thylakoid of the chloroplast.	Occurs in stroma of the chloroplast

b) Reactants and End products.

Reactants		End products
Light dependent	Photosynthetic pigment, light, H_2O	ATP, O_2
Light independent	CO_2, ATP	Glucose

c) Place of occurrence
Light dependent : Occurs in thylakoid of the chloroplast
Light Independent : Occurs in Stroma of the chloroplast

VIII. Higher order Thinking Skills (HOTS)

1. **The reactions of photosynthesis make up a biochemical pathway.**   [PTA-5]
   A) What are the end product of light and dark reaction of photosynthesis.

	End products
Light reaction	ATP, $NADPH_2$, $O_2\uparrow$, H_2O
Dark reaction	Carbohydrates (Glucose)

   B) Explain how the biochemical pathway of photosynthesis recycles many of its own reactions and identify the recycled reactants.
   1. The end products ADP, NADP of the light independent reaction are the reactants of the light dependent reaction.
   2. ATP and $NADPH_2$ formed from light reaction are converted to ADP and NADP through Calvin cycle.
   3. Both **ADP** and **NADP** are recycled back into the light reaction.
   4. Recycled reactants - **ADP** and **NADP**

2. **Where do the light dependent reaction and the Calvin cycle occur in the chloroplast?**
   Photosynthetic Reactions Occur in Chloroplast
   ➢ The light dependent reaction (Hill - reaction) occur in the thylakoid of the **grana** of chloroplasts.
   ➢ The Dark reaction (Calvin - cycle) occur in the **stroma** of the chloroplasts.

PART II - PTA & GOVT. QUESTION AND ANSWERS

I. Short answer (2 Marks)

1. **What is the common step in aerobic and anaerobic pathway and where does it occur in a cell?** `PTA-5`
   - It takes place in cytoplasm in cell
   - It is a breakdown of one molecule of glucose (6 carbon) into two molecules of pyruvic acid (3 carbon)
   - It is the first step of both aerobic and anaerobic respiration.

2. **What is vascular bundle?** `PTA-1`
   - It consists of xylem and phloem tissues. They are present in the form of bundles called vascular bundles.

   - Xylem conducts water and minerals to different parts of the plant.
   - Phloem conducts food materials to different parts of the plant.

3. **What are the factors affecting photosynthesis ?** `Aug 2022` `April 2023`
   a) **Internal Factors :**
      i) Pigments ii) Leaf age iii) Accumulation of carbohydrates   iv) Hormones
   b) **External Factors :**
      i) Light   ii) Carbon dioxide
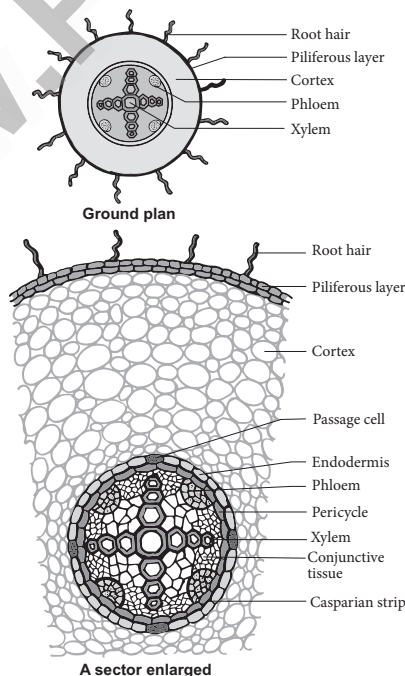   iii) Temperature   iv) Water
      v) Mineral elements
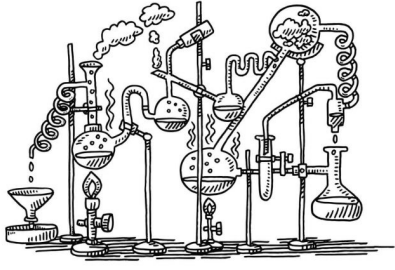
II. Answer in detail (4 & 7 Marks)

1. **Draw and label the different types of conjoint vascular bundles.** `PTA-4`

Conjoint, collateral and open   Conjoint, collateral and closed   Conjoing, Bicollateral

Phloem
Cambium
Xylem
Xylem
Outer Phloem
Inner Cambium
Inner Phloem

2. **Draw the structure of a dicot root and label the parts.** `PTA-6`

Root hair
Piliferous layer
Cortex
Phloem
Xylem

Ground plan

Root hair
Piliferous layer
Cortex
Passage cell
Endodermis
Phloem
Pericycle
Xylem
Conjunctive tissue
Casparian strip

A sector enlarged

Practicals

PHYSICS

1. DETERMINATION OF WEIGHT OF AN OBJECT USING THE PRINCIPLE OF MOMENTS

Aim:

To determine the weight of an object using the principle of moments

Apparatus required:

A metre scale, a knife edge, slotted weights, thread

Procedure:

i.   A metre scale is balanced at its centre of gravity by a knife edge.

ii. A known weight (W_2) and an unknown weight (W_1) are suspended on either side of the scale.

iii. Fix the position of the known weight (W_2) and adjust the position of the unknown weight (W_1) until the scale is balanced.

iv. Then measure the distances d_1 & d_2.

v.   Repeat the experiment by changing the position of an unknown weight W_1 and tabulate the values of d_1 & d_2.

Observation:

S.No	Weight in the weight hanger (W_2) kg	Distance of known weight d_1 (m)	Distance of unknown weight d_2 (m)	$W_2 \times d_2$ (kg m)	Unknown weight $W_1 = \dfrac{W_2 \times d_2}{d_1}$ (kg)
1	50	20	13.5	1×10^{-2}	74.07
2	100	20	27.0	2×10^{-2}	74.07
3	150	20	40.5	3×10^{-2}	74.07
4	200	20	54	4×10^{-2}	74.07

Mean:74.07

Calculations:
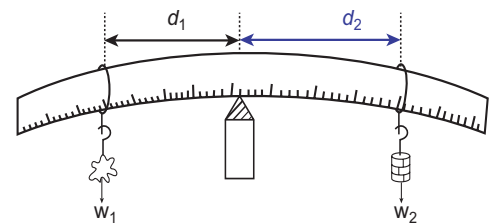
Moment of a force can be calculated using the formula

Moment of the force = Force x distance

Anti Clock wise moment by unknown weight = $W_1 \times d_1$

Clockwise moment by known weight = $W_2 \times d_2$

$W_1 \times d_1 = W_2 \times d_2$

Unknown weight = $W_1 = \dfrac{W_2 \times d_2}{d_1}$

Result:

Using the principle of moments, the weight of the unknown body $W_1 = 74.07 \times 10^{-3}$ Kg Wt.

1. They are biconcave and disc shaped.
2. They are also known as erythrocytes   **Red Blood Cells**
3. Mature mammalian RBC's do not have nucleus.
4. Haemoglobin is a respiratory pigment which gives red colour.
5. It transports oxygen from lungs to tissues and carbon- dioxide from tissues to lungs

The given slide is identified as **White blood cells**

1. WBC's are colourless and they have nucleus.
2. They are also known as Leucocytes
3. They show amoeboid movements.
4. They fight against germs and other foreign bodies and thus protect the body from microbial infections and diseases.
5. There are five different types of WBC namely Neutrophils, Eosinophils, Basophils, Lymphocytes and Monocytes

Neutrophil   Eosinophil   Basophil

Lymphocyte   Monocyte
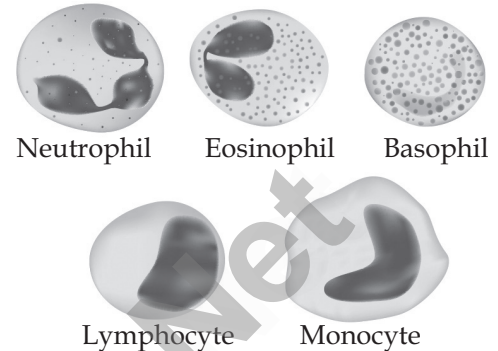
14. IDENTIFICATION OF ENDOCRINE GLANDS

Aim:

To identify the endocrine gland, its location, hormone secreted and functions - Thyroid gland and Pancreas

Materials Required:

1. Endocrine glands – (a) Thyroid gland
   (b) Pancreas – Islets of Langerhans
2. Any one endocrine gland should be flag labelled.

   For the purpose of flag labelling a model / a chart / photograph showing all endocrine glands should be used. (Mark the endocrine glands mentioned for the practical)

Identification:

Identify the flagg labelled endocrine gland, write its location, the hormones secreted and its functions.

(a) Thyroid gland

Identification: The flag labelled endocrine gland is identified as Thyroid gland

Location: Thyroid gland is a bilobed gland located in the neck region on either side of the trachea.

Hormones secreted: Triiodothyronine (T3) and Thyroxine (T4)

Functions of Hormones:

1. Thyroid hormones increases the basal metabolic rate (BMR).
2. It increases the body temperature.
3. It regulates metabolism
4. It is required for normal growth and development
5. It is also known as personality hormone.
6. Deficiency of thyroxine results in simple goiter, myxoedema (in adults) and cretinism (in children).
7. Excess secretion causes Grave's diseases.

★ **Practical**

(b) Pancreas – Islets of Langerhans

Identification: The flag labelled endocrine gland is identified as Islets of Langerhans in the Pancreas.

Location: Islets of Langerhans are seen embedded in the pancreas which is located in the abdominal region.

Hormones secreted: 1. α cells secrete glucagon, 2. β cells secrete insulin

Functions of Hormones:

1. Insulin converts glucose into glycogen and stores it in liver and muscles.
2. Glucagon converts glycogen into glucose.
3. Insulin and glucagon maintain the blood sugar level (80 – 120 mg/dl) by their antagonistic function.
4. Decrease in insulin secretion causes diabetes mellitus.

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