Common Half Yearly Exam – 2024

Standard – X Science Rpt Dist

PART-I

1. b) NKg^{-1}
2. d)8.31 j mol^{-1} k^{-1}
3. b) 20KHz
4. c) $Fe_2O_3.xH_2O$
5. c) Light
6. b) Mitochondrial matrix
7. c) Water
8. c) Anterior Pituitary
9. b) Seminiferous tubules
10. c) Jean Baptiste Lamarck
11. a) May 31
12. c) rainfall is high

PART-II 7x2=14

13.

Differentiate convex lens and concave lens. ✱ ✱

S.No	Convex lens	Concave lens
1.	A convex lens is **thicker** in the **middle** than at edges.	A concave lens is **thinner** in the **middle** than at edges.
2.	It is a **converging** lens.	It is a **diverging** lens.
3.	It produces mostly **real** images.	It produces **virtual** images.
4.	It is used to treat **hypermeteropia**.	It is used to treat **myopia**.

14.

Define the unit of current. ✱ ✱ ✱

- The SI unit of current is **ampere (A).**
- The current flowing through a conductor is said to be one ampere, when a charge of one coulomb flows across any cross-section of a conductor in one second.
- $$1\,\text{ampere} = \frac{1\,\text{coulomb}}{1\,\text{second}}$$

15. Match it

a) Co-60 - Mumbai

b)Fuel - Hydrogen Bomb

c) BARC - Leukemia

d) Fusion reaction - Uranium

ans – c d a b

16.

What is the molar volume of gas?

- One mole (6.023×10^{23} of entities) of any gas occupies **22.4 litre** or 22400 ml at **STP**.
- This volume is called as molar volume of gas.

17.

What is aqueous and non-aqueous solution? Give an example.

Aqueous solution:

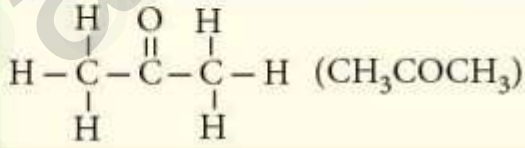
- The solution in which **water** acts as a **solvent** is called aqueous solution.
- **Example:** Salt in **water**

Non-aqueous solution:

- The solution in which **any liquid** other than water acts as a solvent is called non-aqueous solution.
- **Example:** Sulphur dissolved in carbon di sulphide.

18.

Name the simplest ketone and give its structural formula.

Simplest ketone	Structural formula
Acetone	 (CH_3COCH_3)

19.

Write the dental formula of rabbit. ★★

Dental formula is $\left(I\frac{2}{1}, C\frac{0}{0}, PM.\frac{3}{2}, M\frac{3}{3}\right)$ in rabbit which is written as $\frac{2033}{1023}$.

20.

Define reflex arc. ✶

The pathway taken by nerve impulse to accomplish reflex action is called reflex arc.

21.

Identify the parts A, B, C and D

A - Exine
B - Intine
C - Generative cell
D - Nucleus

22.

Problem-1: Calculate the velocity of a moving body of mass 5 kg whose linear momentum is 2.5 $kg\,m\,s^{-1}$.

Solution: Linear momentum = mass × velocity

Velocity = linear momentum / mass.

V = 2.5 / 5 = 0.5 $m\,s^{-1}$

PART-III 7x4=28

23. a)

Differentiate mass and weight. ✶✶

Mass	Weight
Fundamental quantity	Derived quantity
It is the amount of **matter** containing in a body	It is the **gravitational pull** acting on the body
Its unit is **kilogram**	Its unit is **newton**
Remains the **same**	**Varies** from place to place.
It is a **scalar** quantity	It is a **vector** quantity

b)

Why are traffic signals red in colour? ✶

- The red colour has longer wavelength.
- So it can travel for longer distance and will be seen clearly. So red colour is used in traffic signals.

24.

a) What are the advantages of LED TV over the normal TV?
b) List the merits of LED bulb.

a) Advantages of LED television:

- It has brighter picture quality.
- It is thinner in size.
- It uses less power and consumes very less energy.
- Its life span is more.
- It is more reliable.

25.

. Derive the ideal gas equation. ★★★

- The ideal gas equation is an equation, which relates to **all the properties** of an ideal gas.
- An ideal gas obeys **Boyle's law** and **Charles' law** and **Avogadro's law**.
- According to Boyle's law,

$$PV = constant \quad \text{-----(1)}$$

- According to Charles's law,

$$V/T = constant \quad \text{-----(2)}$$

- According to Avogadro's law,

$$V/n = constant \quad \text{-----(3)}$$

After combining equations (1), (2) and (3), you can get the following equation.

$$\boldsymbol{PV/nT = constant} \quad \textbf{-----(4)}$$

The above relation is called the combined law of gases.

- If you consider a gas, which contains μ moles of the gas, the number of atoms contained will be equal to μ times the Avogadro number, N_A.

$$i.e. \quad n = \mu N_A. \quad \text{-----(5)}$$

Using equation (5), equation (4) can be written as

$$PV/ \mu N_A T = \text{constant}$$

$$PV/ \mu N_A T = k_B$$

$$PV = \mu N_A k_B T$$

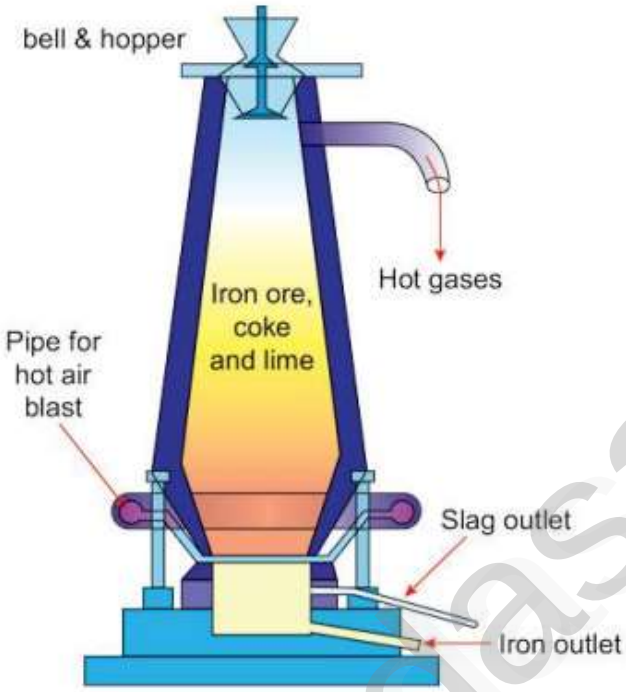
Here, $\mu N_A k_B = R$, which is termed as universal gas constant whose value is 8.31 J mol^{-1} K^{-1}.

$$\boldsymbol{PV = RT} \quad \text{-------(6)}$$

Explain smelting process. ★★★

Smelting (in a Blast Furnace):

- The charge consisting of **roasted ore, coke** and **limestone** in the ratio **8:4:1** is smelted in a blast furnace by introducing it through the cup and cone arrangement at the top.
- There are **three** important regions in the furnace.



Blast Farnance

a) The Lower Region (Combustion Zone):

- The temperature is at **1500°C.**
- In this region, **coke** burns with **oxygen** to form CO_2 when the charge comes in contact with a hot blast of air.
- It is an **exothermic reaction** since heat is liberated.

$$C + O_2 \xrightarrow[\Delta]{1500°C} CO_2 + \text{Heat}$$

b) The Middle Region (Fusion Zone):

- The temperature prevails at **1000°C.**
- In this region, CO_2 is reduced to **CO.**

$$CO_2 + C \xrightarrow[\Delta]{1000°C} 2CO - \text{Heat}$$

- Limestone decomposes to **calcium oxide** and CO_2.

$$CaCO_3 \xrightarrow[\Delta]{} CaO + CO_2 - \text{Heat}$$

- These two reactions are endothermic due to absorption of heat.
- Calcium oxide combines with **silica** to form **calcium silicate** slag.

$$CaO + SiO_2 \longrightarrow CaSiO_3$$

c) The Upper Region (Reduction Zone):

- The temperature prevails at **400°C.**
- In this region carbon monoxide **reduces ferric oxide** to form a fairly pure spongy iron.

$$Fe_2O_3 + 3CO \xrightarrow{400°C} 2Fe + 3CO_2$$

- The molten iron is collected at the bottom of the furnace after removing the slag.
- The iron thus formed is called **pig iron.**
- It is remelted and cast into different moulds.
- This iron is called **cast iron.**

27.

Differentiate reversible and irreversible reactions. ★★★

S.No	Reversible	Irreversible
1.	It **can be reversed** under suitable conditions.	It **cannot be reversed.**
2.	**Both forward and backward** reactions take place simultaneously.	It is unidirectional. It proceeds **only in forward direction.**
3.	It **attains** equilibrium.	Equilibrium is **not attained.**
4.	The reactants **cannot be converted** completely into products.	The reactants **can be completely converted** into products.
5.	It is relatively **slow.**	It is **fast.**

28. a)

Write a short note on mesophyll.

- The tissue present between the **upper** and the **lower epidermis** is called mesophyll.
- Mesophyll cells contain chloroplasts.
- In dicot leaf, the mesophyll is differentiated into **palisade** parenchyma and **spongy** parenchyma.
- Palisade cells do not have intercellular spaces and take active part in photosynthesis. Whereas, spongy parenchyma cells have large **intercellular spaces** and helps in **gaseous exchange.**

b)

What is respiratory quotient? ★★

- Respiratory quotient (R.Q) is the ratio of **volume** of **carbon dioxide** liberated and the **volume** of **oxygen** consumed during respiration.
- $$RQ = \frac{\text{Volume of } CO_2 \text{ liberated}}{\text{Volume of } O_2 \text{ consumed}}$$

29.

Define Ethnobotany and write its importance.

Ethnobotany is the study of a **region's plants** and their practical uses through the **traditional knowledge** of local culture of people.

Importance

- It provides **traditional uses** of plant.
- It gives information about certain **unknown** and **known** useful plants.
- The ethnomedicinal data will serve as a useful source of information for the chemists, pharmacologists.
- Tribal communities utilise ethnomedicinal plant and prepare medicine to cure many diseases.

30. a)

What are the consequences of deforestation? ✶ ✶

Deforestation gives rise to ecological problems like floods, drought, soil erosion, loss of wild life, extinction of species, imbalance of biogeochemicals, alternation of climatic conditions and desertification.

b)

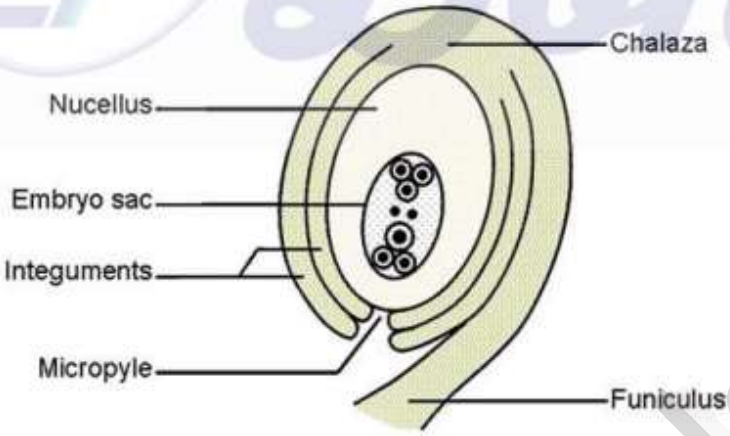
State the applications of DNA fingerprinting technique. ✶ ✶

- DNA fingerprinting technique is used in **forensic applications** like crime investigation.
- It is also used for **paternity testing** in case of disputes.
- It also helps in the study of genetic diversity of population, evolution an speciation.

31.

With a neat labelled diagram describe the parts of a typical angiospermic ovule.

- The main part of the ovule is the **nucellus** which is enclosed by two integuments leaving an opening called as **micropyle**.
- The ovule is attached to the ovary wall by a stalk known as **funiculus**.
- **Chalaza** is the basal part.



Structure of the Ovule

- The embryo sac contains **seven cells** and the **eighth nuclei** located within the **nucellus**.
- Three cells at the **micropylar** end form the **egg apparatus** and the three cells at the **chalaza end** are the antipodal cells.
- The remaining two nuclei are called **polar nuclei** found in the centre.

32.

What is the pH of 1.0×10^{-5} molar solution of KOH?

KOH is a strong base and dissolve in water and gives

$$KOH \rightarrow K^+ + OH^-$$

Each KOH molecules gives one OH^- ion. So 1.0×10^{-5} molar solution of KOH gives 1.0×10^{-5} OH^- ions.

Formula used:

$pOH = -\log_{10}[OH^-]$

$$[OH^-] = 1.0 \times 10^{-5}$$
$$pOH = -\log_{10}[OH^-]$$
$$= -\log_{10} 1.0 \times 10^{-5}$$
$$= -(-5)\log_{10} 10$$
$$pOH = 5 \times 1$$
$$pOH = 5$$
$$pH + pOH = 14$$
$$pH = 14 - pOH$$
$$= 14 - 5$$
$$\mathbf{pH = 9}$$

The pH of 1.0×10^{-5} molar solution of KOH is **9.**

PART-IV 3x7=21

33. a) i) 5 marks

List any five properties of light

Properties of light:

- Light is a **form of energy.**
- Light always travels along a **straight line.**
- Light does **not need any medium** for its propagation. It can even travel through vacuum.
- The speed of light in vacuum or air is, $\mathbf{c = 3 \times 10^8\ m/s}$
- Since, light is in the form of waves, it is characterized by **a wavelength** (λ) and a **frequency** (ν), which are related by the following equation: $c = \nu\lambda$ (c - velocity of light).

a) ii) 2 marks

How does a fuse wire protect electrical appliances?

The fuse wire is connected in series, in an electric circuit. When a large current passes through the circuit, the fuse wire **melts** due to **Joule's heating effect** and hence the circuit gets **disconnected**. Therefore, the circuit and the electric appliances are saved from any **damage**. The fuse wire is made up of a material whose melting point is relatively low.

b) i) 5 marks

What is a nuclear reactor? Explain its essential parts with their functions. ★ ★ ★

- A nuclear reactor is a device in which the nuclear fission reaction takes place in a self sustained and controlled manner.

Fuel:

- A fissile material is used as the fuel.
- The commonly used fuel material is uranium.

Moderator:

- A moderator is used to slow down the high energy neutrons to provide slow neutrons.
- Graphite and heavy water are the commonly used moderators.

Control rod:

- Control rods are used to control the number of neutrons in order to have sustained chain reaction.
- Mostly boron or cadmium rods are used as control rods. They absorb the neutrons.

Coolant:

- A coolant is used to remove the heat produced in the reactor core, to produce steam.
- This steam is used to run a turbine in order to produce electricity.
- Water, air and helium are some of the coolants.

Protection wall:

- A thick concrete lead wall is built around the nuclear reactor in order to prevent the harmful radiations from escaping into the environment.

b) ii) 2 marks

Why does sound travel faster on a rainy day than on a dry day?

- During rainy days, the moisture content is more in the atmosphere and speed of sound increases with **increase in humidity.**
- Hence the **sound travels faster** on rainy days.

34. a) i) 5 marks

How is ethanol manufactured from sugar-cane? ✶ ✶ ✶

- **Molasses** is a **dark coloured syrupy** liquid left after the crystallization of sugar from the concentrated sugarcane juice.
- It contains **30 %** of **sucrose**, which cannot be separated by crystallization.

Dilution of molasses:

- Molasses is first **diluted** with water to bring down the concentration of sugar to about **8 to 10 percent.**

Addition of Nitrogen source:

- Molasses contains enough nitrogenous matter to act as food for yeast during the fermentation process.
- If the nitrogenous matter is poor, **ammonium sulphate** or **ammonium phosphate** is added.

Addition of yeast:

- This solution kept in large fermentation tank and **yeast** is added to and it kept at about 303 K for a few days.
- During this period, the enzymes **invertase** and **zymase** present in yeast, converts **sucrose** into **ethanol**.
- $\underset{\text{sugar}}{C_{12}H_{22}O_{11}} + H_2O \xrightarrow{\text{invertase}} \underset{\text{fructose}}{C_6H_{12}O_6} + \underset{\text{glucose}}{C_6H_{12}O_6}$
- $\underset{\text{fructose (or) Glucose}}{C_6H_{12}O_6} \xrightarrow{\text{zymase}} 2\underset{\text{ethanol}}{C_2H_5OH} + 2CO_2$
- The fermented liquid is technically called **wash**.

Distillation of wash:

- This wash containing **15 to 18 %** alcohol, is now subjected to **fractional distillation.**
- The main fraction drawn in an aqueous solution of ethanol which contains **95.5 %** of ethanol and **4.5 %** of water.
- This is called **rectified spirit.**
- This mixture is then **refluxed** over **quicklime** for about 5 to 6 hour and then allowed to stand for **12 hours.**
- On **distillation** of mixture, **pure alcohol (100 %)** is obtained.

34. a) ii) 2 marks

Define the term: Solution. ✶ ✶ ✶

- A solution is a **homogeneous mixture** of two or more substance.
  E.g: Sea water.
- In a solution, the component present in **lesser** amount by weight is called a **solute.**
- The component present in a **larger** amount by weightis called a **solvent.**

34. b) i) 4 marks

Write the applications of Avogadro's law.

- It explains **Gay-Lussac's law.**
- It helps in the determination of **atomicity of gases.**
- **Molecular formula** of gases can be derived using Avogadro's law
- It determine the relation between **molecular mass** and **vapour density.**

34. b) ii) 2 marks

State two conditions necessary for rusting of iron.

Conditions necessary for rusting of iron.

- Iron is exposed to moist air.
- Presence of water droplets in the atmosphere.
- Presence of Oxygen.

34. b) iii) 1 mark

The normal pH of human body is ***7.4.***

35. a) i) 3 marks

12.9.7 Factors Affecting Photosynthesis

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

35. a) ii) 2 marks

What are allosomes? ✶ ✶ ✶

- Allosomes are chromosomes which are responsible for **determining** the **sex** of an individual.
- They are also called as sex chromosomes or **hetero-chromosomes.**

35. a) iii) 2 marks

What do you understand by the term phenotype and genotype? ✶ ✶

- **External expression** of a particular trait is known as phenotype.
- A genotype is the **genetic expression** of an organism.

35. b) i) 4 marks

Differentiate between Type-1 and Type-2 diabetes mellitus ✶ ✶

Factors	Type-I Insulin dependent diabetes mellitus (IDDM)	Type-II Non-insulin dependent diabetes mellitus (NIDDM)
Prevalence	10 - 20%	80 - 90 %
Age of onset	Juvenile onset (< 20 years)	Maturity onset (> 30 years)
Body weight	Normal or underweight	Obese
Defect	Insulin deficiency due to destruction of β-cells	Target cells do respond to insulin
Treatment	Insulin administration is necessary	Can be controlled by diet, exercise and medicine

35. b) ii) 2 marks

Unipolar (A), Bipolar (B) and multipolar (C) neurons

b) iii) 1 mark **Who is the father of Indian Green Revolution ?**

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