AP EAPCET 2025 May 19 Shift 2 Question Paper with Solutions

Time Allowed :3 Hours	**Maximum Marks :**160	**Total questions :**160

General Instructions

Read the following instructions very carefully and strictly follow them:

1. Duration of Exam: 3 Hours

2. Total Number of Questions: 160 Questions

3. Section-wise Distribution of Questions:

   - Physics - 40 Questions

   - Chemistry - 40 Questions

   - Mathematics - 80 Questions

4. Type of Questions: Multiple Choice Questions (Objective)

5. Marking Scheme: One mark awarded for each correct response

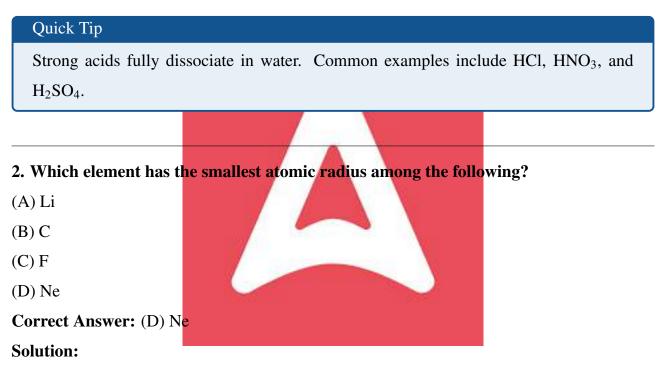6. Negative Marking: There is no provision for negative marking.

1. Which of the following is a strong acid?

(A) Acetic acid

(B) Hydrochloric acid

(C) Carbonic acid

(D) Formic acid

Correct Answer: (B) Hydrochloric acid

Solution:

Hydrochloric acid (HCl) is a strong acid because it completely ionizes in water to release H^+ ions. Acetic acid, carbonic acid, and formic acid are weak acids as they partially ionize in solution.

> **Quick Tip**
>
> Strong acids fully dissociate in water. Common examples include HCl, HNO_3, and H_2SO_4.

2. Which element has the smallest atomic radius among the following?

(A) Li

(B) C

(C) F

(D) Ne

Correct Answer: (D) Ne

Solution:

Atomic radius decreases across a period due to increasing nuclear charge. Among the given elements in Period 2, Neon is the last and has the highest effective nuclear charge, pulling electrons closer and resulting in the smallest radius.

> **Quick Tip**
>
> Atomic radius decreases from left to right across a period and increases down a group.

3. Which of the following compounds contains both ionic and covalent bonds?
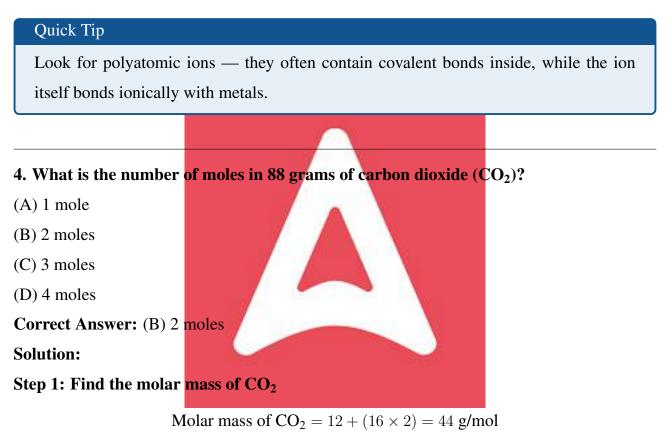
(A) NaCl

(B) NH_3

(C) $CaCO_3$

(D) CH_4

Correct Answer: (C) $CaCO_3$

Solution:

Calcium carbonate ($CaCO_3$) has both ionic and covalent bonds. The bond between Ca^{2+} and CO_3^{2-} is ionic, while the bonds within the carbonate ion (C and O) are covalent.

> **Quick Tip**
>
> Look for polyatomic ions — they often contain covalent bonds inside, while the ion itself bonds ionically with metals.

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4. What is the number of moles in 88 grams of carbon dioxide (CO_2)?

(A) 1 mole

(B) 2 moles

(C) 3 moles

(D) 4 moles

Correct Answer: (B) 2 moles

Solution:

Step 1: Find the molar mass of CO_2

$$\text{Molar mass of } CO_2 = 12 + (16 \times 2) = 44 \text{ g/mol}$$

Step 2: Use the formula:

$$\text{Number of moles} = \frac{\text{Given mass}}{\text{Molar mass}} = \frac{88}{44} = 2$$

$$\boxed{2 \text{ moles of } CO_2}$$

> **Quick Tip**
>
> To calculate moles, divide the given mass by the molar mass. Always calculate molar mass accurately using atomic weights.
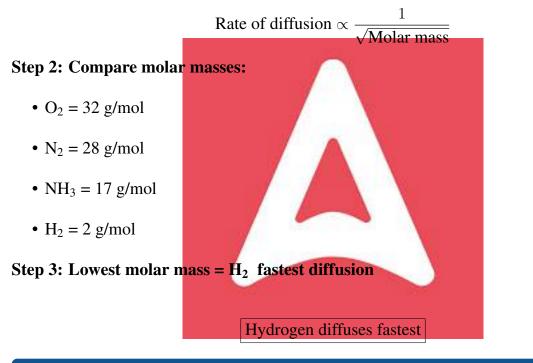
5. Which gas will diffuse the fastest under identical conditions of temperature and pressure?

(A) Oxygen (O_2)

(B) Nitrogen (N_2)

(C) Ammonia (NH_3)

(D) Hydrogen (H_2)

Correct Answer: (D) Hydrogen (H_2)

Solution:

Step 1: Use Graham's law of diffusion:

$$\text{Rate of diffusion} \propto \frac{1}{\sqrt{\text{Molar mass}}}$$

Step 2: Compare molar masses:

- O_2 = 32 g/mol

- N_2 = 28 g/mol

- NH_3 = 17 g/mol

- H_2 = 2 g/mol

Step 3: Lowest molar mass = H_2 fastest diffusion

Hydrogen diffuses fastest

> **Quick Tip**
>
> Lighter gases diffuse faster. Use Graham's Law to compare gases based on their molar masses.

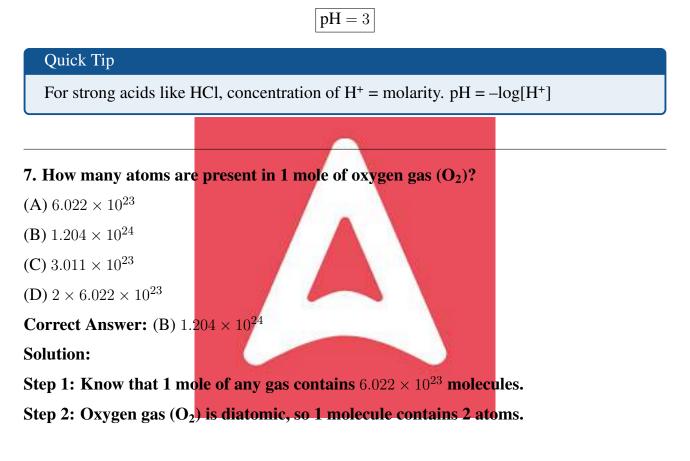**6. What is the pH of a 0.001 M HCl solution?**

(A) 3

(B) 1

(C) 2

(D) 4

Correct Answer: (A) 3

Solution:

Step 1: Use pH formula for strong acids:

$$\text{pH} = -\log[H^+]$$

Step 2: Given concentration of HCl = 0.001 M = 10^{-3} $\text{pH} = -\log(10^{-3}) = 3$

$$\boxed{\text{pH} = 3}$$

> **Quick Tip**
>
> For strong acids like HCl, concentration of H$^+$ = molarity. pH = –log[H$^+$]

7. How many atoms are present in 1 mole of oxygen gas (O_2)?

(A) 6.022×10^{23}

(B) 1.204×10^{24}

(C) 3.011×10^{23}

(D) $2 \times 6.022 \times 10^{23}$

Correct Answer: (B) 1.204×10^{24}

Solution:

Step 1: Know that 1 mole of any gas contains 6.022×10^{23} **molecules.**

Step 2: Oxygen gas (O_2) is diatomic, so 1 molecule contains 2 atoms.

$$\Rightarrow \text{Total atoms} = 2 \times 6.022 \times 10^{23} = 1.204 \times 10^{24}$$

$$\boxed{1.204 \times 10^{24} \text{ atoms}}$$

> **Quick Tip**
>
> Always multiply by 2 for diatomic gases like O_2, H_2, N_2 when calculating number of atoms.

8. Which of the following elements exhibits variable oxidation states and forms colored compounds?

(A) Sodium

(B) Calcium

(C) Copper

(D) Magnesium

Correct Answer: (C) Copper

Solution:

Copper (Cu) is a transition element. Transition metals are known for:

- Showing variable oxidation states (e.g., Cu^+, Cu^{2+})

- Forming colored compounds (like blue $CuSO_4$)

Copper shows variable oxidation states and forms colored compounds.

> **Quick Tip**
>
> Transition metals = Variable oxidation states + Colored compounds due to d–d transitions.

9. What volume will 2 moles of an ideal gas occupy at STP (Standard Temperature and Pressure)?

(A) 11.2 L

(B) 22.4 L

(C) 44.8 L

(D) 33.6 L

Correct Answer: (C) 44.8 L

Solution:

Step 1: At STP, 1 mole of an ideal gas occupies 22.4 L

$$\text{Volume for 2 moles} = 2 \times 22.4 = 44.8 \text{ L}$$

$$\boxed{44.8 \text{ L}}$$

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10. What is the acceleration of a body of mass 4 kg when a force of 20 N is applied to it?

(A) 2 m/s^2

(B) 4 m/s^2

(C) 5 m/s^2

(D) 10 m/s^2

Correct Answer: (C) 5 m/s^2

Solution:

Step 1: Use Newton's second law of motion

$$F = ma \Rightarrow a = \frac{F}{m}$$

Step 2: Substitute the values

$$a = \frac{20 \text{ N}}{4 \text{ kg}} = 5 \text{ m/s}^2$$

$$\boxed{a = 5 \text{ m/s}^2}$$

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11. A 100 W electric bulb is used for 5 hours daily. What is the energy consumed in 30 days?

(A) 15 kWh

(B) 10 kWh

(C) 5 kWh

(D) 20 kWh

Correct Answer: (A) 15 kWh

Solution:

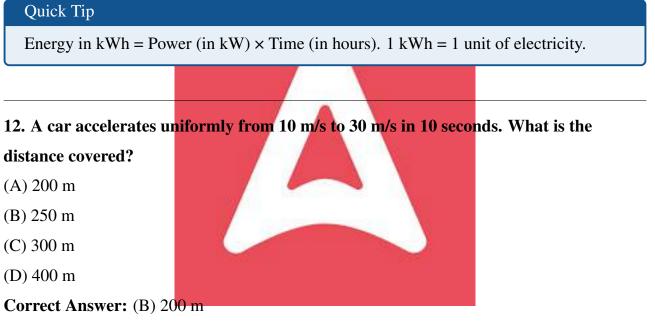**Step 1: Convert power to kilowatts**

$$100 \text{ W} = 0.1 \text{ kW}$$

Step 2: Total time used = 5 hours/day × 30 days = 150 hours

Step 3: Energy consumed = Power × Time

$$E = 0.1 \times 150 = 15 \text{ kWh}$$

$$\boxed{15 \text{ kWh}}$$

> **Quick Tip**
>
> Energy in kWh = Power (in kW) × Time (in hours). 1 kWh = 1 unit of electricity.

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12. A car accelerates uniformly from 10 m/s to 30 m/s in 10 seconds. What is the distance covered?

(A) 200 m

(B) 250 m

(C) 300 m

(D) 400 m

Correct Answer: (B) 200 m

Solution:

Step 1: Use the formula for uniformly accelerated motion:

$$s = \frac{(u + v)}{2} \cdot t$$

Where: $u = 10$ m/s, $v = 30$ m/s, $t = 10$ s

$$s = \frac{(10 + 30)}{2} \cdot 10 = \frac{40}{2} \cdot 10 = 20 \cdot 10 = 200 \text{ m}$$

$$\boxed{200 \text{ m}}$$

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13. Two light waves of intensities $I_1 = 4I$ and $I_2 = I$ interfere. If the path difference between the waves is 25% of the wavelength λ, find the resultant intensity at that point.

Solution:

Step 1: Given intensities:

$$I_1 = 4I, \quad I_2 = I.$$

Step 2: Amplitudes of the waves are proportional to the square root of intensities:

$$A_1 = \sqrt{I_1} = \sqrt{4I} = 2\sqrt{I}, \quad A_2 = \sqrt{I_2} = \sqrt{I} = \sqrt{I}.$$

Step 3: The phase difference ϕ corresponding to path difference $\Delta x = 0.25\lambda$ is:

$$\phi = \frac{2\pi}{\lambda} \times \Delta x = 2\pi \times 0.25 = \frac{\pi}{2}.$$

Step 4: The resultant amplitude is:

$$A = \sqrt{A_1^2 + A_2^2 + 2A_1 A_2 \cos\phi}.$$

Step 5: Substitute the values:

$$A = \sqrt{(2\sqrt{I})^2 + (\sqrt{I})^2 + 2 \times 2\sqrt{I} \times \sqrt{I} \times \cos\frac{\pi}{2}} = \sqrt{4I + I + 0} = \sqrt{5I}.$$

Step 6: The resultant intensity I_r is proportional to the square of amplitude:

$$I_r = A^2 = 5I.$$

Answer:

$$\boxed{I_r = 5I}.$$

14. A total charge q is uniformly distributed over a circular ring of radius R. The ring is rotated about its axis with angular velocity ω. Find the magnetic dipole moment of the ring.
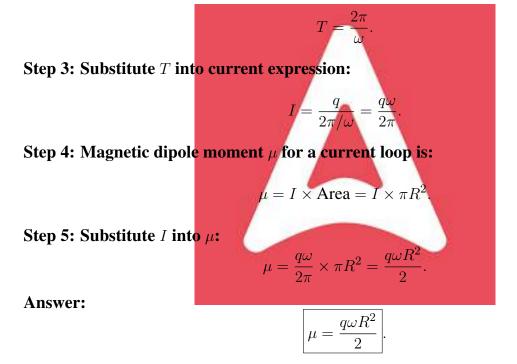
Solution:

Step 1: The rotating charged ring constitutes a current loop. The current I is given by the charge passing a point per unit time:

$$I = \frac{q}{T},$$

where T is the time period of one rotation.

Step 2: The time period T is related to angular velocity ω as:

$$T = \frac{2\pi}{\omega}.$$

Step 3: Substitute T into current expression:

$$I = \frac{q}{2\pi/\omega} = \frac{q\omega}{2\pi}.$$

Step 4: Magnetic dipole moment μ for a current loop is:

$$\mu = I \times \text{Area} = I \times \pi R^2.$$

Step 5: Substitute I into μ:

$$\mu = \frac{q\omega}{2\pi} \times \pi R^2 = \frac{q\omega R^2}{2}.$$

Answer:

$$\boxed{\mu = \frac{q\omega R^2}{2}}.$$

> **Quick Tip**
>
> Magnetic dipole moment for a rotating charged ring equals the current (charge/time) times the area of the loop.

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15. In a nuclear reactor, fuel is consumed at the rate of 2×10^{-3} g/s. If 100% of the mass is converted to energy, find the power output of the reactor in kilowatts (kW).

Solution:

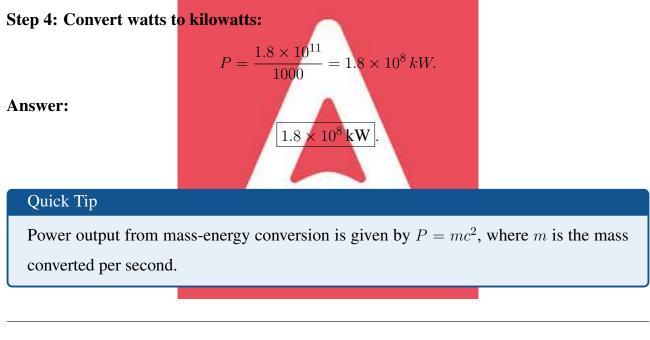**Step 1: Use Einstein's mass-energy equivalence:**

$$E = mc^2,$$

where m is the mass converted per second (mass flow rate), $c = 3 \times 10^8 \, m/s$ is the speed of light.

Step 2: Convert the mass flow rate to kilograms per second:

$$m = 2 \times 10^{-3} \, g/s = 2 \times 10^{-6} \, kg/s.$$

Step 3: Calculate power output P in watts (J/s):

$$P = mc^2 = 2 \times 10^{-6} \times (3 \times 10^8)^2 = 2 \times 10^{-6} \times 9 \times 10^{16} = 1.8 \times 10^{11} \, W.$$

Step 4: Convert watts to kilowatts:

$$P = \frac{1.8 \times 10^{11}}{1000} = 1.8 \times 10^8 \, kW.$$

Answer:

$$\boxed{1.8 \times 10^8 \, kW}.$$

> **Quick Tip**
>
> Power output from mass-energy conversion is given by $P = mc^2$, where m is the mass converted per second.

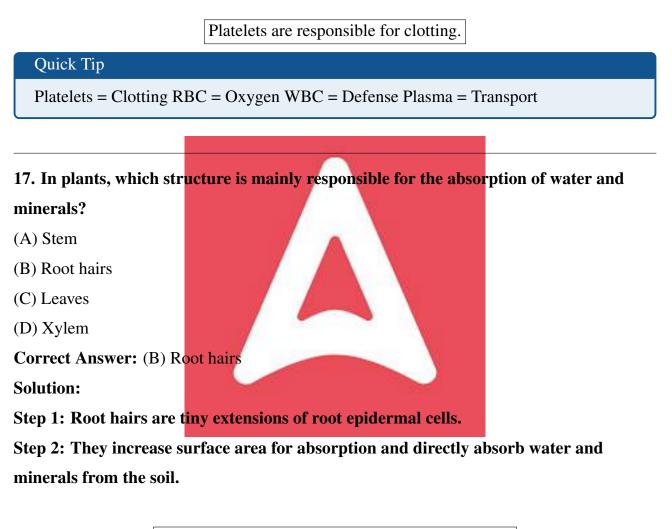---

16. Which blood component is responsible for clotting?

(A) Red blood cells

(B) White blood cells

(C) Platelets

(D) Plasma

Correct Answer: (C) Platelets

Solution:

Step 1: Understand the function of each blood component

- RBCs: Transport oxygen

- WBCs: Fight infections

- Plasma: Carries nutrients, hormones, and waste

- Platelets: Help in blood clotting

Step 2: Platelets release clotting factors that form fibrin threads to stop bleeding.

Platelets are responsible for clotting.

> **Quick Tip**
>
> Platelets = Clotting RBC = Oxygen WBC = Defense Plasma = Transport

17. In plants, which structure is mainly responsible for the absorption of water and minerals?

(A) Stem

(B) Root hairs

(C) Leaves

(D) Xylem

Correct Answer: (B) Root hairs

Solution:

Step 1: Root hairs are tiny extensions of root epidermal cells.

Step 2: They increase surface area for absorption and directly absorb water and minerals from the soil.

Root hairs absorb water and minerals from the soil.

> **Quick Tip**
>
> Root hairs increase surface area for absorption, located in the zone of maturation.

18. Which hormone is secreted in response to high blood sugar levels?

(A) Glucagon

(B) Insulin

(C) Adrenaline

(D) Thyroxine

Correct Answer: (B) Insulin

Solution:

Step 1: Insulin is secreted by the beta cells of the pancreas (Islets of Langerhans).

Step 2: It lowers blood glucose by promoting uptake of glucose into cells and stimulating glycogen formation in the liver.

Insulin lowers blood sugar levels.

Quick Tip

Insulin = Lowers blood sugar Glucagon = Raises blood sugar Both are pancreatic hormones.