GUJCET-PCE 2026 (Physics & Chemistry) Question Paper (Memory-Based Questions) with Solutions Pdf

Time Allowed :2 Hours	**Maximum Marks :**80	**Total Questions :**80

General Instructions

Read the following instructions very carefully and strictly follow them:

- The Physics & Chemistry test consists of 80 questions. Each question carries 1 mark. For each correct response, the candidate will get 1 mark. For each incorrect response, $\frac{1}{4}$ mark will be deducted. The maximum marks are 80.
- This Test is of 2 hour duration.
- Use Black Ball Point Pen only for writing particulars on OMR Answer Sheet and marking answers by darkening the circle **"•"**.
- Rough work is to be done on the space provided for this purpose in the Test Booklet only.
- On completion of the test, the candidate must handover the Answer Sheet to the Invigilator in the Room / Hall. The candidates are allowed to take away this Test Booklet with them.
- The Set No. for this Booklet is **09**. Make sure that the Set No. printed on the Answer Sheet is the same as that on this Booklet. In case of discrepancy, the candidate should immediately report the matter to the Invigilator for replacement of both the Test Booklet and the Answer Sheet.
- The candidate should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet.
- Do not write your Seat No. anywhere else, except in the specified space in the Test Booklet / Answer Sheet.
- Use of White fluid for correction is not permissible on the Answer Sheet.
- Each candidate must show on demand his/her Admission Card to the Invigilator.
- No candidate, without special permission of the Superintendent or Invigilator, should leave his/her seat.
- Use of Simple (Manual) Calculator is permissible.

Physics

1. A capacitor of capacitance C is connected to a battery of voltage V. What is the energy stored?

(a) CV
(b) $\frac{1}{2}CV^2$
(c) $\frac{1}{2}C^2V$
(d) CV^2

Correct Answer: (b) $\frac{1}{2}CV^2$

Solution:
Step 1: Understanding the Concept:
Energy is stored in a capacitor in the form of an electrostatic field between the plates. Work must be done by the battery to move charge onto the plates against the existing electric field.

Step 2: Formula Derivation:
The work done dW to add a small charge dq is $dW = V dq$. Since $V = q/C$, we integrate:

$$W = \int_0^Q \frac{q}{C} dq = \frac{1}{2}\frac{Q^2}{C}$$

Using $Q = CV$, we get $U = \frac{1}{2}CV^2$.

Step 3: Final Answer:
The energy stored is given by option (b).

Quick Tip

Remember the three forms of the energy formula: $U = \frac{1}{2}CV^2 = \frac{1}{2}QV = \frac{Q^2}{2C}$. Use the one that matches the given variables!

---

2. The dimensional formula of Planck's constant is:

(a) $[ML^2T^{-1}]$
(b) $[MLT^{-2}]$
(c) $[M^0L^2T^{-1}]$
(d) $[ML^2T^{-2}]$

Correct Answer: (a) $[ML^2T^{-1}]$

Solution:
Step 1: Understanding the Concept:
Planck's constant (h) relates the energy of a photon to its frequency ($E = h\nu$). Dimensions are found by isolating h.

Step 2: Dimensional Analysis:
Energy (E) has dimensions $[ML^2T^{-2}]$. Frequency (ν) has dimensions $[T^{-1}]$.

$$[h] = \frac{[E]}{[\nu]} = \frac{[ML^2T^{-2}]}{[T^{-1}]} = [ML^2T^{-1}]$$

Step 3: Final Answer:
The correct dimensional formula is $[ML^2T^{-1}]$.

Quick Tip

Planck's constant has the same dimensions as **Angular Momentum** ($L = r \times p$). This is a common shortcut for exams!

---

3. A body is moving in a circular path with constant speed. Its acceleration is:

(a) Zero
(b) Tangential
(c) Radial (centripetal)
(d) Both zero and tangential

Correct Answer: (c) Radial (centripetal)

Solution:
Step 1: Understanding the Concept:
In uniform circular motion, "constant speed" means the magnitude of velocity is fixed, but the **direction** is constantly changing.

Step 2: Detailed Explanation:
Since the direction changes, there must be acceleration. Tangential acceleration is zero because speed is constant. However, to keep the body in a circle, a centripetal (radial) acceleration acting toward the center is required, given by $a_c = v^2/r$.

Step 3: Final Answer:
The acceleration is purely Radial (centripetal).

Quick Tip

If speed is **changing** in a circle, you have both radial and tangential acceleration. If speed is **constant**, only radial exists.

---

4. The resistance of a wire increases with temperature because:

(a) Electron density increases
(b) Collision frequency increases
(c) Length decreases
(d) Area increases

Correct Answer: (b) Collision frequency increases

Solution:
Step 1: Understanding the Concept:
Resistance is the opposition to the flow of electrons. In conductors, this depends on the relaxation time (τ) between collisions.

Step 2: Detailed Explanation:
As temperature rises, the thermal energy causes ions in the lattice to vibrate more violently. This leads to more frequent collisions between drifting electrons and the ions. Since collision frequency increases, the relaxation time τ decreases. Because $R \propto 1/\tau$, the resistance increases.

Step 3: Final Answer:
The increase is due to increased collision frequency.

Quick Tip

For **semiconductors**, resistance **decreases** with temperature because the electron density (option A) increases significantly, outweighing the collision factor.

---

5. In Young's double slit experiment, fringe width depends on:

(a) Distance between slits
(b) Wavelength
(c) Distance to screen
(d) All of the above

Correct Answer: (d) All of the above

Solution:
Step 1: Understanding the Concept:
The fringe width (β) is the distance between two consecutive bright or dark fringes on the interference pattern.

Step 2: Formula Application:
The formula for fringe width is:

$$\beta = \frac{\lambda D}{d}$$

Where: λ = Wavelength of light D = Distance between slits and screen d = Distance between the two slits

Step 3: Final Answer:
Since β involves all three variables, the correct option is (d).

Quick Tip

To make fringes wider (easier to see), use a longer wavelength (Red light) or move the screen further away (D).

---

6. The escape velocity of Earth is approximately:

(a) 7.9 km/s
(b) 11.2 km/s
(c) 9.8 km/s
(d) 5 km/s

Correct Answer: (b) 11.2 km/s

Solution:
Step 1: Understanding the Concept:
Escape velocity (v_e) is the minimum speed an object must have to break free from the gravitational pull of a celestial body without further propulsion.

Step 2: Formula Application:
The formula for escape velocity is:

$$v_e = \sqrt{\frac{2GM}{R}} = \sqrt{2gR}$$

Using Earth's values ($g \approx 9.8$ m/s^2 and $R \approx 6.4 \times 10^6$ m):

$$v_e \approx \sqrt{2 \times 9.8 \times 6.4 \times 10^6} \approx 11.2 \text{ km/s}$$

Step 3: Final Answer:
The approximate value is 11.2 km/s.

Quick Tip

Don't confuse escape velocity (11.2 km/s) with orbital velocity (7.9 km/s). Orbital velocity is what you need to **stay** in orbit; escape velocity is what you need to **leave** it.

---

7. A transformer works on the principle of:

(a) Self induction
(b) Mutual induction
(c) Capacitance
(d) Resistance

Correct Answer: (b) Mutual induction

Solution:
Step 1: Understanding the Concept:
A transformer is a static device that transfers electrical energy from one circuit to another through inductively coupled conductors.

Step 2: Detailed Explanation:
When an alternating current flows through the primary coil, it creates a varying magnetic flux in the core. This changing flux passes through the secondary coil, inducing an electromotive force (EMF) in it. This phenomenon of inducing voltage in one coil due to current change in another is called **Mutual Induction**.

Step 3: Final Answer:
The principle is Mutual induction.

Quick Tip

Transformers **only** work with Alternating Current (AC). They will not work with Direct Current (DC) because DC does not create the **changing** magnetic flux needed for induction.

---

8. If the frequency of a wave increases, its wavelength:

(a) Increases
(b) Decreases
(c) Remains same
(d) Becomes zero

Correct Answer: (b) Decreases

Solution:
Step 1: Understanding the Concept:
For any wave traveling through a medium at a constant speed (v), there is a fixed relationship between its frequency (f) and wavelength (λ).

Step 2: Mathematical Relationship:
The wave equation is:

$$v = f\lambda$$

If the speed (v) remains constant, frequency and wavelength are inversely proportional ($f \propto 1/\lambda$). Therefore, if frequency increases, the wavelength must decrease to maintain the same speed.

Step 3: Final Answer:
The wavelength decreases.

Quick Tip

In the electromagnetic spectrum, Violet light has a higher frequency than Red light, which is why Violet has a **shorter** wavelength.

Chemistry

9. Which of the following is an example of a strong electrolyte?

(a) Acetic acid
(b) NaCl
(c) NH_4OH
(d) Glucose

Correct Answer: (b) NaCl

Solution:
Step 1: Understanding the Concept:
An electrolyte is a substance that dissociates into ions when dissolved in water. A **strong electrolyte** is one that dissociates completely (100%) into ions, providing high electrical conductivity.

Step 2: Detailed Explanation:
NaCl (Sodium Chloride): It is a strong ionic salt that completely breaks into Na^+ and Cl^- ions in solution. **Acetic acid (CH_3COOH)** and **NH_4OH:** These are weak electrolytes; they only partially ionize. **Glucose:** It is a non-electrolyte; it dissolves but does not form ions.

Step 3: Final Answer:
The correct option is (b).

Quick Tip

Most soluble salts (like NaCl, KCl), strong acids (HCl, H_2SO_4), and strong bases (NaOH) are always strong electrolytes.

---

10. The hybridization of carbon in methane (CH_4) is:

(a) sp
(b) sp^2
(c) sp^3
(d) dsp^2

Correct Answer: (c) sp^3

Solution:
Step 1: Understanding the Concept:
Hybridization is the mixing of atomic orbitals to form new hybrid orbitals suitable for the pairing of electrons to form chemical bonds.

Step 2: Detailed Explanation:
In Methane (CH_4), the central Carbon atom has 4 valence electrons and forms 4 sigma (σ) bonds with Hydrogen atoms. To accommodate 4 bonds with equal energy and a tetrahedral geometry (bond angle 109.5°), one s-orbital and three p-orbitals mix to form four equivalent $\mathbf{sp^3}$ hybrid orbitals.

Step 3: Final Answer:
The hybridization is sp^3.

Quick Tip

Count the number of "items" (atoms attached + lone pairs) around the central atom. 4 items = sp^3, 3 items = sp^2, 2 items = sp.

---

11. Which gas is evolved when zinc reacts with dilute HCl?

(a) Oxygen
(b) Hydrogen
(c) Chlorine
(d) Nitrogen

Correct Answer: (b) Hydrogen

Solution:
Step 1: Understanding the Concept:
Active metals (those above Hydrogen in the reactivity series) react with dilute acids to displace Hydrogen and form a metal salt.

Step 2: Chemical Equation:
The balanced chemical equation for the reaction is:

$$Zn(s) + 2HCl(aq) \rightarrow ZnCl_2(aq) + H_2(g) \uparrow$$

Zinc (Zn) displaces the Hydrogen (H) from Hydrochloric acid because it is more reactive.

Step 3: Final Answer:
Hydrogen gas is evolved.

Quick Tip

To test for Hydrogen gas, bring a burning splinter near the mouth of the test tube. It will burn with a characteristic **"pop"** sound.

12. The pH of a neutral solution at 25°C is:

(a) 0
(b) 14
(c) 7
(d) 1

Correct Answer: (c) 7

Solution:
Step 1: Understanding the Concept:
The pH scale measures the acidity or alkalinity of a solution. It is defined as the negative logarithm of the hydrogen ion concentration: $pH = -\log[H^+]$.

Step 2: Detailed Explanation:
At 25°C, the ionic product of water (K_w) is 1.0×10^{-14}. For a neutral solution, the concentration of hydrogen ions $[H^+]$ is equal to the concentration of hydroxide ions $[OH^-]$.

$$[H^+] = \sqrt{K_w} = 1.0 \times 10^{-7} \text{ mol/L}$$

Taking the negative log: $pH = -\log(10^{-7}) = 7$.

Step 3: Final Answer:
The correct option is (c).

Quick Tip

The pH scale is temperature-dependent. If the temperature increases, the pH of neutral water actually **decreases** below 7, even though the water remains neutral!

---

13. Which of the following is an example of an oxidation reaction?

(a) Gain of electrons
(b) Loss of electrons
(c) Gain of hydrogen
(d) Loss of oxygen

Correct Answer: (b) Loss of electrons

Solution:
Step 1: Understanding the Concept:
Oxidation and Reduction (Redox) can be defined using the classical view (oxygen/hydrogen) or the modern electronic view (electrons).

Step 2: Detailed Explanation:
According to the electronic concept: **Oxidation** is the loss of electrons by an atom, ion, or

molecule. **Reduction** is the gain of electrons. In the classical view, oxidation is also the gain of oxygen or the loss of hydrogen.

Step 3: Final Answer:
Loss of electrons is the correct definition for oxidation.

Quick Tip

Use the mnemonic **OIL RIG**: **O**xidation **I**s **L**oss, **R**eduction **I**s **G**ain (of electrons).

---

14. The IUPAC name of CH_3COOH is:

(a) Methanoic acid
(b) Ethanoic acid
(c) Propanoic acid
(d) Butanoic acid

Correct Answer: (b) Ethanoic acid

Solution:
Step 1: Understanding the Concept:
IUPAC nomenclature follows specific rules: identifying the longest carbon chain, numbering, and adding the functional group suffix.

Step 2: Detailed Explanation:
The molecule CH_3COOH contains: 1. Two carbon atoms (Root word: "Eth"). 2. Single bonds between carbons ("an"). 3. A carboxylic acid group $-COOH$ (Suffix: "oic acid"). Combining these, we get **Ethanoic acid**. Its common name is Acetic acid.

Step 3: Final Answer:
The correct option is (b).

Quick Tip

Always count the carbon atom present **inside** the functional group (like $-COOH$ or $-CHO$) as part of the main chain.

---

15. Which of the following elements has the highest electronegativity?

(a) Oxygen
(b) Nitrogen
(c) Fluorine
(d) Chlorine

Correct Answer: (c) Fluorine

Solution:
Step 1: Understanding the Concept:
Electronegativity is the tendency of an atom to attract a shared pair of electrons toward itself in a covalent bond.

Step 2: Detailed Explanation:
In the periodic table, electronegativity increases from left to right across a period and decreases down a group. **Fluorine** is located at the top-right (excluding noble gases), making it the most electronegative element with a value of approximately 4.0 on the Pauling scale.

Step 3: Final Answer:
The correct option is (c).

Quick Tip

Remember the order of the top three most electronegative elements: $F > O > N$. (Mnemonic: "FON" or "Phone").
