MHT CET 2026 April 22 Shift 2

Question Paper with Solutions (Memory Based)

Conducted by CET Cell, Maharashtra

General Instructions

(i) **Duration:** The total duration of the examination is 3 hours (180 minutes).

(ii) **Total Marks:** The complete paper carries a maximum of 200 marks.

(iii) **Structure:** The paper has 3 Sections:

- **Section A:** 50 Multiple Choice Questions (Physics)
- **Section B:** 50 Multiple Choice Questions (Chemistry)
- **Section C:** 100 Multiple Choice Questions (Biology)

(iv) **Compulsory Questions:** All 200 questions are compulsory.

(v) Each question has four options. Only **one** option is correct.

(vi) **Right Answer:** Physics (+1 marks), Chemistry (+1 marks) and Biology(+1 marks).

(vii) **Incorrect Answer:** (No Negative marking).

(viii) **Unanswered/Marked for Review:** 0 marks.

1. Calculate the centripetal acceleration of a particle moving in a circle of radius $5\,\text{m}$ with a velocity of $20\,\text{m/s}$.

(A) $80\,\text{m/s}^2$

(B) $40\,\text{m/s}^2$

(C) $100\,\text{m/s}^2$

(D) $160\,\text{m/s}^2$

Correct Answer: (1) $80\,\text{m/s}^2$

Solution:

Concept:

For a particle moving in a circular path, the acceleration directed toward the center of the circle is called **centripetal acceleration**. It depends on the velocity of the particle and the radius of the circular path.

$$\text{Centripetal acceleration} = \frac{v^2}{r}$$

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Step 1: Write the given values from the question.

$$v = 20\,\text{m/s}, \qquad r = 5\,\text{m}$$

Step 2: Substitute the values into the centripetal acceleration formula.

$$a = \frac{v^2}{r}$$

$$a = \frac{(20)^2}{5}$$

Step 3: Calculate the value.

$$a = \frac{400}{5} = 80\,\text{m/s}^2$$

Hence, the centripetal acceleration of the particle is:

$$\boxed{80\,\text{m/s}^2}$$

Quick Tip: In circular motion problems, always remember the centripetal acceleration relation $a = \frac{v^2}{r}$. Increasing velocity increases acceleration rapidly because velocity is squared.

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2. What is the working principle behind signal transmission in an optical fiber?

(A) Refraction

(B) Diffraction

(C) Total Internal Reflection

(D) Interference

Correct Answer: (3) Total Internal Reflection

Solution:

Concept:

Optical fibers transmit light signals over long distances using the principle of **Total Internal Reflection (TIR)**. When light travels from a denser medium to a rarer medium at an angle greater than the critical angle, it gets completely reflected back into the denser medium instead of refracting out.

Step 1: Understand the structure of an optical fiber.

An optical fiber consists of:

- Core (denser medium)
- Cladding (rarer medium)

Step 2: Apply the condition for Total Internal Reflection.

Light entering the core strikes the core-cladding boundary at an angle greater than the critical angle, causing it to reflect entirely within the core.

Step 3: Resulting transmission.

Due to repeated total internal reflections, the light signal propagates through the fiber with minimal loss.

Hence, the working principle behind signal transmission in optical fibers is:

Total Internal Reflection

Quick Tip: For Total Internal Reflection to occur: (1) Light must travel from a denser to a rarer medium, and (2) The angle of incidence must be greater than the critical angle.

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3. Find the equivalent resistance of three resistors of $6\,\Omega$ each connected in parallel.

(A) $6\,\Omega$

(B) $3\,\Omega$

(C) $2\,\Omega$

(D) $1\,\Omega$

Correct Answer: (3) $2\,\Omega$

Solution:

Concept:

When resistors are connected in **parallel**, the reciprocal of the equivalent resistance is equal to the sum of the reciprocals of the individual resistances.

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Step 1: Write the given resistance values.

$$R_1 = R_2 = R_3 = 6\,\Omega$$

Step 2: Substitute the values in the parallel resistance formula.

$$\frac{1}{R_p} = \frac{1}{6} + \frac{1}{6} + \frac{1}{6}$$

Step 3: Calculate the equivalent resistance.

$$\frac{1}{R_p} = \frac{3}{6} = \frac{1}{2}$$

$$R_p = 2\,\Omega$$

Hence, the equivalent resistance is:

$$\boxed{2\,\Omega}$$

Quick Tip: For n identical resistors connected in parallel, the equivalent resistance is given by R/n, where R is the resistance of each resistor.

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4. According to Curie's Law, what happens to magnetic susceptibility if absolute temperature is doubled?

(A) It doubles

(B) It is halved

(C) It remains constant

(D) It becomes zero

Correct Answer: (2) It is halved

Solution:

Concept:

Curie's Law states that the magnetic susceptibility of a paramagnetic material is inversely proportional to the absolute temperature.

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where χ is magnetic susceptibility, C is Curie constant, and T is absolute temperature.

Step 1: Understand the proportionality from Curie's Law.

$$\chi \propto \frac{1}{T}$$

Step 2: Analyze the effect of doubling temperature. If temperature becomes $2T$:

$$\chi' = \frac{C}{2T} = \frac{1}{2}\left(\frac{C}{T}\right)$$

Step 3: Interpret the result. The new susceptibility becomes half of the original value.

Hence,

Magnetic susceptibility is halved

Quick Tip: Curie's Law applies to paramagnetic materials and shows that increasing temperature weakens magnetization because thermal agitation disturbs the alignment of magnetic moments.

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5. Which series of the Hydrogen spectrum lies in the visible region?

(A) Lyman Series

(B) Balmer Series

(C) Paschen Series

(D) Brackett Series

Correct Answer: (2) Balmer Series

Solution:

Concept:

The hydrogen atom emits spectral lines when an electron transitions between different energy levels. These spectral lines are grouped into series depending on the final energy level of the electron.

- Lyman Series: Ultraviolet region ($n = 1$)
- Balmer Series: Visible region ($n = 2$)
- Paschen Series: Infrared region ($n = 3$)
- Brackett Series: Infrared region ($n = 4$)

The wavelength of spectral lines in hydrogen is given by the Rydberg formula.

$$\frac{1}{\lambda} = R\left(\frac{1}{n_1^2} - \frac{1}{n_2^2}\right)$$

Step 1: Identify the series corresponding to the visible region.

In the hydrogen spectrum, transitions ending at the energy level $n = 2$ produce visible spectral lines.

Step 2: Recognize the name of this series.

The spectral series corresponding to transitions terminating at $n = 2$ is called the **Balmer Series**.

Step 3: State the conclusion.

Therefore, the hydrogen spectral series that lies in the visible region is the Balmer Series.

Balmer Series

Quick Tip: Remember the order of hydrogen spectral series with increasing wavelength: Lyman (UV) → Balmer (Visible) → Paschen → Brackett → Pfund (Infrared).

6. Arrange carbocations in increasing order of stability.

(A) Tertiary < Secondary < Primary

(B) Primary < Secondary < Tertiary

(C) Secondary < Primary < Tertiary

(D) Primary < Tertiary < Secondary

Correct Answer: (2) Primary < Secondary < Tertiary

Solution:

Concept:

Carbocations are positively charged carbon species. Their stability depends mainly on the **electron-donating effect of alkyl groups**. Alkyl groups stabilize carbocations through the **+I (inductive effect)** and **hyperconjugation**.

Greater the number of alkyl groups attached to the positively charged carbon, greater is the stabilization.

Step 1: Identify the type of carbocations.

- Primary carbocation: carbon attached to one alkyl group
- Secondary carbocation: carbon attached to two alkyl groups
- Tertiary carbocation: carbon attached to three alkyl groups

Step 2: Apply stability rule.

More alkyl groups provide greater stabilization through inductive effect and hyperconjugation.

Step 3: Arrange them in increasing stability.

$$\text{Primary} < \text{Secondary} < \text{Tertiary}$$

$$\boxed{\text{Primary} < \text{Secondary} < \text{Tertiary}}$$

Quick Tip: Carbocation stability generally follows: Tertiary > Secondary > Primary > Methyl due to increasing hyperconjugation and inductive effects.

7. What is the oxidation state of Phosphorus in H_3PO_4?

(A) +3

(B) +5

(C) +1

(D) −3

Correct Answer: (2) +5

Solution:

Concept:

The oxidation state of an element in a compound is calculated by assigning standard oxidation numbers to known atoms and solving for the unknown element.

Rules used:

- Hydrogen generally has oxidation state +1
- Oxygen generally has oxidation state −2
- The sum of oxidation states in a neutral compound is zero

Step 1: Assign oxidation states to known elements.

$$H = +1, \quad O = -2$$

For H_3PO_4:

$$3(+1) + x + 4(-2) = 0$$

where x is the oxidation state of phosphorus.

Step 2: Solve the equation.

$$3 + x - 8 = 0$$

$$x - 5 = 0$$

$$x = +5$$

Step 3: State the result.

$$\boxed{+5}$$

Quick Tip: To find oxidation states quickly, remember common values: Hydrogen +1, Oxygen −2, Alkali metals +1, and the total oxidation number of a neutral compound is always zero.

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8. What color is produced when Phenol reacts with neutral Ferric Chloride?

(A) Blue

(B) Violet

(C) Green

(D) Yellow

Correct Answer: (2) Violet

Solution:

Concept:

Phenols react with neutral ferric chloride ($FeCl_3$) to form colored complexes. This reaction is commonly used as a qualitative test for phenolic compounds.

Step 1: Understand the reaction.

When phenol reacts with neutral ferric chloride, a complex ion is formed between the phenoxide ion and Fe^{3+}.

Step 2: Observe the characteristic color.

This complex formation produces a characteristic **violet color** in the solution.

Step 3: State the conclusion.

$$\boxed{\text{Violet color}}$$

Quick Tip: The Ferric Chloride test is widely used to detect phenols. Most phenols give violet, blue, or green colored complexes with Fe^{3+}.

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9. Calculate the pH of a 0.001 M solution of HNO_3.

(A) 1

(B) 2

(C) 3

(D) 4

Correct Answer: (3) 3

Solution:

Concept:

The pH of a solution is defined as the negative logarithm of the hydrogen ion concentration in the solution.

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Nitric acid (HNO_3) is a strong acid and completely dissociates in water, producing hydrogen ions.

Step 1: Write the concentration of hydrogen ions.

Since HNO_3 is a strong acid,

$$[H^+] = 0.001 = 10^{-3}$$

Step 2: Substitute into the pH formula.

$$pH = -\log(10^{-3})$$

Step 3: Calculate the value.

$$pH = 3$$

Hence,

$$\boxed{pH = 3}$$

Quick Tip: For strong acids, assume complete dissociation. If $[H^+] = 10^{-n}$, then $pH = n$.

10. What are the monomers of Buna-S?

(A) Ethene and Styrene

(B) 1,3-Butadiene and Styrene

(C) Isoprene and Styrene

(D) Butadiene and Vinyl Chloride

Correct Answer: (2) 1,3-Butadiene and Styrene

Solution:

Concept:

Buna-S is a synthetic rubber produced by the copolymerization of two different monomers. The name Buna-S is derived from its components:

- **Bu**: Butadiene
- **Na**: Sodium catalyst used in polymerization
- **S**: Styrene

Step 1: Identify the monomers involved.

The two monomers used in Buna-S formation are:

- 1,3-Butadiene
- Styrene

Step 2: Understand the polymer formation.

These monomers undergo copolymerization to produce **styrene-butadiene rubber (SBR)**, commonly called Buna-S.

Step 3: State the final answer.

1,3-Butadiene and Styrene

Quick Tip: Common synthetic rubbers: Buna-S (Butadiene + Styrene), Buna-N (Butadiene + Acrylonitrile), and Neoprene (Chloroprene).

11. Which plant hormone promotes apical dominance?

(A) Gibberellin

(B) Cytokinin

(C) Auxin

(D) Ethylene

Correct Answer: (3) Auxin

Solution:

Concept:

Apical dominance is the phenomenon in which the main central stem of a plant grows more strongly than the side branches. This occurs due to the action of plant hormones that regulate growth.

Auxin is the plant hormone responsible for promoting apical dominance. It is synthesized in the **apical bud** (tip of the plant) and transported downward.

Step 1: Understand the role of auxin.

Auxin inhibits the growth of lateral (side) buds while promoting elongation of the main shoot.

Step 2: Mechanism of action.

Auxin moves from the apical bud downward and suppresses the growth of axillary buds, preventing branching.

Step 3: Conclusion.

Thus, auxin maintains apical dominance by ensuring the main stem grows preferentially.

Auxin

Quick Tip: If the apical bud is removed, auxin supply decreases, and lateral buds start growing, leading to bushier plants.

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12. Name the antibody most abundant in human colostrum.

(A) IgG

(B) IgM

(C) IgA

(D) IgE

Correct Answer: (3) IgA

Solution:

Concept:

Colostrum is the first milk produced by the mother immediately after childbirth. It is rich in antibodies that provide passive immunity to the newborn.

Among all immunoglobulins, **Immunoglobulin A (IgA)** is the most abundant in colostrum.

Step 1: Understand the function of colostrum.

Colostrum protects the newborn against infections, especially in the early days when the infant's immune system is not fully developed.

Step 2: Role of IgA.

IgA protects mucosal surfaces such as the gastrointestinal tract by preventing pathogen attachment.

Step 3: Conclusion.

Thus, IgA is the predominant antibody in colostrum.

$$\boxed{\text{IgA}}$$

Quick Tip: IgA is mainly found in secretions like saliva, tears, and milk, where it plays a key role in mucosal immunity.

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13. What is the phenotypic ratio of a Mendelian dihybrid cross in F_2?

(A) 3 : 1

(B) 1 : 2 : 1

(C) 9 : 3 : 3 : 1

(D) 1 : 1 : 1 : 1

Correct Answer: (3) 9 : 3 : 3 : 1

Solution:

Concept:

A dihybrid cross involves two pairs of contrasting traits. According to Mendel's law of independent assortment, alleles of different genes assort independently during gamete formation.

Step 1: Consider the parental cross.

Example: $YYRR \times yyrr$

Step 2: F_1 generation.

All offspring are heterozygous: $YyRr$

Step 3: F_2 generation.

Self-cross: $YyRr \times YyRr$

Gametes formed: YR, Yr, yR, yr

Step 4: Phenotypic ratio.

On combining these gametes, four phenotypes appear in the ratio:

$$9:3:3:1$$

Step 5: Interpretation.

- 9: Both dominant traits
- 3: First dominant, second recessive
- 3: First recessive, second dominant
- 1: Both recessive

$$\boxed{9:3:3:1}$$

Quick Tip: The 9 : 3 : 3 : 1 ratio is observed only when genes assort independently and there is no linkage between them.

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14. Which enzyme acts as "molecular glue" to join DNA fragments?

(A) DNA Polymerase

(B) DNA Ligase

(C) Helicase

(D) Restriction Endonuclease

Correct Answer: (2) DNA Ligase

Solution:

Concept:

DNA ligase is an enzyme that joins DNA fragments by forming phosphodiester bonds between adjacent nucleotides. It is commonly referred to as **"molecular glue"**.

Step 1: Understand its function.

DNA ligase seals nicks in the DNA backbone during replication and repair.

Step 2: Role in recombinant DNA technology.

It is used to join DNA fragments cut by restriction enzymes, enabling the formation of recombinant DNA.

Step 3: Conclusion.

Thus, DNA ligase acts as the molecular glue that joins DNA fragments.

DNA Ligase

Quick Tip: DNA ligase is essential in DNA replication (joining Okazaki fragments) and in genetic engineering for creating recombinant DNA molecules.

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15. In which ecological interaction is one species harmed while the other is unaffected?

(A) Mutualism

(B) Parasitism

(C) Commensalism

(D) Amensalism

Correct Answer: (4) Amensalism

Solution:

Concept:

Ecological interactions describe the relationships between organisms living in the same environment. Different types of interactions affect the species involved in different ways.

- **Mutualism**: Both species benefit.
- **Parasitism**: One benefits while the other is harmed.
- **Commensalism**: One benefits while the other is unaffected.
- **Amensalism**: One species is harmed while the other remains unaffected.

Step 1: Identify the definition given in the question.

The interaction described is where one organism suffers harm while the other organism does not experience any benefit or harm.

Step 2: Match with the correct ecological term.

This interaction corresponds to **amensalism**.

Step 3: Example of amensalism.

A classic example is the production of antibiotics by certain fungi that inhibit bacterial growth without affecting the fungus itself.

Amensalism

Quick Tip: Remember the interaction symbols: Mutualism (+/+), Commensalism (+/0), Parasitism (+/), and Amensalism (/0).