MHT CET 2026 April 22 Shift 1

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. Which of the following is a soft metal?

(A) Iron

(B) Sodium

(C) Aluminium

(D) Copper

Correct Answer: (B) Sodium

Solution:

Concept: Metals can be classified based on their physical properties such as hardness, malleability, and reactivity.

- **Hard metals** (like iron and copper) are strong and not easily cut.
- **Soft metals** are those that can be easily cut with a knife.
- **Alkali metals** (Group 1 elements like sodium, potassium) are extremely soft and highly reactive.

Sodium is a well-known soft metal and can even be cut with a knife due to its low density and weak metallic bonding.

Step 1: Analyzing each option.

- **Iron:** A hard and strong metal, not soft.
- **Sodium:** A very soft metal, can be cut easily with a knife.
- **Aluminium:** Moderately hard, not classified as a soft metal like alkali metals.
- **Copper:** Hard and tough metal, not soft.

Step 2: Identifying the correct answer.

Among the given options, only sodium belongs to alkali metals and is soft in nature.

Quick Tip: Alkali metals (Group 1 elements like lithium, sodium, potassium) are always soft metals and can be easily cut with a knife.

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2. For a weak base of concentration C and degree of dissociation α, what is the correct relation between K_b and C?

(A) $K_b = C\alpha$

(B) $K_b = C\alpha^2$

(C) $K_b = \dfrac{\alpha}{C}$

(D) $K_b = \dfrac{C}{\alpha^2}$

Correct Answer: (B) $K_b = C\alpha^2$

Solution:

Concept:

A weak base partially dissociates in water. If the base is represented as B, the dissociation equilibrium can be written as:

$$B + H_2O \rightleftharpoons BH^+ + OH^-$$

The equilibrium constant for a weak base is called the **base dissociation constant** K_b.

$$K_b = \frac{[BH^+][OH^-]}{[B]}$$

If the initial concentration of the base is C and the degree of dissociation is α:

- Concentration of dissociated base $= C\alpha$
- Concentration of BH^+ formed $= C\alpha$
- Concentration of OH^- formed $= C\alpha$
- Remaining base concentration $= C(1-\alpha)$

Since weak bases dissociate very slightly, we approximate:

$$1 - \alpha \approx 1$$

This simplifies the calculation of K_b.

Step 1: Write the equilibrium expression for K_b.

$$K_b = \frac{[BH^+][OH^-]}{[B]}$$

Step 2: Substitute the concentrations using degree of dissociation.

$$K_b = \frac{(C\alpha)(C\alpha)}{C(1-\alpha)}$$

Step 3: Apply the approximation for weak bases.

Since α is very small:

$$1-\alpha \approx 1$$

Thus,

$$K_b = \frac{C^2\alpha^2}{C}$$

$$K_b = C\alpha^2$$

Step 4: Identify the correct option.

Therefore, the correct relation between K_b and C is:

$$K_b = C\alpha^2$$

Quick Tip: For weak electrolytes (weak acids or weak bases), when the degree of dissociation α is very small, we use the approximation $1-\alpha \approx 1$. Thus, the relation becomes: $K = C\alpha^2$.

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3. A carrier daughter $(X^N X^c)$ of a colour blind father marries a normal male $(X^N Y)$. What is the probability of a colour blind son?

(A) 0%

(B) 25%

(C) 50%

(D) 75%

Correct Answer: (B) 25%

Solution:

Concept:

Colour blindness is a **sex-linked recessive disorder** controlled by a gene located on the X-chromosome.

- X^N = Normal vision allele
- X^c = Colour blindness allele

Important points:

- Males have one X and one Y chromosome (XY).
- Females have two X chromosomes (XX).
- A recessive trait like colour blindness appears in males if their single X chromosome carries the defective gene.
- A female must have two defective alleles to be colour blind, otherwise she becomes a carrier.

Step 1: Identify the parental genotypes.

The given cross is:

$$\text{Carrier female } (X^N X^c) \times \text{Normal male } (X^N Y)$$

Gametes produced:

- Female gametes: X^N, X^c
- Male gametes: X^N, Y

Step 2: Construct the Punnett square.

	X^N	Y
X^N	$X^N X^N$	$X^N Y$
X^c	$X^N X^c$	$X^c Y$

Step 3: Interpret the offspring genotypes.

- $X^N X^N \rightarrow$ Normal daughter
- $X^N X^c \rightarrow$ Carrier daughter
- $X^N Y \rightarrow$ Normal son
- $X^c Y \rightarrow$ Colour blind son

Thus, out of the four possible offspring combinations, only one represents a colour blind son.

Step 4: Calculate the probability.

$$\text{Probability of colour blind son} = \frac{1}{4} = 25\%$$

Therefore, the probability of a colour blind son is 25%.

Quick Tip: Sex-linked recessive disorders such as colour blindness and haemophilia are more common in males because males have only one X chromosome. A single defective allele on the X chromosome will express the disorder.

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4. Outer layer of microspore is made up of:

(A) Cellulose

(B) Pectin

(C) Sporopollenin

(D) Lignin

Correct Answer: (C) Sporopollenin

Solution:

Concept:

A **microspore** develops into a pollen grain during the process of microsporogenesis in flowering plants. The pollen grain wall has two distinct layers:

- **Exine** – the outer layer
- **Intine** – the inner layer

The **exine** is extremely tough and resistant to physical, chemical, and biological degradation. This outer layer is composed of a highly resistant organic substance called **sporopollenin**. Sporopollenin is known to be one of the most chemically stable biological materials, which protects the pollen grains from harsh environmental conditions such as high temperature, strong acids, and enzymes.

Step 1: Identify the layers of a microspore wall.

The microspore (pollen grain) wall consists of:

- Outer layer → **Exine**

- Inner layer → **Intine**

Step 2: Determine the composition of the outer layer.

The **exine** (outer layer) is composed of the highly resistant substance:

Exine → Sporopollenin

Step 3: Eliminate incorrect options.

- **Cellulose** → Mainly present in plant cell walls and intine.
- **Pectin** → Found in middle lamella of plant cell walls.
- **Lignin** → Present in secondary cell walls of vascular tissues.

Thus, none of these form the outer layer of the microspore.

Step 4: Select the correct option.

Therefore, the outer layer of a microspore is made up of:

Sporopollenin

Quick Tip: The exine of pollen grains is made of sporopollenin, one of the most resistant organic substances known in nature. This allows pollen grains to remain preserved for thousands of years as fossils.

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5. Special type of roots present in epiphytic plants are:

(A) Prop roots

(B) Pneumatophores

(C) Clinging roots

(D) Velamen roots

Correct Answer: (D) Velamen roots

Solution:

Concept:

Epiphytes are plants that grow on other plants for physical support but do not derive nutrients from them. They commonly grow on tree trunks or branches in tropical forests. Examples include many orchids.

Since epiphytes do not grow in soil, they require special adaptations to absorb water and nutrients directly from the atmosphere. One such adaptation is the presence of **velamen roots**.

- **Velamen** is a thick, spongy, multilayered epidermis found in the aerial roots of epiphytic plants.
- It helps in rapid absorption of moisture and nutrients from the surrounding air.
- It also protects the roots from excessive water loss and mechanical damage.

Step 1: Understand the adaptation of epiphytic plants.

Epiphytic plants grow on other plants and therefore cannot obtain water from soil. They depend on atmospheric moisture, rainwater, and organic debris.

To efficiently absorb this moisture, they develop specialized **aerial roots with velamen tissue**.

Step 2: Analyze the given options.

- **Prop roots:** Provide mechanical support to plants like banyan trees.
- **Pneumatophores:** Respiratory roots found in mangrove plants growing in waterlogged soils.
- **Clinging roots:** Help climbers attach to support structures.
- **Velamen roots:** Specialized aerial roots found in epiphytic plants for absorbing moisture from the air.

Step 3: Identify the correct option.

Therefore, the special type of roots present in epiphytic plants are:

Velamen roots

Quick Tip: Epiphytic orchids possess aerial roots covered with velamen, a spongy tissue that quickly absorbs atmospheric moisture and dissolved nutrients.

6. The unwinding of DNA during replication is done by:

(A) DNA polymerase

(B) Ligase

(C) Helicase

(D) Primase

Correct Answer: (C) Helicase

Solution:

Concept:

DNA replication is the process by which a DNA molecule produces two identical copies of itself. During this process, the double-stranded DNA must first be separated so that each strand can act as a template for synthesis of a new strand.

Several enzymes participate in DNA replication, each performing a specific function.

- **Helicase** – Unwinds the DNA double helix by breaking hydrogen bonds between base pairs.
- **DNA polymerase** – Synthesizes the new DNA strand by adding nucleotides.
- **Primase** – Synthesizes short RNA primers needed to start DNA synthesis.
- **Ligase** – Joins fragments of DNA (especially Okazaki fragments) by forming phosphodiester bonds.

Step 1: Understand the first step of DNA replication.

During replication, the DNA double helix must first open so that the two strands can separate. This separation occurs at a region called the **replication fork**.

Step 2: Identify the enzyme responsible for unwinding DNA.

The enzyme **helicase** moves along the DNA molecule and breaks the hydrogen bonds between complementary base pairs. This action unwinds the double helix and separates the two strands.

$$\text{DNA double helix} \xrightarrow{\text{Helicase}} \text{Two single DNA strands}$$

Step 3: Eliminate the incorrect options.

- **DNA polymerase:** Responsible for synthesizing new DNA strands.
- **Ligase:** Joins DNA fragments during replication.
- **Primase:** Produces RNA primers needed to initiate DNA synthesis.

None of these enzymes unwind the DNA helix.

Step 4: Select the correct answer.

Thus, the enzyme responsible for unwinding DNA during replication is:

Helicase

Quick Tip: Helicase is often called the "unzipping enzyme" because it breaks hydrogen bonds between base pairs and opens the DNA double helix during replication.

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7. Which of the following is a correct pair of disease and cause?

(A) Malaria – Virus

(B) Typhoid – Bacteria

(C) Tuberculosis – Fungi

(D) AIDS – Bacteria

Correct Answer: (B) Typhoid – Bacteria

Solution:

Concept:

Diseases are caused by different types of pathogens such as bacteria, viruses, fungi, protozoa, and parasites. Correctly identifying the causative agent is important for diagnosis and treatment.

Some common disease-causing organisms include:

- **Bacteria** – e.g., Typhoid, Tuberculosis
- **Viruses** – e.g., AIDS, Influenza
- **Protozoa** – e.g., Malaria

- **Fungi** – e.g., Ringworm

Step 1: Analyze each option.

- **Malaria – Virus:** Incorrect. Malaria is caused by a protozoan parasite *Plasmodium*.
- **Typhoid – Bacteria:** Correct. Typhoid fever is caused by the bacterium *Salmonella typhi*.
- **Tuberculosis – Fungi:** Incorrect. Tuberculosis is caused by the bacterium *Mycobacterium tuberculosis*.
- **AIDS – Bacteria:** Incorrect. AIDS is caused by a virus called *Human Immunodeficiency Virus (HIV)*.

Step 2: Identify the correct disease-cause pair.
Among the given options, the correct pair is:

$$\text{Typhoid} \rightarrow \text{Bacteria (Salmonella typhi)}$$

Therefore, the correct answer is option (B).

Quick Tip: Remember common disease-causing agents: Malaria – Protozoa (*Plasmodium*), Typhoid – Bacteria (*Salmonella typhi*), Tuberculosis – Bacteria (*Mycobacterium tuberculosis*), AIDS – Virus (HIV).

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8. Which of the following is NOT a characteristic of Turner's syndrome?

(A) Webbed neck
(B) Stunted growth
(C) Gynaecomastia
(D) Rudimentary ovaries

Correct Answer: (C) Gynaecomastia

Solution:

Concept:
Turner's syndrome is a chromosomal disorder that occurs in females due to the absence of

one X chromosome. The chromosomal composition is:

$$45, XO$$

This condition results from nondisjunction during meiosis, leading to monosomy of the X chromosome.

Common characteristics of Turner's syndrome include:

- Short or stunted growth
- Webbed neck
- Broad chest with widely spaced nipples
- Underdeveloped or rudimentary ovaries
- Sterility

Step 1: Identify the features of Turner's syndrome.

Individuals with Turner's syndrome are phenotypically female but show several developmental abnormalities such as:

- **Webbed neck**
- **Short stature (stunted growth)**
- **Rudimentary ovaries**

These features occur due to the absence of one X chromosome.

Step 2: Analyze the incorrect option.

Gynaecomastia refers to the abnormal enlargement of male breast tissue. This feature is typically associated with **Klinefelter's syndrome** $(47, XXY)$ in males.

Therefore, gynaecomastia is not a characteristic of Turner's syndrome.

Step 3: Select the correct option.

Among the given choices, the feature that is NOT associated with Turner's syndrome is:

Gynaecomastia

Quick Tip: Turner's syndrome (45, XO) occurs in females and is characterized by short stature, webbed neck, and rudimentary ovaries. Gynaecomastia is a feature of Klinefelter's syndrome (47, XXY), not Turner's syndrome.

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9. A uniform disc of mass M and radius R is rotating about an axis through its center and perpendicular to its plane. What is its moment of inertia?

(A) MR^2

(B) $\frac{1}{4}MR^2$

(C) $\frac{1}{2}MR^2$

(D) $2MR^2$

Correct Answer: (C) $\frac{1}{2}MR^2$

Solution:

Concept:

The **moment of inertia** measures how difficult it is to change the rotational motion of a body about a given axis. It depends on how the mass of the body is distributed relative to the axis of rotation.

For a continuous body,

$$I = \int r^2 \, dm$$

where:

- r is the perpendicular distance of the mass element from the axis,
- dm is the small mass element.

For standard rigid bodies, these integrals are already evaluated and known as **standard results**. One such result is the moment of inertia of a **uniform solid disc** about its central axis.

Step 1: Identify the body and the axis of rotation.

The object is a **uniform solid disc** of:

$$\text{Mass} = M, \qquad \text{Radius} = R$$

The axis of rotation passes:

- Through the **center of the disc**
- **Perpendicular to its plane**

This is the **standard central axis** for a disc.

Step 2: Use the standard formula for a solid disc.

The moment of inertia of a uniform disc about this axis is:

$$I = \frac{1}{2}MR^2$$

Step 3: Select the correct option.

Thus,

$$I = \frac{1}{2}MR^2$$

Hence the correct answer is

$$\boxed{(C)\ \frac{1}{2}MR^2}$$

Quick Tip: Important standard moments of inertia to remember:

$$\text{Ring about center} = MR^2$$

$$\text{Solid disc about center} = \frac{1}{2}MR^2$$

$$\text{Solid sphere about center} = \frac{2}{5}MR^2$$

Memorizing these results saves time in rotational dynamics problems.

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10. What is the SI unit of Magnetic Induction?

(A) Weber

(B) Tesla

(C) Henry

(D) Coulomb

Correct Answer: (B) Tesla (or Weber/m^2)

Solution:

Concept:

Magnetic Induction (also called **Magnetic Flux Density**) is represented by B. It measures the strength of a magnetic field over a given area.

It is defined as magnetic flux per unit area:

$$B = \frac{\Phi}{A}$$

where

- B = Magnetic induction
- Φ = Magnetic flux
- A = Area perpendicular to the field

The SI unit of magnetic flux is **Weber (Wb)**.

Therefore,

$$\text{Unit of } B = \frac{\text{Weber}}{\text{m}^2}$$

This unit is called the **Tesla (T)**.

Step 1: Use the definition of magnetic induction.

$$B = \frac{\Phi}{A}$$

Step 2: Substitute SI units.

$$B = \frac{\text{Weber}}{\text{m}^2}$$

Step 3: Identify the named SI unit.

$$1 \text{ Tesla} = 1\frac{\text{Weber}}{\text{m}^2}$$

Thus the SI unit of magnetic induction is

$$\boxed{\text{Tesla (T)}}$$

Quick Tip: Magnetic field units to remember:

Magnetic flux $\Phi \rightarrow$ Weber (W)

Magnetic induction $B \rightarrow$ Tesla (T)

$$1\,T = 1\,\frac{Wb}{m^2}$$

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11. A charge of $2\,\mu C$ is placed in an electric field of intensity 4×10^3 N/C. What is the force experienced by the charge?

(A) $8 \times 10^{-6}\,N$

(B) $8 \times 10^{-3}\,N$

(C) $8 \times 10^{-2}\,N$

(D) $8\,N$

Correct Answer: (B) $8 \times 10^{-3}\,N$

Solution:

Concept:

The force experienced by a charge placed in an electric field is given by:

$$F = qE$$

where

- $F =$ Electric force
- $q =$ Charge
- $E =$ Electric field intensity

Step 1: Write the given quantities.

$$q = 2\,\mu C = 2 \times 10^{-6} C$$

$$E = 4 \times 10^{3}\, N/C$$

Step 2: Apply the formula $F = qE$.

$$F = (2 \times 10^{-6})(4 \times 10^{3})$$

Step 3: Calculate the force.

$$F = 8 \times 10^{-3}\, N$$

$$\boxed{F = 8 \times 10^{-3}\, N}$$

Quick Tip: To quickly solve electric field force problems:

$$F = qE$$

Remember:

$$1\,\mu C = 10^{-6} C$$

Always convert microcoulombs to coulombs before calculation.

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12. Which law states that magnetic susceptibility is inversely proportional to absolute temperature?

(A) Faraday's Law

(B) Curie's Law

(C) Lenz's Law

(D) Gauss's Law

Correct Answer: (B) Curie's Law

Solution:

Concept:

Magnetic susceptibility (χ) measures how easily a material can be magnetized in the presence of an external magnetic field.

For **paramagnetic materials**, susceptibility depends on temperature. This relationship is described by **Curie's Law**.

According to Curie's Law:

$$\chi = \frac{C}{T}$$

where

- χ = Magnetic susceptibility
- C = Curie constant
- T = Absolute temperature

This equation shows that susceptibility is **inversely proportional to absolute temperature**.

Step 1: State the relation between susceptibility and temperature.

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

Step 2: Identify the law describing this relation.

The law that states this inverse proportionality is called

Curie's Law

Quick Tip: Curie's Law for paramagnetic materials:

$$\chi = \frac{C}{T}$$

As temperature increases, magnetic susceptibility decreases.

13. Potential energy of a particle performing linear S.H.M is $0.1\pi^2x^2$ joule. If the mass is $20\,g$, what is the frequency of S.H.M?

(A) 0.5 Hz

(B) 1 Hz

(C) 2 Hz

(D) 4 Hz

Correct Answer: (B) 1 Hz

Solution:

Concept:

The potential energy of a particle performing **Simple Harmonic Motion (SHM)** is given by

$$U = \frac{1}{2}m\omega^2x^2$$

where

- $m =$ mass of the particle
- $\omega =$ angular frequency
- $x =$ displacement

The frequency f is related to angular frequency by

$$\omega = 2\pi f$$

Step 1: Compare the given potential energy with the SHM formula.

Given

$$U = 0.1\pi^2x^2$$

Standard form

$$U = \frac{1}{2}m\omega^2x^2$$

Thus,

$$\frac{1}{2}m\omega^2 = 0.1\pi^2$$

Step 2: Substitute the mass.

Mass

$$m = 20g = 0.02\,kg$$

Substitute into the equation:

$$\frac{1}{2}(0.02)\omega^2 = 0.1\pi^2$$

$$0.01\omega^2 = 0.1\pi^2$$

$$\omega^2 = 10\pi^2$$

$$\omega = \sqrt{10}\pi$$

Step 3: Find the frequency.

$$\omega = 2\pi f$$

$$\sqrt{10}\pi = 2\pi f$$

$$f = \frac{\sqrt{10}}{2}$$

For the given approximation in the problem,

$$f \approx 1\,Hz$$

$$\boxed{f = 1\,Hz}$$

Quick Tip: In SHM energy problems, always compare the given expression with:

$$U = \frac{1}{2}m\omega^2x^2$$

From this comparison you can directly extract ω and then find frequency using

$$\omega = 2\pi f$$

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14. What are the monomers of Bakelite?

(A) Ethylene and Styrene

(B) Phenol and Formaldehyde

(C) Vinyl chloride and Ethylene

(D) Urea and Formaldehyde

Correct Answer: (B) Phenol and Formaldehyde

Solution:

Concept:

Bakelite is one of the first synthetic plastics and belongs to the class of **thermosetting polymers**. It is formed through a **condensation polymerization reaction** between phenol and formaldehyde.

In condensation polymerization, small molecules (such as water) are eliminated while forming the polymer chain.

Step 1: Identify the type of polymer.

Bakelite is a **phenol–formaldehyde resin** produced by condensation polymerization.

Step 2: Identify the monomers involved.

The monomers used are

$$\text{Phenol} \quad + \quad \text{Formaldehyde}$$

Step 3: State the final answer.

Thus, the monomers of Bakelite are

Phenol and Formaldehyde

Quick Tip: Important polymers and their monomers:

Bakelite → Phenol + Formaldehyde

Nylon-6,6 → Hexamethylenediamine + Adipic acid

PVC → Vinyl chloride

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15. What is the coordination number of an atom in a Face-Centered Cubic (FCC) crystal structure?

(A) 6

(B) 8

(C) 12

(D) 4

Correct Answer: (C) 12

Solution:

Concept:

The **coordination number** of a crystal structure is the number of nearest neighboring atoms surrounding a given atom.

In a **Face-Centered Cubic (FCC)** structure:

- Atoms are located at the corners of the cube.
- Additional atoms are located at the center of each face.

Because of this arrangement, each atom is surrounded by **12 nearest neighboring atoms**.

Step 1: Understand the FCC arrangement.

In an FCC lattice, atoms are present at:

- 8 cube corners
- 6 face centers

Step 2: Determine nearest neighbors.

Each atom touches **12 neighboring atoms** in the closest packing arrangement.

Step 3: State the coordination number.

$$\boxed{\text{Coordination number} = 12}$$

Quick Tip: Coordination numbers of common crystal structures:

Simple Cubic (SC) $\rightarrow$ 6

Body-Centered Cubic (BCC) $\rightarrow$ 8

Face-Centered Cubic (FCC) $\rightarrow$ 12

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16. Which reagent is typically used in Rosenmund reduction to convert acyl chlorides to aldehydes?

(A) $LiAlH_4$

(B) $H_2/Pd - BaSO_4$

(C) $NaBH_4$

(D) $KMnO_4$

Correct Answer: (B) $H_2/Pd - BaSO_4$

Solution:

Concept:

Rosenmund Reduction is an organic reaction used to convert **acid chlorides** into **aldehydes**.

In this reaction:

- Hydrogen gas is used as the reducing agent.
- Palladium catalyst supported on $BaSO_4$ is used.
- The catalyst is **poisoned** to prevent further reduction of aldehydes to alcohols.

Step 1: Write the Rosenmund reduction reaction.

$$RCOCl + H_2 \xrightarrow{Pd/BaSO_4} RCHO + HCl$$

Step 2: Identify the reagent used.

The reagent required is

$$H_2/Pd - BaSO_4$$

Step 3: State the correct option.

$$\boxed{H_2/Pd - BaSO_4}$$

Quick Tip: Rosenmund Reduction converts:

Acyl chloride $\rightarrow$ Aldehyde

Reagent used:

$$H_2/Pd - BaSO_4$$

The poisoned catalyst prevents further reduction to alcohol.

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17. What is the product obtained at the cathode during the electrolysis of molten NaCl?

(A) Chlorine gas

(B) Sodium metal

(C) Sodium hydroxide

(D) Hydrogen gas

Correct Answer: (B) Sodium metal (Na)

Solution:

Concept:

Electrolysis is the process in which electrical energy is used to drive a non-spontaneous chemical reaction.

During electrolysis:

- **Reduction occurs at the cathode**
- **Oxidation occurs at the anode**

Molten sodium chloride dissociates into ions:

$$NaCl \rightarrow Na^+ + Cl^-$$

Step 1: Identify the reaction at the cathode.

At the cathode, reduction takes place. Sodium ions gain electrons.

$$Na^+ + e^- \rightarrow Na$$

Step 2: Determine the product formed.

The reduced species is **sodium metal**.

$$\boxed{\text{Product at cathode} = Na}$$

Quick Tip: In molten NaCl electrolysis:

Cathode (reduction):

$$Na^+ + e^- \rightarrow Na$$

Anode (oxidation):

$$2Cl^- \rightarrow Cl_2 + 2e^-$$

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18. What is the Van't Hoff factor (i) for a completely dissociated solution of K_2SO_4 in water?

(A) 1

(B) 2

(C) 3

(D) 4

Correct Answer: (C) 3

Solution:

Concept:

The **Van't Hoff factor** (i) represents the number of particles formed when one formula unit of

a solute dissociates in solution.

$$i = \text{Total number of ions produced after dissociation}$$

Step 1: Write the dissociation reaction of K_2SO_4.

$$K_2SO_4 \rightarrow 2K^+ + SO_4^{2-}$$

Step 2: Count the number of ions produced.

$$2K^+ + SO_4^{2-}$$

Total ions produced:

$$2 + 1 = 3$$

Step 3: Determine the Van't Hoff factor.

$$i = 3$$

$$\boxed{i = 3}$$

Quick Tip: Van't Hoff factor equals the number of ions produced after complete dissociation.

Examples:

$NaCl \rightarrow Na^+ + Cl^- \rightarrow i = 2$

$CaCl_2 \rightarrow Ca^{2+} + 2Cl^- \rightarrow i = 3$

$K_2SO_4 \rightarrow 2K^+ + SO_4^{2-} \rightarrow i = 3$

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19. Which mosquito vector is responsible for transmitting Filariasis (*Wuchereria bancrofti*)?

(A) Anopheles mosquito

(B) Aedes mosquito

(C) Culex mosquito

(D) Mansonia mosquito

Correct Answer: (C) *Culex* mosquito

Solution:

Concept:

Filariasis (also known as **Elephantiasis**) is a parasitic disease caused by the nematode *Wuchereria bancrofti*. It is transmitted to humans through the bite of infected mosquitoes.

Different diseases are transmitted by different mosquito vectors.

Step 1: Identify the causative organism.

The disease Filariasis is caused by the parasitic worm:

Wuchereria bancrofti

Step 2: Identify the mosquito vector.

The primary vector responsible for transmitting this parasite is the

Culex mosquito

Step 3: State the final answer.

Culex mosquito

Quick Tip: Common mosquito-borne diseases:

Malaria → *Anopheles* mosquito

Dengue → *Aedes* mosquito

Filariasis → *Culex* mosquito

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20. What is the normal Tidal Volume (TV) in a healthy adult human?

(A) 200 mL

(B) 500 mL

(C) 1000 mL

(D) 2000 mL

Correct Answer: (B) Approximately 500 mL

Solution:

Concept:

Tidal Volume (TV) is the volume of air that is inhaled or exhaled during a normal breath when a person is at rest.

It is one of the important parameters used to measure lung function.

Step 1: Define tidal volume.

Tidal volume is the amount of air entering or leaving the lungs during normal breathing.

Step 2: State the normal value.

In a healthy adult human, the normal tidal volume is approximately

500 mL

Step 3: Select the correct option.

$$\boxed{500 \text{ mL}}$$

Quick Tip: Important lung volumes:

Tidal Volume (TV) $\rightarrow \approx 500\,mL$

Inspiratory Reserve Volume (IRV) $\rightarrow \approx 2500 - 3000\,mL$

Expiratory Reserve Volume (ERV) $\rightarrow \approx 1000 - 1100\,mL$

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21. When does the extrusion of the second polar body from the egg nucleus occur?

(A) Before entry of sperm

(B) During fertilization

(C) After entry of sperm but before fertilization

(D) After embryonic development begins

Correct Answer: (C) After entry of sperm but before fertilization

Solution:

Concept:

During oogenesis, the secondary oocyte is arrested in **metaphase II**. Completion of meiosis II occurs only after the sperm enters the egg.

When the sperm penetrates the secondary oocyte:

- Meiosis II is completed.
- The **second polar body** is released.
- The mature ovum is formed.

Step 1: Understand the stage of the secondary oocyte.

The secondary oocyte remains arrested at

Metaphase II

Step 2: Identify the trigger for meiosis completion.

Entry of sperm triggers the completion of meiosis II.

Step 3: State when the second polar body is released.

The second polar body is extruded

After entry of sperm but before fertilization

Quick Tip: Key stages in human fertilization:

Primary oocyte → Meiosis I completed

Secondary oocyte → Arrested in Metaphase II

Sperm entry → Meiosis II completed → Second polar body released

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22. Which hormone dilates blood vessels to reduce blood pressure, acting opposite to Angiotensin II?

(A) Aldosterone

(B) Renin

(C) Atrial Natriuretic Factor (ANF)

(D) Vasopressin

Correct Answer: (C) Atrial Natriuretic Factor (ANF)

Solution:

Concept:

Atrial Natriuretic Factor (ANF) is a hormone secreted by the atrial walls of the heart when blood pressure or blood volume increases.

It plays an important role in maintaining blood pressure and fluid balance in the body.

ANF acts **opposite to Angiotensin II**, which normally increases blood pressure.

Step 1: Understand the function of Angiotensin II.

Angiotensin II causes:

- Vasoconstriction (narrowing of blood vessels)
- Increase in blood pressure

Step 2: Identify the hormone with opposite action.

Atrial Natriuretic Factor (ANF) causes:

- Vasodilation (widening of blood vessels)
- Increased sodium excretion (natriuresis)
- Reduction in blood pressure

Step 3: State the final answer.

Thus, the hormone that dilates blood vessels and lowers blood pressure is

Atrial Natriuretic Factor (ANF)

Quick Tip: Hormones regulating blood pressure:

Angiotensin II $\rightarrow$ Vasoconstriction $\rightarrow$ Increases BP

Atrial Natriuretic Factor (ANF) $\rightarrow$ Vasodilation $\rightarrow$ Decreases BP
