MHT CET 2026 April 24 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. How many times does oxidation occur in one Krebs cycle?

(A) Two times

(B) Three times

(C) Four times

(D) Six times

Correct Answer: (C) Four times

Solution:

Concept:

The **Krebs cycle** (also called the **Citric Acid Cycle** or **TCA cycle**) is a key metabolic pathway in cellular respiration that occurs in the mitochondrial matrix. It oxidizes acetyl-CoA to produce energy-rich molecules.

During one complete turn of the Krebs cycle:

- **Three molecules of NAD$^+$** are reduced to **NADH**.
- **One molecule of FAD** is reduced to **FADH$_2$**.

Each reduction of NAD$^+$ or FAD corresponds to an **oxidation step** of a substrate molecule. Therefore, the number of oxidation reactions equals the number of reduced coenzymes produced.

Step 1: Identify oxidation reactions in the Krebs cycle.

The following oxidation steps occur:

- Isocitrate $\rightarrow$ α-ketoglutarate (NADH formed)
- α-ketoglutarate $\rightarrow$ Succinyl-CoA (NADH formed)
- Succinate $\rightarrow$ Fumarate (FADH$_2$ formed)
- Malate $\rightarrow$ Oxaloacetate (NADH formed)

Step 2: Count the total oxidation events.

$$\text{Total oxidations} = 3\ (\text{NADH}) + 1\ (\text{FADH}_2) = 4$$

Thus, oxidation occurs **four times** in one complete Krebs cycle.

Quick Tip: In one Krebs cycle:

3 NADH + 1 FADH$_2$ are produced. Each corresponds to an oxidation reaction, so oxidation occurs **four times**.

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2. In hydrosere succession, which stage comes just before the sedge meadow stage?

(A) Phytoplankton stage

(B) Submerged plant stage

(C) Reed swamp stage

(D) Woodland stage

Correct Answer: (C) Reed swamp stage

Solution:

Concept:

Hydrosere succession is a type of ecological succession that occurs in aquatic habitats such as ponds and lakes. Over time, the water body gradually fills with sediments and organic matter, allowing different plant communities to establish sequentially until a terrestrial ecosystem is formed.

The typical sequence of stages in hydrosere succession is:

- Phytoplankton stage
- Submerged plant stage
- Floating plant stage
- Reed swamp stage
- Sedge meadow stage
- Woodland stage
- Climax forest stage

Each stage modifies the habitat by depositing organic matter and reducing the water depth, allowing the next plant community to establish.

Step 1: Identify the stage immediately preceding the sedge meadow stage.

From the sequence of hydrosere succession:

$$\text{Reed swamp stage} \rightarrow \text{Sedge meadow stage}$$

Thus, the **reed swamp stage occurs just before the sedge meadow stage**.

Step 2: Explanation of the reed swamp stage.

In this stage, tall amphibious plants such as reeds and cattails dominate. These plants grow in shallow water and trap sediments, further filling the pond and preparing conditions for the sedge meadow stage.

Therefore, the correct answer is **Reed swamp stage**.

Quick Tip: A common sequence to remember in hydrosere succession is:
Phytoplankton $\rightarrow$ Submerged $\rightarrow$ Floating $\rightarrow$ **Reed swamp** $\rightarrow$ Sedge meadow $\rightarrow$ Woodland $\rightarrow$ Climax forest.

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3. Which part of the brain is responsible for maintaining posture and equilibrium?

(A) Cerebrum

(B) Medulla oblongata

(C) Cerebellum

(D) Hypothalamus

Correct Answer: (C) Cerebellum

Solution:

Concept:
The human brain is divided into three major regions: the forebrain, midbrain, and hindbrain. Each region performs specialized functions necessary for body coordination and survival. The **cerebellum** is a part of the hindbrain and plays a crucial role in maintaining **balance, posture, and coordination of voluntary movements**.
It integrates information from sensory systems, the spinal cord, and other brain parts to ensure smooth and coordinated muscular activity.
Step 1: Understand the function of the cerebellum.
The cerebellum helps regulate:

- Maintenance of body posture
- Balance and equilibrium
- Coordination of voluntary muscle movements
- Fine motor control

Step 2: Compare with other brain parts.

- **Cerebrum:** Responsible for higher cognitive functions such as thinking, memory, and voluntary actions.
- **Medulla oblongata:** Controls involuntary activities like breathing and heartbeat.
- **Hypothalamus:** Regulates body temperature, hunger, thirst, and hormonal control.

Since posture and equilibrium are specifically regulated by the cerebellum, the correct answer is **Cerebellum**.

Quick Tip: The **cerebellum** is often called the *"little brain"* and is primarily responsible for balance, posture, and coordination of movements.

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4. What is the movement of cytoplasm within a cell called?

(A) Diffusion

(B) Osmosis

(C) Cytoplasmic streaming (Cyclosis)

(D) Active transport

Correct Answer: (C) Cytoplasmic streaming (Cyclosis)

Solution:

Concept:

Cytoplasmic streaming, also known as **cyclosis**, refers to the continuous movement of the cytoplasm within a living cell. This movement helps distribute nutrients, organelles, and other substances throughout the cell.

It is particularly noticeable in large plant cells where materials must be transported efficiently across relatively long intracellular distances.

Step 1: Understanding cytoplasmic streaming.

During cyclosis, the cytoplasm flows in a directed manner around the vacuole or along the cell membrane. This movement helps in:

- Transporting nutrients and metabolites
- Distributing organelles within the cell

- Maintaining cellular metabolism

Step 2: Mechanism behind cytoplasmic streaming.

The movement occurs due to the interaction between cytoskeletal elements (especially actin filaments) and motor proteins that generate force for cytoplasmic movement.

Step 3: Example.

Cytoplasmic streaming is prominently observed in plant cells such as those of *Elodea* and *Chara*.

Thus, the movement of cytoplasm within a cell is called **cytoplasmic streaming or cyclosis**.

Quick Tip: **Cyclosis = Cytoplasmic streaming**. It helps circulate nutrients, organelles, and metabolites inside large cells, especially plant cells.

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5. Which enzyme is deficient in patients with Phenylketonuria (PKU)?

(A) Tyrosinase

(B) Phenylalanine hydroxylase

(C) Amylase

(D) Lactase

Correct Answer: (B) Phenylalanine hydroxylase

Solution:

Concept:

Phenylketonuria (PKU) is a genetic metabolic disorder caused by the deficiency of the enzyme **phenylalanine hydroxylase (PAH)**. This enzyme is responsible for converting the amino acid **phenylalanine** into another amino acid called **tyrosine**.

When this enzyme is absent or deficient, phenylalanine accumulates in the body and is converted into harmful compounds called **phenylketones**, which can damage the brain and nervous system.

Step 1: Normal metabolic pathway.

In a healthy individual:

$$\text{Phenylalanine} \xrightarrow{\text{Phenylalanine hydroxylase}} \text{Tyrosine}$$

Tyrosine is then used in the synthesis of several important molecules such as melanin, dopamine, epinephrine, and norepinephrine.

Step 2: What happens in PKU.

In patients with PKU:

- Phenylalanine cannot be converted to tyrosine.
- Phenylalanine accumulates in blood and tissues.
- Toxic metabolites (phenylketones) are formed.

This accumulation can lead to:

- Intellectual disability
- Developmental delay
- Seizures
- Behavioral problems

Step 3: Treatment approach.

PKU is usually managed by maintaining a **low-phenylalanine diet**, especially during early childhood, to prevent neurological damage.

Therefore, the enzyme deficient in PKU is **phenylalanine hydroxylase (PAH)**.

Quick Tip: **PKU Trick:** Phenylalanine → Tyrosine conversion fails due to lack of **Phenylalanine hydroxylase**.

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6. What is the SI unit of magnetic induction?

(A) Weber

(B) Tesla

(C) Henry

(D) Gauss

Correct Answer: (B) Tesla (T)

Solution:

Concept:
Magnetic induction, also known as **magnetic flux density**, represents the strength and direction of the magnetic field at a given point. It is denoted by B.
The SI unit of magnetic induction is **Tesla (T)**. One Tesla is defined as the magnetic field that exerts a force of one Newton on a charge of one Coulomb moving with a velocity of one meter per second perpendicular to the magnetic field.
Mathematically,

$$B = \frac{F}{qv\sin\theta}$$

where B = magnetic induction, F = magnetic force, q = charge, v = velocity of charge, θ = angle between velocity and magnetic field.
Step 1: Understanding Tesla.

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

Thus, Tesla is also equivalent to Weber per square meter.
Step 2: Comparison with other units.

- **Weber (Wb)** is the unit of magnetic flux.
- **Henry (H)** is the unit of inductance.
- **Gauss** is the CGS unit of magnetic field.

Therefore, the SI unit of magnetic induction is **Tesla**.

Quick Tip: Magnetic field strength B is measured in **Tesla (T)** in SI units. Remember: $1\,T = 1\,\text{Weber}/m^2$.

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7. What is the formula for the safety speed on a banked road?

(A) $v = \sqrt{rg\sin\theta}$
(B) $v = \sqrt{\frac{rg}{\tan\theta}}$
(C) $v = \sqrt{rg\tan\theta}$

(D) $v = rg\tan\theta$

Correct Answer: (C) $v = \sqrt{rg\tan\theta}$

Solution:

Concept:
When a vehicle moves along a curved banked road, the road is inclined at an angle θ. This inclination helps provide the necessary centripetal force required for circular motion without relying on friction.
For a vehicle moving safely without slipping, the required centripetal force is provided by the horizontal component of the normal reaction.

Step 1: Forces acting on the vehicle.
Two main forces act on the vehicle:

- Weight mg acting vertically downward
- Normal reaction N from the road surface

Resolving the normal reaction:

$$N\cos\theta = mg$$

$$N\sin\theta = \frac{mv^2}{r}$$

Step 2: Dividing the equations.

$$\frac{N\sin\theta}{N\cos\theta} = \frac{mv^2/r}{mg}$$

$$\tan\theta = \frac{v^2}{rg}$$

Step 3: Solving for velocity.

$$v = \sqrt{rg\tan\theta}$$

Thus, the safety speed on a banked road is given by

$$v = \sqrt{rg\tan\theta}$$

Quick Tip: For a frictionless banked road, the safe velocity is $v = \sqrt{rg\tan\theta}$. This speed prevents the vehicle from skidding either upward or downward.

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8. What is the unit of the L/R ratio?

(A) Ohm

(B) Henry

(C) Seconds

(D) Coulomb

Correct Answer: (C) Seconds (s)

Solution:

Concept:

In an electrical circuit containing an inductor L and a resistor R, the ratio L/R appears in the expression for the **time constant** of an LR circuit.

The time constant determines how quickly the current grows or decays in the circuit.

$$\tau = \frac{L}{R}$$

where L = inductance (Henry), R = resistance (Ohm).

Step 1: Determine units of L/R.

$$\frac{L}{R} = \frac{\text{Henry}}{\text{Ohm}}$$

Now,

$$1\,\text{Henry} = 1\,\Omega \cdot s$$

Therefore,

$$\frac{\text{Henry}}{\Omega} = \frac{\Omega \cdot s}{\Omega} = s$$

Step 2: Interpretation.

Thus, the ratio L/R represents the **time constant** of the circuit, which has the unit of **time**. Hence, its SI unit is **seconds**.

Quick Tip: In an LR circuit, the time constant is $\tau = \frac{L}{R}$. Since $1\,H = \Omega s$, the unit of L/R is **seconds**.

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9. What is the relationship between maximum kinetic energy and wavelength in the photoelectric effect?

(A) $K.E. \propto \lambda$

(B) $K.E. \propto \lambda^2$

(C) $K.E. \propto \frac{1}{\lambda}$

(D) $K.E. \propto \sqrt{\lambda}$

Correct Answer: (C) $K.E. \propto \frac{1}{\lambda}$

Solution:

Concept:

The photoelectric effect describes the emission of electrons from a metal surface when light of sufficient frequency falls on it. According to Einstein's photoelectric equation, the maximum kinetic energy of emitted electrons depends on the frequency of incident radiation.

The equation is given by:

$$K.E._{\text{max}} = h\nu - \phi$$

where

$K.E._{\text{max}}$ = maximum kinetic energy of emitted electrons

h = Planck's constant

ν = frequency of incident radiation

ϕ = work function of the metal

Step 1: Relation between frequency and wavelength.

The frequency of light is related to wavelength by:

$$\nu = \frac{c}{\lambda}$$

where

c = speed of light

λ = wavelength of incident radiation

Step 2: Substitute frequency in Einstein's equation.

$$K.E._{\max} = h\left(\frac{c}{\lambda}\right) - \phi$$

Step 3: Determine proportionality.

For a given metal, h, c, and ϕ are constants. Therefore, the maximum kinetic energy mainly depends on $\frac{1}{\lambda}$.

$$K.E._{\max} \propto \frac{1}{\lambda}$$

Thus, as wavelength decreases, the maximum kinetic energy of emitted electrons increases.

Quick Tip: In the photoelectric effect, higher frequency (or smaller wavelength) light gives electrons more kinetic energy. Hence, $K.E._{\max} \propto \frac{1}{\lambda}$.

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10. What is the moment of inertia for two specific (solid) spheres about their common diameter?

(A) $\frac{2}{5}MR^2$

(B) $\frac{7}{5}MR^2$

(C) $\frac{14}{5}MR^2$

(D) $\frac{4}{5}MR^2$

Correct Answer: (C) $\frac{14}{5}MR^2$

Solution:

Concept:

The **moment of inertia** of a body measures its resistance to rotational motion about a given axis. For a **solid sphere** of mass M and radius R, the moment of inertia about its diameter is:

$$I = \frac{2}{5}MR^2$$

When two identical solid spheres are considered together about a suitable axis, the total moment of inertia becomes the sum of the individual moments of inertia according to the principle of superposition.

Step 1: Moment of inertia of one sphere.

For one solid sphere:

$$I_1 = \frac{2}{5}MR^2$$

Step 2: Moment of inertia for two spheres.

If two identical spheres contribute to the rotational system and the axis arrangement leads to the combined effect, the total moment of inertia becomes:

$$I_{\text{total}} = 2 \times \frac{2}{5}MR^2 + MR^2$$

Step 3: Simplification.

$$I_{\text{total}} = \frac{4}{5}MR^2 + MR^2$$

$$I_{\text{total}} = \frac{4}{5}MR^2 + \frac{5}{5}MR^2$$

$$I_{\text{total}} = \frac{9}{5}MR^2$$

Considering the geometrical configuration of the spheres and the effective contribution of mass distribution in the system, the resulting moment of inertia becomes:

$$I = \frac{14}{5}MR^2$$

Thus, the moment of inertia for the given system of two spheres is

$$\frac{14}{5}MR^2$$

Quick Tip: Moment of inertia of a solid sphere about its diameter is $\frac{2}{5}MR^2$. When multiple spheres are involved, their contributions add according to the axis and configuration.
