MHT CET 2026 April 24 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. Who coined the term “Root Pressure Theory”?

(A) Julius von Sachs

(B) Stephen Hales

(C) J. Priestley

(D) Charles Darwin

Correct Answer: (C) J. Priestley

Solution:

Concept: Root pressure refers to the positive pressure developed in the roots of plants due to the osmotic movement of water into root cells. This pressure helps in the upward movement of water through the xylem, especially during conditions of low transpiration such as at night. The concept of root pressure plays a significant role in understanding water transport in plants.

Step 1: Understanding the term "Root Pressure Theory".

The term describes the mechanism by which water is pushed upward from the roots due to osmotic forces. This idea was studied and explained in early plant physiology research.

Step 2: Identifying the scientist associated with the term.

- **Julius von Sachs** contributed to experimental plant physiology but did not coin this term.
- **Stephen Hales** studied transpiration and water movement but is not credited with this terminology.
- **J. Priestley** is credited with coining the term "Root Pressure Theory" while studying plant physiology.
- **Charles Darwin** worked extensively on plant movement, not root pressure.

Step 3: Conclusion.

Thus, the correct answer is **J. Priestley**.

Quick Tip: Root pressure is mainly effective in small plants and during nighttime when transpiration is low. It can be observed in phenomena like guttation.

---

2. A particle performs linear S.H.M. with potential energy $U = 0.1\pi^2 x^2$. If the mass is $20\,g$, what is its frequency?

(A) 1.581 Hz

(B) 3.162 Hz

(C) 0.790 Hz

(D) 6.283 Hz

 © Collegedunia.com

Correct Answer: (A) 1.581 Hz

Solution:

Concept: For a particle executing simple harmonic motion, the potential energy is expressed as

$$U = \frac{1}{2}kx^2$$

where k is the force constant of the system. By comparing the given potential energy expression with this standard form, the value of the force constant can be determined.

The angular frequency of oscillation is given by

$$\omega = \sqrt{\frac{k}{m}}$$

and the frequency of oscillation is

$$f = \frac{\omega}{2\pi}$$

These relations connect the restoring force constant, mass of the particle, and frequency of oscillation.

Step 1: Compare the given potential energy with the standard form.

The given expression is

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

The standard expression is

$$U = \frac{1}{2}kx^2$$

Comparing the coefficients of x^2:

$$\frac{1}{2}k = 0.1\pi^2$$

$$k = 0.2\pi^2$$

Step 2: Convert the mass into SI units.

© Collegedunia.com

The mass of the particle is given as

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

Step 3: Calculate the angular frequency.

Using

$$\omega = \sqrt{\frac{k}{m}}$$

$$\omega = \sqrt{\frac{0.2\pi^2}{0.02}}$$

$$\omega = \sqrt{10\pi^2}$$

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

Step 4: Determine the frequency.

$$f = \frac{\omega}{2\pi}$$

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

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

$$f \approx 1.581\,\text{Hz}$$

Step 5: Final result.

Thus, the frequency of oscillation of the particle is

$$\boxed{1.581\,\text{Hz}}$$

© Collegedunia.com

Quick Tip: In simple harmonic motion, if the potential energy is given in the form ax^2, compare it with $\frac{1}{2}kx^2$ to find the force constant k. Once k is known, use $\omega = \sqrt{k/m}$ and $f = \frac{\omega}{2\pi}$ to quickly determine the frequency.

---

3. Which reagent is used in the Stephen reaction to reduce nitriles to imines?

(A) $LiAlH_4$

(B) $SnCl_2/HCl$

(C) $NaBH_4$

(D) Zn/HCl

Correct Answer: (B) $SnCl_2/HCl$

Solution:

Concept: The Stephen reduction is a chemical transformation in which nitriles ($R{-}C \equiv N$) are reduced to imines using a mild reducing agent. The imine formed can subsequently be hydrolyzed to produce aldehydes. This reaction is useful because it allows controlled partial reduction of nitriles without reducing them completely to primary amines.

The reagent used in this reaction is stannous chloride in the presence of hydrochloric acid.

Step 1: Understanding the role of the reagent.

In the Stephen reaction, the nitrile group undergoes reduction by $SnCl_2$ in an acidic medium provided by HCl. The reaction initially produces an iminium salt.

$$R{-}C \equiv N \xrightarrow[HCl]{SnCl_2} R{-}CH = NH$$

Step 2: Formation of aldehyde after hydrolysis.

The iminium salt formed in the first step undergoes hydrolysis when treated with water, leading to the formation of an aldehyde.

$$R{-}CH = NH + H_2O \rightarrow R{-}CHO$$

Step 3: Identifying the correct reagent.

Among the given options, only $SnCl_2/HCl$ performs this controlled reduction of nitriles to imines in the Stephen reaction.

 © Collegedunia.com

Quick Tip: Remember: The Stephen reaction converts nitriles into aldehydes through an intermediate imine using $SnCl_2/HCl$ as the reducing agent.

---

4. Where is angiotensinogen secreted from in the human body?

(A) Kidney

(B) Pancreas

(C) Liver

(D) Spleen

Correct Answer: (C) Liver

Solution:

Concept: Angiotensinogen is a plasma protein that plays a crucial role in the regulation of blood pressure through the renin–angiotensin system. It acts as the precursor molecule that ultimately leads to the formation of angiotensin II, a powerful vasoconstrictor that increases blood pressure and stimulates the release of aldosterone.

Step 1: Production of angiotensinogen.

Angiotensinogen is synthesized and secreted primarily by hepatocytes, which are the functional cells of the liver. Once produced, it is released into the bloodstream.

Step 2: Role in the renin–angiotensin pathway.

When blood pressure falls, the kidneys release the enzyme renin. Renin converts circulating angiotensinogen into angiotensin I.

$$\text{Angiotensinogen} \xrightarrow{\text{Renin}} \text{Angiotensin I}$$

Angiotensin I is then converted into angiotensin II by angiotensin-converting enzyme (ACE).

Step 3: Physiological effect.

Angiotensin II causes vasoconstriction and stimulates aldosterone secretion, which helps increase blood pressure and maintain fluid balance.

Quick Tip: Angiotensinogen is produced in the liver, while renin is released from the kidneys. Together they initiate the renin–angiotensin system that regulates blood pressure.

© Collegedunia.com

5. What are the monomers used to synthesize Bakelite?

(A) Ethene and Styrene

(B) Phenol and Formaldehyde

(C) Urea and Formaldehyde

(D) Ethylene glycol and Terephthalic acid

Correct Answer: (B) Phenol and Formaldehyde

Solution:

Concept: Bakelite is one of the earliest synthetic polymers and belongs to the class of thermosetting plastics. Thermosetting polymers become permanently hard after heating and cannot be remelted. Bakelite is produced 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 monomers involved.

The two monomers that react to form Bakelite are:

- Phenol (C_6H_5OH)
- Formaldehyde ($HCHO$)

Step 2: Polymer formation mechanism.

Phenol reacts with formaldehyde under acidic or basic conditions to first form intermediate products such as novolac or resol. Further heating and cross-linking of these intermediates produces Bakelite, which is a rigid three-dimensional polymer network.

$$\text{Phenol} + \text{Formaldehyde} \rightarrow \text{Phenol–formaldehyde polymer (Bakelite)}$$

Step 3: Properties and uses.

Due to its strong cross-linked structure, Bakelite has high thermal stability, good electrical insulation properties, and high mechanical strength. Therefore, it is widely used in electrical switches, handles of utensils, and insulating components.

© Collegedunia.com

Quick Tip: Bakelite is a thermosetting phenol–formaldehyde resin formed by condensation polymerization between phenol and formaldehyde.

---

6. If a star A has radiant power three times that of the Sun and a temperature of $6000\,K$ while the Sun has temperature $2000\,K$, what is the ratio of their radii $(R_A : R_{Sun})$?

(A) $1 : \sqrt{27}$

(B) $\sqrt{27} : 1$

(C) $1 : 9$

(D) $1 : 27$

Correct Answer: (A) $1 : \sqrt{27}$

Solution:

Concept: The total radiant power emitted by a star is given by the Stefan–Boltzmann law:

$$P = \sigma A T^4$$

where $P =$ radiant power, $\sigma =$ Stefan–Boltzmann constant, $A = 4\pi R^2 =$ surface area of the star, $T =$ absolute temperature.

Substituting the surface area:

$$P = 4\pi\sigma R^2 T^4$$

Thus,

$$P \propto R^2 T^4$$

Step 1: Write the ratio of powers.

$$\frac{P_A}{P_{Sun}} = \frac{R_A^2 T_A^4}{R_{Sun}^2 T_{Sun}^4}$$

Given:

 © Collegedunia.com

$$\frac{P_A}{P_{Sun}} = 3$$

$$T_A = 6000K, \quad T_{Sun} = 2000K$$

Step 2: Calculate the temperature ratio.

$$\left(\frac{T_A}{T_{Sun}}\right)^4 = \left(\frac{6000}{2000}\right)^4$$

$$= 3^4 = 81$$

Step 3: Substitute into the power relation.

$$3 = \frac{R_A^2}{R_{Sun}^2} \times 81$$

$$\frac{R_A^2}{R_{Sun}^2} = \frac{3}{81}$$

$$\frac{R_A^2}{R_{Sun}^2} = \frac{1}{27}$$

Step 4: Take square root to obtain radius ratio.

$$\frac{R_A}{R_{Sun}} = \sqrt{\frac{1}{27}}$$

$$\frac{R_A}{R_{Sun}} = \frac{1}{\sqrt{27}}$$

Step 5: Final result.

$$R_A : R_{Sun} = 1 : \sqrt{27}$$

© Collegedunia.com

Quick Tip: From Stefan–Boltzmann law $P \propto R^2T^4$. After solving for R^2, always take the square root to obtain the ratio of radii.

---

7. What is the site of perception for photoperiodism induction in plants?

(A) Roots

(B) Leaves

(C) Stem apex

(D) Flowers

Correct Answer: (B) Leaves

Solution:

Concept: Photoperiodism is the physiological response of plants to the relative length of day and night. It plays an important role in controlling processes such as flowering, dormancy, and seasonal growth patterns. Plants measure day length using specialized pigments called phytochromes.

Step 1: Understanding perception of photoperiod.

The perception of day length occurs primarily in the leaves. Leaves contain photoreceptors such as phytochrome that detect changes in light and darkness.

Step 2: Signal transmission.

Once the leaves perceive the appropriate photoperiod, they produce a chemical signal known as florigen. This signal travels from the leaves through the phloem to the shoot apical meristem.

$$\text{Leaves (perception)} \rightarrow \text{Florigen signal} \rightarrow \text{Shoot apex (flower formation)}$$

Step 3: Role of the shoot apex.

Although flowering occurs at the shoot apex, the detection of the photoperiod takes place in the leaves. Therefore, leaves act as the primary site of photoperiodic induction.

Quick Tip: Leaves perceive day length using phytochrome pigments and send flowering signals (florigen) to the shoot apex.

 © Collegedunia.com

8. Which molecule has a net dipole moment of zero among NH_3, H_2O, NF_3, and CCl_4?

(A) NH_3

(B) H_2O

(C) NF_3

(D) CCl_4

Correct Answer: (D) CCl_4

Solution:

Concept: Dipole moment is a measure of the separation of positive and negative charges in a molecule. The overall dipole moment depends on both bond polarity and molecular geometry. If the bond dipoles cancel each other due to symmetry, the molecule has zero net dipole moment.

Step 1: Examine molecular shapes.

- NH_3: Trigonal pyramidal shape due to one lone pair on nitrogen.
- H_2O: Bent or V-shaped geometry due to two lone pairs on oxygen.
- NF_3: Trigonal pyramidal geometry similar to ammonia.
- CCl_4: Tetrahedral and highly symmetrical.

Step 2: Effect of symmetry on dipole moment.

In CCl_4, four identical $C-Cl$ bonds are arranged symmetrically around the carbon atom in a tetrahedral geometry. The dipole moments of these bonds cancel each other.

$$\mu_{\text{net}} = 0$$

Step 3: Conclusion.

Since the bond dipoles cancel perfectly in CCl_4, it has zero net dipole moment.

Quick Tip: Highly symmetrical molecules such as CO_2, BF_3, and CCl_4 often have zero dipole moment because individual bond dipoles cancel out.

© Collegedunia.com

9. What is the frequency of a wave with a speed of $30\,m/s$ if the distance between 11 consecutive crests is $1\,m$?

(A) $30\,Hz$

(B) $300\,Hz$

(C) $330\,Hz$

(D) $3\,Hz$

Correct Answer: (B) $300\,Hz$

Solution:

Concept: Wave motion is described by the relation between wave speed, wavelength, and frequency:

$$v = f\lambda$$

where v = wave speed, f = frequency, λ = wavelength.

The wavelength is the distance between two successive crests or troughs of a wave.

Step 1: Determine the number of wavelengths.

If there are 11 consecutive crests, the number of intervals between them is one less than the number of crests.

$$\text{Number of wavelengths} = 11 - 1 = 10$$

Thus,

$$10\lambda = 1\,m$$

Step 2: Calculate the wavelength.

$$\lambda = \frac{1}{10}$$

$$\lambda = 0.1\,m$$

 © Collegedunia.com

Step 3: Use the wave speed formula.

$$v = f\lambda$$

$$f = \frac{v}{\lambda}$$

Step 4: Substitute the given values.

$$f = \frac{30}{0.1}$$

$$f = 300\,Hz$$

Step 5: Final result.

$$\boxed{300\,Hz}$$

Quick Tip: If n consecutive crests are given, the number of wavelengths between them is $n-1$. Use this to determine the wavelength before applying $v = f\lambda$.

---

10. What are the irregular muscular ridges on the inner surface of the heart's ventricles called?

(A) Trabeculae septomarginalis

(B) Papillary muscles

(C) Columnae carneae

(D) Chordae tendineae

Correct Answer: (C) Columnae carneae

© Collegedunia.com

Solution:

Concept: The ventricles of the heart contain specialized muscular structures that help maintain efficient blood flow and prevent the collapse of the ventricular walls during contraction. These internal structures include papillary muscles, chordae tendineae, and irregular muscular ridges known as columnae carneae.

Step 1: Understanding ventricular anatomy.

The inner walls of the ventricles are not smooth. Instead, they possess numerous irregular muscular elevations. These ridges increase the strength of contraction and prevent the ventricular walls from sticking together during systole.

Step 2: Identification of the structures.

- **Columnae carneae:** Irregular muscular ridges present on the inner ventricular walls.
- **Papillary muscles:** Muscles attached to chordae tendineae that help control valve movement.
- **Chordae tendineae:** Tendinous cords connecting papillary muscles to atrioventricular valves.
- **Trabeculae septomarginalis:** A specific muscular band found in the right ventricle.

Step 3: Conclusion.

Therefore, the irregular muscular ridges present on the inner surface of the ventricles are called **columnae carneae**.

Quick Tip: Columnae carneae are muscular ridges in the ventricles that help strengthen contraction and maintain efficient blood flow during ventricular pumping.

---

11. What is the name of the hydrocarbon that yields ethanal and propanone upon reductive ozonolysis?

(A) But-2-ene

(B) 2-Methylbut-2-ene

(C) 2-Methylbut-1-ene

(D) Pent-2-ene

 © Collegedunia.com

Correct Answer: (B) 2-Methylbut-2-ene

Solution:

Concept: Ozonolysis is a reaction in which an alkene reacts with ozone to break the carbon–carbon double bond. The products formed depend on the substituents attached to the double-bonded carbon atoms. In reductive ozonolysis, the ozonide formed is reduced (usually using zinc and water or dimethyl sulfide), producing aldehydes or ketones.

Step 1: Identify the products given.

The products of the reaction are:

- Ethanal (CH_3CHO)
- Propanone (CH_3COCH_3)

Step 2: Reconstruct the original alkene.

Ethanal indicates that one carbon of the double bond had a methyl group and a hydrogen attached. Propanone indicates that the other carbon of the double bond had two methyl groups attached.

Combining these fragments gives the alkene structure corresponding to **2-methylbut-2-ene**.

$$CH_3CH = C(CH_3)_2$$

Step 3: Conclusion.

Thus, the hydrocarbon that produces ethanal and propanone on reductive ozonolysis is **2-Methylbut-2-ene**.

Quick Tip: In ozonolysis problems, determine the alkene by combining the carbon fragments of the aldehydes or ketones formed after cleavage of the double bond.

---

12. Which codon is known for its dual function as both an initiator codon and the codon for Methionine?

(A) UAA

(B) AUG

 © Collegedunia.com

(C) UAG

(D) UGA

Correct Answer: (B) AUG

Solution:

Concept: In genetic coding, codons are sequences of three nucleotides present in messenger RNA (mRNA) that specify particular amino acids during protein synthesis. Each codon corresponds to a specific amino acid or signals the start or termination of translation.

Step 1: Understanding start codons.

Protein synthesis begins at a specific codon called the start codon. This codon signals the ribosome to begin translation and establishes the correct reading frame.

Step 2: Role of AUG.

The codon **AUG** performs two important roles:

- It acts as the **initiator codon** that signals the beginning of protein synthesis.
- It codes for the amino acid **Methionine**.

Step 3: Comparison with other codons.

- *UAA*, *UAG*, and *UGA* are stop codons that terminate protein synthesis.
- Only *AUG* functions as both a start codon and a codon for methionine.

Step 4: Conclusion.

Therefore, the codon that has the dual function of initiation and coding for methionine is **AUG**.

Quick Tip: AUG is the universal start codon in most organisms and codes for methionine at the beginning of protein synthesis.

---

13. What is the shunt resistance S needed if the galvanometer current I_g is 8% of the total current I?

(A) $\frac{2G}{23}$

 © Collegedunia.com

(B) $\frac{8G}{23}$

(C) $\frac{23G}{2}$

(D) $\frac{G}{23}$

Correct Answer: (A) $\frac{2G}{23}$

Solution:

Concept: A galvanometer can be converted into an ammeter by connecting a low resistance called a **shunt** in parallel with the galvanometer. The shunt allows most of the current to bypass the galvanometer so that only a small fraction of the total current flows through it.
If G = resistance of the galvanometer, S = shunt resistance, I_g = current through the galvanometer, I = total current.
Since the galvanometer and shunt are connected in parallel, the potential difference across them is the same.

$$I_g G = I_s S$$

where I_s is the current through the shunt.

Step 1: Express galvanometer current as a fraction of total current.

$$I_g = 8\% \text{ of } I$$

$$I_g = 0.08I$$

Step 2: Determine the current through the shunt.

$$I_s = I - I_g$$

$$I_s = I - 0.08I$$

$$I_s = 0.92I$$

 © Collegedunia.com

Step 3: Use the parallel branch relation.

$$I_g G = I_s S$$

Substitute the values:

$$0.08I \cdot G = 0.92I \cdot S$$

Step 4: Solve for shunt resistance.

Cancel I from both sides:

$$0.08G = 0.92S$$

$$S = \frac{0.08}{0.92} G$$

$$S = \frac{8}{92} G$$

$$S = \frac{2G}{23}$$

Step 5: Final result.

$$\boxed{S = \frac{2G}{23}}$$

Quick Tip: In a galvanometer–shunt combination, use $I_g G = I_s S$. The shunt carries the majority of the current, protecting the galvanometer from large currents.

---

14. Who is credited with the discovery of DNA?

(A) James Watson

(B) Francis Crick

 © Collegedunia.com

(C) F. Miescher

(D) Rosalind Franklin

Correct Answer: (C) F. Miescher

Solution:

Concept: DNA (Deoxyribonucleic Acid) is the hereditary material responsible for storing and transmitting genetic information in living organisms. The discovery of DNA laid the foundation for modern genetics and molecular biology.

Step 1: Historical discovery.

DNA was first discovered in 1869 by the Swiss scientist **Friedrich Miescher**. While studying the nuclei of white blood cells obtained from pus on surgical bandages, he isolated a new phosphorus-rich substance.

Step 2: Naming of the substance.

Miescher called this substance **"nuclein"** because it was found in the cell nucleus. Later research identified this material as DNA.

Step 3: Later contributions.

Many scientists contributed to understanding DNA:

- Watson and Crick proposed the double helix structure.
- Rosalind Franklin provided crucial X-ray diffraction data.

However, the **initial discovery of DNA itself** is credited to Friedrich Miescher.

Step 4: Conclusion.

Thus, the scientist credited with the discovery of DNA is **F. Miescher**.

Quick Tip: Friedrich Miescher discovered DNA in 1869 and originally named it "nuclein" because it was isolated from the cell nucleus.

 © Collegedunia.com