CUET PG 2026 Geophysics Question Paper with Solutions(Memory Based)

Time Allowed :1 Hours 30 min	Maximum Marks :300	Total Questions :75

General Instructions

1. The exam lasts 90 minutes (1 hour 30 minutes).
2. There are 75 Multiple Choice Questions (MCQs) to be answered.
3. +4 marks for every correct answer. -1 mark (negative marking) for every incorrect answer. 0 marks for unanswered or un-attempted questions.
4. For any discrepancy in questions, the English version is considered final (except for language-specific papers).
5. Click one of the four options to choose an answer.
6. You must click "Save & Next" to confirm your response. Only saved answers are considered for evaluation.
7. Use "Mark for Review & Next" to flag a question for later. You can unselect or change your answer using the "Clear Response" button.
8. All calculations must be done on the Rough Sheets provided at the centre. These must be returned to the invigilator after the exam.

1. What is the shape of the air film formed in the Newton's ring experiment?
(A) Plane
(B) Cylindrical
(C) Spherical
(D) Wedge-shaped

Correct Answer: (4) Wedge-shaped

Solution:
Concept: Newton's rings are formed due to interference of light waves reflected from the top and bottom surfaces of a thin air film formed between a plano-convex lens and a glass plate.
Step 1: Formation of air film.
When a plano-convex lens is placed on a flat glass plate, a thin layer of air is trapped between them.
Step 2: Nature of the air film.
The thickness of this air film gradually increases from the point of contact outward.
Step 3: Shape identification.
Since the thickness varies continuously in one direction, the air film behaves like a wedge-shaped film.
Step 4: Evaluating the options.

- Plane → Uniform thickness (incorrect)

- Cylindrical $\rightarrow$ Not applicable (incorrect)
- Spherical $\rightarrow$ Lens is spherical, but film is not (incorrect)
- Wedge-shaped $\rightarrow$ Thickness varies gradually (correct)

Step 5: Additional insight.
The varying thickness of the air film causes constructive and destructive interference, producing concentric circular fringes known as Newton's rings.
Step 6: Conclusion.
Thus, the air film formed in Newton's rings experiment is wedge-shaped.

Quick Tip

Remember: Variable thickness air film = Wedge-shaped (Newton's rings).

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2. Which Maxwell's equation represents Gauss's Law in Magnetostatics?
(A) $\nabla \cdot \mathbf{E} = \frac{\rho}{\varepsilon_0}$
(B) $\nabla \cdot \mathbf{B} = 0$
(C) $\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t}$
(D) $\nabla \times \mathbf{B} = \mu_0 \mathbf{J}$

Correct Answer: (2) $\nabla \cdot \mathbf{B} = 0$

Solution:
Concept: Maxwell's equations describe the behavior of electric and magnetic fields. Gauss's law for magnetism states that there are no magnetic monopoles.
Step 1: Understanding Gauss's Law in Magnetostatics.
It states that the net magnetic flux through a closed surface is zero.
Step 2: Mathematical expression.
This is represented as:

$$\nabla \cdot \mathbf{B} = 0$$

Step 3: Physical meaning.
Magnetic field lines always form closed loops; they do not begin or end like electric field lines.
Step 4: Evaluating the options.

- $\nabla \cdot \mathbf{E} = \frac{\rho}{\varepsilon_0} \rightarrow$ Gauss's law for electricity (incorrect)
- $\nabla \cdot \mathbf{B} = 0 \rightarrow$ Gauss's law for magnetism (correct)
- $\nabla \times \mathbf{E} = -\frac{\partial \mathbf{B}}{\partial t} \rightarrow$ Faraday's law (incorrect)
- $\nabla \times \mathbf{B} = \mu_0 \mathbf{J} \rightarrow$ Ampere's law (incorrect)

Step 5: Conclusion.
Thus, Gauss's Law in magnetostatics is $\nabla \cdot \mathbf{B} = 0$.

Quick Tip

Remember: No magnetic monopoles $\Rightarrow \nabla \cdot \mathbf{B} = 0$.

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3. Calculate the efficiency of a Carnot engine operating between the steam point (373 K) and ice point (273 K).
(A) 26.8%
(B) 36.8%
(C) 46.8%
(D) 56.8%

Correct Answer: (1) 26.8%

Solution:
Concept: Efficiency of a Carnot engine depends only on the temperatures of the hot and cold reservoirs.
Step 1: Formula for Carnot efficiency.

$$\eta = 1 - \frac{T_c}{T_h}$$

Step 2: Substituting values.

$$T_h = 373\,K, \quad T_c = 273\,K$$

$$\eta = 1 - \frac{273}{373}$$

Step 3: Calculation.

$$\frac{273}{373} \approx 0.732$$
$$\eta = 1 - 0.732 = 0.268$$

Step 4: Convert to percentage.

$$\eta = 26.8\%$$

Step 5: Evaluating the options.

- 26.8% $\rightarrow$ Correct
- 36.8% $\rightarrow$ Incorrect
- 46.8% $\rightarrow$ Incorrect
- 56.8% $\rightarrow$ Incorrect

Step 6: Conclusion.
Thus, the efficiency of the Carnot engine is 26.8%.

Quick Tip

Remember: $\eta = 1 - \frac{T_c}{T_h}$ (Temperatures must be in Kelvin).

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4. What is the Compton shift for a photon backscattered at 180 degrees?
(A) $\frac{h}{mc}$
(B) $\frac{2h}{mc}$
(C) $\frac{h}{2mc}$
(D) 0

Correct Answer: (2) $\frac{2h}{mc}$

Solution:
Concept: Compton shift refers to the change in wavelength of a photon when it is scattered by a particle such as an electron.
Step 1: Compton shift formula.

$$\Delta\lambda = \frac{h}{mc}(1 - \cos\theta)$$

Step 2: Given condition.
For backscattering, $\theta = 180^\circ$

$$\cos 180^\circ = -1$$

Step 3: Substitute the value.

$$\Delta\lambda = \frac{h}{mc}(1 - (-1)) = \frac{h}{mc}(2)$$

$$\Delta\lambda = \frac{2h}{mc}$$

Step 4: Evaluating the options.

- $\frac{h}{mc} \rightarrow$ Incorrect
- $\frac{2h}{mc} \rightarrow$ Correct
- $\frac{h}{2mc} \rightarrow$ Incorrect
- $0 \rightarrow$ Incorrect

Step 5: Conclusion.
Thus, the Compton shift for backscattering is $\frac{2h}{mc}$.

Quick Tip

Remember: Maximum Compton shift occurs at $180^\circ \rightarrow \frac{2h}{mc}$.

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5. For a series LCR circuit, what is the formula for the phase angle between current and emf?

(A) $\tan\phi = \frac{X_L - X_C}{R}$
(B) $\tan\phi = \frac{R}{X_L - X_C}$
(C) $\sin\phi = \frac{X_L - X_C}{R}$
(D) $\cos\phi = \frac{X_L - X_C}{R}$

Correct Answer: (1) $\tan\phi = \frac{X_L - X_C}{R}$

Solution:
Concept: In a series LCR circuit, the phase difference between current and applied emf depends on resistance and reactance.
Step 1: Understanding reactance.
Inductive reactance: $X_L = \omega L$
Capacitive reactance: $X_C = \frac{1}{\omega C}$
Step 2: Net reactance.

$$X = X_L - X_C$$

Step 3: Phase angle formula.

$$\tan\phi = \frac{X}{R} = \frac{X_L - X_C}{R}$$

Step 4: Evaluating the options.

- $\tan\phi = \frac{X_L - X_C}{R} \rightarrow$ Correct
- $\tan\phi = \frac{R}{X_L - X_C} \rightarrow$ Incorrect
- $\sin\phi = \frac{X_L - X_C}{R} \rightarrow$ Incorrect
- $\cos\phi = \frac{X_L - X_C}{R} \rightarrow$ Incorrect

Step 5: Conclusion.
Thus, the phase angle is given by $\tan\phi = \frac{X_L - X_C}{R}$.

Quick Tip

Remember: $\tan\phi = \frac{\text{Reactance}}{\text{Resistance}}$.

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6. According to Wien's displacement law, how is the surface temperature of a star related to its maximum intensity wavelength?

(A) $\lambda_{\text{max}} \propto T$
(B) $\lambda_{\text{max}} \propto \frac{1}{T}$
(C) $\lambda_{\text{max}} \propto T^2$
(D) $\lambda_{\text{max}} \propto \frac{1}{T^2}$

Correct Answer: (2) $\lambda_{\text{max}} \propto \frac{1}{T}$

Solution:
Concept: Wien's displacement law relates the temperature of a black body to the wavelength at which it emits maximum radiation.
Step 1: Wien's law formula.

$$\lambda_{\text{max}} T = b$$

where b is Wien's constant.
Step 2: Rewriting the relation.

$$\lambda_{\text{max}} = \frac{b}{T}$$

Step 3: Understanding the relationship.
As temperature increases, the peak wavelength decreases.
Step 4: Evaluating the options.

- $\lambda_{\text{max}} \propto T \rightarrow$ Incorrect
- $\lambda_{\text{max}} \propto \frac{1}{T} \rightarrow$ Correct
- $\lambda_{\text{max}} \propto T^2 \rightarrow$ Incorrect
- $\lambda_{\text{max}} \propto \frac{1}{T^2} \rightarrow$ Incorrect

Step 5: Conclusion.
Thus, λ_{max} is inversely proportional to temperature.

Quick Tip

Remember: Hotter object $\rightarrow$ shorter wavelength ($\lambda_{\text{max}} \downarrow$).

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7. Which thermodynamic process must occur "infinitesimally slowly" to remain reversible?
(A) Isothermal process
(B) Adiabatic process
(C) Quasi-static process
(D) Isochoric process

Correct Answer: (3) Quasi-static process

Solution:
Concept: A reversible process is an ideal thermodynamic process that occurs in such a way that the system remains in equilibrium at every stage.
Step 1: Understanding reversible process.
For a process to be reversible, it must proceed infinitely slowly so that the system remains in thermodynamic equilibrium.
Step 2: Definition of quasi-static process.
A quasi-static process is one that occurs very slowly, passing through a sequence of equilibrium states.
Step 3: Connection to reversibility.
All reversible processes are quasi-static, as they require infinitesimally slow changes.
Step 4: Evaluating the options.

- Isothermal process $\rightarrow$ Constant temperature, not necessarily slow (incorrect)
- Adiabatic process $\rightarrow$ No heat exchange (incorrect)
- Quasi-static process $\rightarrow$ Infinitesimally slow, reversible (correct)
- Isochoric process $\rightarrow$ Constant volume (incorrect)

Step 5: Conclusion.
Thus, a quasi-static process must occur infinitesimally slowly to remain reversible.

> Quick Tip
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> Remember: Reversible process = Quasi-static (very slow).

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8. What is the relation between the polarizing angle and the refractive index in Brewster's Law?
(A) $\mu = \sin\theta_p$
(B) $\mu = \cos\theta_p$
(C) $\mu = \tan\theta_p$
(D) $\mu = \cot\theta_p$

Correct Answer: (3) $\mu = \tan\theta_p$

Solution:
Concept: Brewster's Law states that at a particular angle of incidence (polarizing angle), the reflected light is completely plane polarized.
Step 1: Brewster's Law formula.

$$\mu = \tan\theta_p$$

where μ is the refractive index and θ_p is the polarizing angle.
Step 2: Physical meaning.
At this angle, the reflected and refracted rays are perpendicular to each other.
Step 3: Evaluating the options.

- $\mu = \sin \theta_p \rightarrow$ Incorrect
- $\mu = \cos \theta_p \rightarrow$ Incorrect
- $\mu = \tan \theta_p \rightarrow$ Correct
- $\mu = \cot \theta_p \rightarrow$ Incorrect

Step 4: Conclusion.
Thus, the relation is $\mu = \tan \theta_p$.

Quick Tip

Remember: Brewster's Law $\rightarrow \mu = \tan \theta_p$.

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9. How does the orbital period of a satellite change as its distance from the Earth's center increases?
(A) $T \propto r$
(B) $T \propto r^2$
(C) $T \propto r^{3/2}$
(D) $T \propto \frac{1}{r}$

Correct Answer: (3) $T \propto r^{3/2}$

Solution:
Concept: The motion of satellites follows Kepler's third law of planetary motion.
Step 1: Kepler's third law.

$$T^2 \propto r^3$$

Step 2: Deriving the relation.
Taking square root on both sides:

$$T \propto r^{3/2}$$

Step 3: Understanding the result.
As the distance from Earth increases, the orbital period increases more than linearly.
Step 4: Evaluating the options.

- $T \propto r \rightarrow$ Incorrect
- $T \propto r^2 \rightarrow$ Incorrect
- $T \propto r^{3/2} \rightarrow$ Correct
- $T \propto \frac{1}{r} \rightarrow$ Incorrect

Step 5: Conclusion.
Thus, $T \propto r^{3/2}$.

Quick Tip

Remember: Kepler's 3rd Law $\rightarrow T^2 \propto r^3$.

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10. In a P-N junction diode, which terminal is connected to the P-side during forward biasing?
(A) Negative terminal
(B) Positive terminal
(C) Ground
(D) Neutral terminal

Correct Answer: (2) Positive terminal

Solution:
Concept: Forward biasing of a P-N junction diode reduces the barrier potential and allows current to flow.
Step 1: Understanding diode structure.
A P-N junction consists of a P-type semiconductor (holes as majority carriers) and an N-type semiconductor (electrons as majority carriers).
Step 2: Forward bias condition.
In forward bias, the external voltage is applied such that it reduces the depletion region.
Step 3: Connection of terminals.
The P-side is connected to the positive terminal, and the N-side is connected to the negative terminal.
Step 4: Evaluating the options.

- Negative terminal $\rightarrow$ Connected to N-side (incorrect)
- Positive terminal $\rightarrow$ Connected to P-side (correct)
- Ground $\rightarrow$ Not specific (incorrect)
- Neutral terminal $\rightarrow$ Not applicable (incorrect)

Step 5: Conclusion.
Thus, the P-side is connected to the positive terminal during forward biasing.

Quick Tip

Remember: Forward bias $\rightarrow$ P to Positive, N to Negative.

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11. What is the quality factor (Q) of an LCR circuit defined in terms of resonant frequency and bandwidth?
(A) $Q = \frac{\text{Bandwidth}}{f_0}$
(B) $Q = \frac{f_0}{\text{Bandwidth}}$

(C) $Q = f_0 \times \text{Bandwidth}$
(D) $Q = \frac{1}{f_0 \times \text{Bandwidth}}$

Correct Answer: (2) $Q = \frac{f_0}{\text{Bandwidth}}$

Solution:
Concept: The quality factor (Q) of a resonant circuit measures the sharpness of resonance.
Step 1: Definition of quality factor.
It is defined as the ratio of resonant frequency to the bandwidth of the circuit.
Step 2: Formula.

$$Q = \frac{f_0}{\Delta f}$$

where f_0 is the resonant frequency and Δf is the bandwidth.
Step 3: Physical meaning.
Higher Q means sharper resonance and lower energy loss.
Step 4: Evaluating the options.

- $Q = \frac{\text{Bandwidth}}{f_0} \rightarrow$ Incorrect
- $Q = \frac{f_0}{\text{Bandwidth}} \rightarrow$ Correct
- $Q = f_0 \times \text{Bandwidth} \rightarrow$ Incorrect
- $Q = \frac{1}{f_0 \times \text{Bandwidth}} \rightarrow$ Incorrect

Step 5: Conclusion.
Thus, $Q = \frac{f_0}{\text{Bandwidth}}$.

Quick Tip

Remember: High Q = Sharp resonance = Narrow bandwidth.

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12. For a rolling solid sphere on an incline of 30°, what is its acceleration a in terms of gravity g?
(A) $\frac{g}{2}$
(B) $\frac{5g}{7}$
(C) $\frac{5g}{7}\sin 30^\circ$
(D) $\frac{2g}{7}\sin 30^\circ$

Correct Answer: (3) $\frac{5g}{7}\sin 30^\circ$

Solution:
Concept: For a body rolling without slipping down an incline, acceleration depends on both translational and rotational motion.

Step 1: General formula.
For rolling motion:

$$a = \frac{g\sin\theta}{1 + \frac{I}{mR^2}}$$

Step 2: Moment of inertia of solid sphere.

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

Step 3: Substitute in formula.

$$a = \frac{g\sin\theta}{1 + \frac{2}{5}} = \frac{g\sin\theta}{\frac{7}{5}} = \frac{5}{7}g\sin\theta$$

Step 4: For $\theta = 30^\circ$.

$$a = \frac{5}{7}g\sin 30^\circ$$

Step 5: Evaluating the options.

- $\frac{g}{2} \rightarrow$ Incorrect
- $\frac{5g}{7} \rightarrow$ Missing $\sin\theta$ (incorrect)
- $\frac{5g}{7}\sin 30^\circ \rightarrow$ Correct
- $\frac{2g}{7}\sin 30^\circ \rightarrow$ Incorrect

Step 6: Conclusion.
Thus, acceleration is $\frac{5g}{7}\sin 30^\circ$.

Quick Tip

Remember: Solid sphere $\rightarrow a = \frac{5}{7}g\sin\theta$.
