Sample Paper-01

Dropper NEET (2024)

PHYSICS

SECTION-A

1. An AC current is given by $I = I_0 + I_1 \sin\omega t$, then its rms value will be;

(1) $\sqrt{I_0^2 + 0.5I_1^2}$ (2) $\sqrt{I_0^2 + 0.5I_0^2}$

(3) 0 (4) $I_0/\sqrt{2}$

2. An ideal efficient transformer has a primary power input of 10 kW. The secondary current when the transformer is on load is 25 A. If the primary to secondary turns ratio is 8:1, then the potential difference applied to the primary coil is:

(1) $\frac{10^4 \times 8^2}{25} V$ (2) $\frac{10^4 \times 8}{25} V$

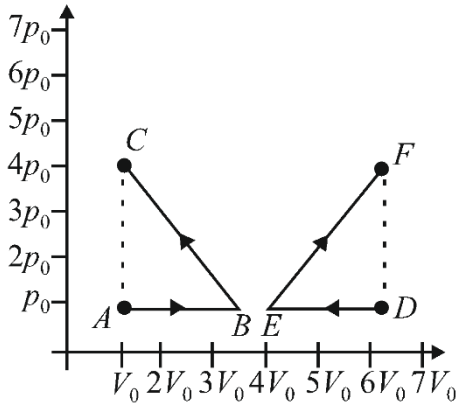
(3) $\frac{10^4}{25 \times 8} V$ (4) $\frac{10^4}{25 \times 8^2} V$

3. The depth d at which the value of acceleration due to gravity becomes $\frac{1}{n}$ times the value at the surface of the earth, is; [R = radius of the earth]

(1) $\frac{R}{n}$ (2) $R\left(\frac{n-1}{n}\right)$

(3) $\frac{R}{n^2}$ (4) $R\left(\frac{n}{n+1}\right)$

4. If W_{ABC} is the work done in process $A \rightarrow B \rightarrow C$ and W_{DEF} is work done in process $D \rightarrow E \rightarrow F$ as shown in the figure, then;



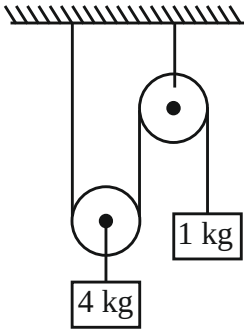
(1) $|W_{DEF}| > |W_{ABC}|$

(2) $|W_{DEF}| < |W_{ABC}|$

(3) $W_{DEF} = W_{ABC}$

(4) $W_{DEF} = -W_{ABC}$

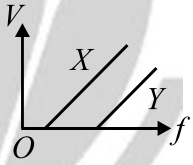
5. In the system shown in the figure, the acceleration of 1 kg mass is

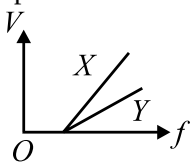


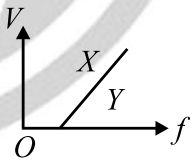
(1) $\frac{g}{4}$ downwards (2) $\frac{g}{2}$ downwards

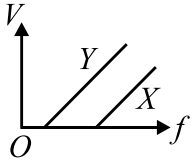
(3) $\frac{g}{2}$ upwards (4) $\frac{g}{4}$ upwards

6. In a photoelectric experiment, electrons are ejected from metals X and Y by light of intensity I and frequency f. The potential difference V required to stop the electrons is measured for various frequencies. If Y has a greater work function than X, then which one of the following graphs best illustrates the expected results?

(1) 

(2) 

(3) 

(4) 

7. An electron with initial kinetic energy of 100 eV is further accelerated through a potential difference of 50V. Now the de-Broglie wavelength of electron becomes-

(1) 1 Å (2) $\sqrt{1.5}$Å

(3) $\sqrt{3}$Å (4) 12.27 Å

8. When a sphere rolls down an inclined plane, then identify the **correct** statement related to the work done by friction force-

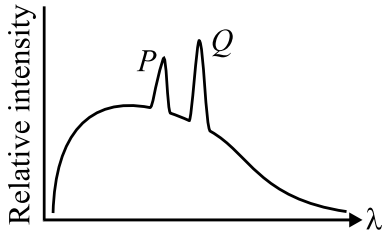
(1) the friction force does positive translational work.

(2) the friction force does negative rotational work.

(3) the net work done by friction is zero.

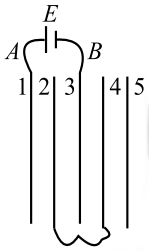
(4) All of the above

9. In a characteristic X-ray spectrum of some atom superimposed on continuous X-ray spectra;



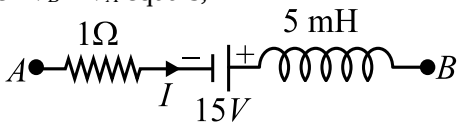
(1) P represents K_α line.
(2) Q represents K_β line.
(3) Q and P represents K_α and K_β lines respectively.
(4) Relative positions of K_α and K_β depend on the particular atom.

10. Five conducting parallel plates having area A and separation between them d, are placed as shown in the figure. Plate number 2 and 4 are connected with wire and between point A and B, a cell of emf E is connected. The charge flown through the cell is;



(1) $\frac{3A\in_0 E}{2d}$ (2) $\frac{2A\in_0 E}{3d}$
(3) $\frac{A\in_0 E}{2d}$ (4) $\frac{2A\in_0 E}{d}$

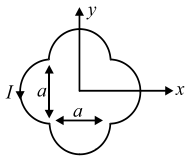
11. The network shown in the figure is part of a complete circuit. If at a certain instant, the current I is 5A and it is decreasing at a rate of 10^3 As^{-1} then $V_B - V_A$ equals;



(1) 20 V (2) 15 V
(3) 10 V (4) 5 V

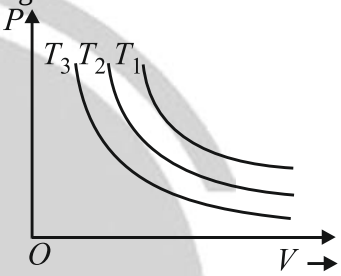
12. The coefficient of static friction between the box and the train's floor is 0.2. The maximum acceleration of the train in which a box lying on its floor will remain stationary is
(Take g = 10 m s^{-2})
(1) 2 m s^{-2} (2) 4 m s^{-2}
(3) 6 m s^{-2} (4) 8 m s^{-2}

13. A loop carrying current I lie in the x-y plane as shown in the figure. The unit vector $\hat{k}$ is coming out of the plane of the paper. The magnetic moment of the current loop is;



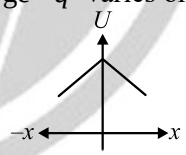
(1) $a^2I\hat{k}$ (2) $\left(\frac{\pi}{2}+1\right)a^2I\hat{k}$
(3) $-\left(\frac{\pi}{2}+1\right)a^2I\hat{k}$ (4) $(2\pi+1)a^2I\hat{k}$

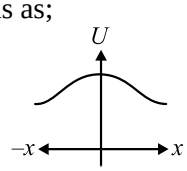
14. The isothermal diagram of a gas at three different temperatures T_1, T_2 and T_3, is shown in the given figure. Then

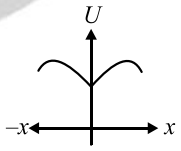


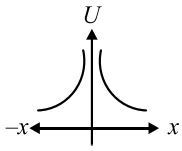
(1) $T_1 < T_2 < T_3$ (2) $T_1 < T_2 > T_3$
(3) $T_1 > T_2 > T_3$ (4) $T_1 > T_2 < T_3$

15. Four equal charges $+q$ are placed at four corners of a square with its centre at origin and lying in yz plane. The electrostatic potential energy of a fifth charge $+q$' varies on x- axis as;

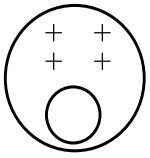
(1) 

(2) 

(3) 

(4) 

16. A spherical portion has been removed from a solid sphere having a charge distributed uniformly in its volume as shown in the figure. The electric field inside the emptied space is;

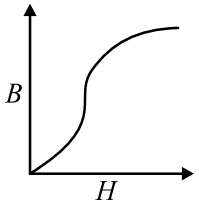


(1) zero everywhere.
(2) non-zero and uniform.
(3) non uniform.
(4) zero only at its centre.

17. A point mass moves along a circle having a radius 20 cm with a constant tangential acceleration 5 cm / s^2. How much time is needed after motion begins for the normal acceleration of the point mass to be equal to tangential acceleration?

(1) 1 s (2) 2 s
(3) 3 s (4) 4 s

18. The figure represents *B*- *H* curve for commercial iron. As *H* is increased, permeability;



(1) increases and becomes constant.
(2) increases, reaches a maximum and then decreases.
(3) decreases continuously till it becomes very small.
(4) decreases reaches a minimum and then increases.

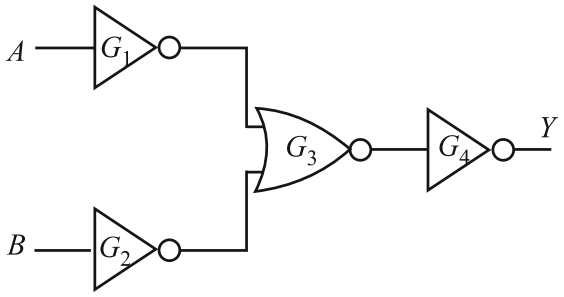
19. A 14.5 kg mass, fastened to the end of a steel wire of unstretched length 1m, is whirled in a vertical circle with an angular velocity of 2 rev/s at the bottom of the circle. The cross-sectional area of the wire is 0.065 cm^2. The elongation of the wire when the mass is at the lowest point of its path is;
[$Y_{steel} = 2 \times 10^{11}$ N/m^2]

(1) 9.67 mm (2) 6.67 mm
(3) 1.87 mm (4) 0.12 mm

20. The moment of inertia of a rod about an axis passing through its centre and perpendicular to it is $\frac{1}{12} ML^2$ (where, *M* is the mass and *L* is the length of the rod). The rod is bent in the middle so that the two halves make an angle of 60°. The moment of inertia of the bent rod about the same axis would be;

(1) $\frac{1}{48}ML^2$ (2) $\frac{1}{12}ML^2$
(3) $\frac{1}{24}ML^2$ (4) $\frac{ML^2}{8\sqrt{3}}$

21. The combination of gates shown below produces



(1) AND gate (2) XOR gate
(3) NOR gate (4) NAND gate

22. Two soap bubbles in vacuum of radius 3 cm and 4 cm coalesce to form a single bubble under isothermal conditions. Then the radius of bigger bubble is;

(1) 7 cm (2) $\frac{12}{7}$ cm
(3) 12 cm (4) 5 cm

23. Two vectors $\vec{A}$ and $\vec{B}$ have equal magnitudes. The magnitude of $(\vec{A}+\vec{B})$ is '*n*' times the magnitude of $(\vec{A}-\vec{B})$. The angle between $\vec{A}$ and $\vec{B}$ is;

(1) $\cos^{-1}\left[\frac{n^2-1}{n^2+1}\right]$ (2) $\cos^{-1}\left[\frac{n-1}{n+1}\right]$
(3) $\sin^{-1}\left[\frac{n^2-1}{n^2+1}\right]$ (4) $\sin^{-1}\left[\frac{n-1}{n+1}\right]$

24. The horizontal and vertical displacements of a particle moving along a curved line are given by $x = 5t$ and $y = 2t^2 + t$. Time after which its velocity vector makes an angle of 45° with the horizontal is;

(1) 0.5 s (2) 1 s
(3) 2 s (4) 1.5 s

25. A closed organ pipe and an open organ pipe are tuned to the same fundamental frequency. The ratio of their lengths is;

(1) 1 : 2 (2) 2 : 1
(3) 1 : 4 (4) 4 : 1

26. A sample of radioactive material has mass *m*, decay constant λ, molecular weight *M* and Avogadro constant N_A. The initial activity of the sample is-

(1) λm (2) $\frac{\lambda m}{M}$
(3) $\frac{\lambda m N_A}{M}$ (4) $mN_A\lambda$

27. A satellite is moving with a constant speed 'V' in a circular orbit about the earth. An object of mass 'm' is ejected from the satellite such that it just escapes from the gravitational pull of the earth. At the time of its ejection, the kinetic energy of the object is;

(1) $\frac{1}{2}mV^2$ (2) mV^2

(3) $\frac{3}{2}mV^2$ (4) $2mV^2$

28. Voltage applied to an *AC* circuit and current flowing in it is given by

$$V = 200\sqrt{2}\sin\left(\omega t + \frac{\pi}{4}\right) \text{ and } i = -\sqrt{2}\cos\left(\omega t + \frac{\pi}{4}\right)$$

Then, power consumed in the circuit will be;

(1) 200 W (2) 400 W

(3) $200\sqrt{2}$ W (4) Zero

29. A solid sphere rolls down two different inclined planes of the same height but of different inclinations;

(1) in both cases the speeds and time of descend will be same.

(2) the speeds will be same but time of descend will be different.

(3) the speeds will be different but time of descend will be same.

(4) speeds and time of descend both will be different.

30. In a stationary wave system, all the particles of the medium;

(1) have zero displacement simultaneously at some instant.

(2) have maximum displacement simultaneously at some instant.

(3) are at rest simultaneously at some instant.

(4) All of the above

31. Two liquids are at temperatures 20°C and 40°C. When same mass of both of them is mixed, the temperature of the mixture is 32°C. What is the ratio of their specific heats?

(1) $\frac{1}{3}$ (2) $\frac{2}{5}$

(3) $\frac{3}{2}$ (4) $\frac{2}{3}$

32. A power transmission line feeds input power at 2300V to a step-down transformer with its primary windings having 4000 turns. The output power is delivered at 230V by the transformer. If the current in the primary of the transformer is 5A and its efficiency is 90%, the output current would be;

(1) 50 A (2) 45 A

(3) 35 A (4) 25 A

33. Unpolarised light is incident on a dielectric of refractive index $\sqrt{3}$. What is the angle of incidence if the reflected beam is completely polarised?

(1) 30° (2) 45°

(3) 60° (4) 75°

34. **Assertion:** Internal forces cannot change linear momentum.

Reason: Internal forces cannot change kinetic energy of a system.

(1) If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.

(2) If both Assertion and Reason are true and the Reason is not a correct explanation of the Assertion.

(3) If Assertion is true but Reason is false.

(4) If Assertion is false and Reason is true

35. A small photocell is placed at a distance of 4 m from a photosensitive surface. When light falls on the surface the current is 5 mA. If the distance of cell is decreased to 1 m, the current will become;

(1) 10 mA (2) 40 mA

(3) 20 mA (4) 80 mA

SECTION-B

36. A prism of apex angle A = 60° has the refractive index $\mu = \sqrt{2}$. The angle of incidence for minimum deviation is;

(1) 30° (2) 45°

(3) 60° (4) None of these

37. **Assertion:** Moment of inertia of a rigid body about any axis passing through its centre of mass is minimum.

Reason: From theorem of parallel axis, $I = I_{cm} + Mr^2$

(1) If both Assertion and Reason are true and the Reason is the correct explanation of the Assertion.

(2) If both Assertion and Reason are true and the Reason is not a correct explanation of the Assertion.

(3) If Assertion is true but Reason is false.

(4) If Assertion is false and Reason is true.

38. In the nucleus of helium if F_1 is the net force between two protons, F_2 is the net force between two neutrons and F_3 is the net force between a proton and a neutron. Then;

(1) $F_1 = F_2 = F_3$ (2) $F_1 > F_2 > F_3$

(3) $F_2 > F_3 > F_1$ (4) $F_2 = F_3 > F_1$

39. Match the following columns and choose the correct option from the codes given below:

Column I		Column II	
(A)	Stress × Strain	(P)	J
(B)	$\frac{YA}{l}$	(Q)	Nm^{-1}
(C)	Yl^3	(R)	Jm^{-3}
(D)	$\frac{Fl}{AY}$	(S)	m

(1) A → R, B → Q, C → P, D → S

(2) A → Q, B → R, C → P, D → S

(3) A → P, B → S, C → R, D → Q

(4) A → Q, B → R, C → S, D → P

40. A charged particle is rotating in uniform circular motion in a uniform magnetic field. Let r = radius of circle, v = speed of particle, K = kinetic energy, a = magnitude of acceleration, p = magnitude of linear momentum, $\frac{q}{m} = \alpha =$ specific charge and ω = angular speed. Then, match the Column I with Column II and mark the correct option from the codes given below.

Column I		Column II	
(A)	If v is doubled	(P)	r will become two times
(B)	If B is doubled	(Q)	ω will become two times
(C)	If p is doubled	(R)	α will become two times
(D)	If α is doubled	(S)	None

(1) A → P, B → Q, C → P, D → Q

(2) A → P, B → R, C → S, D → Q

(3) A → S, B → R, C → S, D → Q

(4) A → P, B → R, C → S, D → S

41. Two sound waves of wavelength 1 m and 1.01 m in a gas produce 10 beats in 3 s. The velocity of sound in the gas is;

(1) 330 m/s (2) 337 m/s

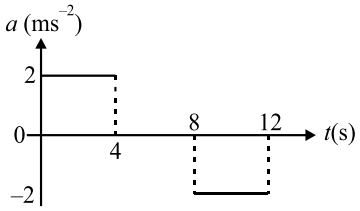
(3) 360 m/s (4) 300 m/s

42. What is the ratio of de-Broglie wavelength of electron in the second and third Bohr orbits in the hydrogen atoms?

(1) 2/3 (2) 3/2

(3) 4/3 (4) 3/4

43. A lift starts from rest. Its acceleration is plotted against time. When it comes to rest its height above its starting point is;



(1) 20 m (2) 64 m

(3) 32 m (4) 36 m

44. A bullet of mass 10gm moving with a speed of 20 m/s hits an ice block of mass 990 gm kept on a frictionless floor and gets stuck in it. How much ice will melt if 50% of the lost *KE* goes to ice ? (Initial temperature of the ice block = 0°C, and latent heat of ice = 80 cal/g)

(1) 0.001 gm (2) 0.002 gm

(3) 0.003 gm (4) None of these

45. Two plane mirrors are inclined at 70°. A ray incident on one mirror at incidence angle θ, after reflection falls on the second mirror and is reflected from there parallel to the first mirror. The value of θ is

(1) 50° (2) 45°

(3) 30° (4) 25°

46. Which of the following statements are **CORRECT?**

Statement I: When a battery is connected across the junction diode with its negative terminal connected to the p-side and the positive terminal connected to the n-side, the diode is said to be forward biased.

Statement II: In forward bias condition, if the bias voltage is greater than the barrier potential, the majority carries move towards the junction and cross it.

Statement III: In reverse biasing of a diode, the majority carriers are pulled away from the junction, making the depletion layer wider.

(1) I and II (2) II and III

(3) I, Il and III (4) I and III

47. Starting from the origin at time t = 0, with initial velocity $5\hat{j}$ ms^{-1}, a particle moves in the x-y plane with a constant acceleration of $(10\hat{i} + 4\hat{j})$ ms^{-2}. At time t, its coordinates are (20 m, y_0 m). The values of t and y_0 are, respectively;

(1) 2s and 18 m (2) 4s and 52 m

(3) 2s and 24 m (4) 5s and 25m

48. **Statement I**: In photoelectric effect, an electron absorbs a quantum of energy (hν) of radiation.
Statement II: If the absorbed energy is less than the work function of the metal, then more tightly bound electrons will emerge with maximum kinetic energies.

(1) Statement I and Statement II both are correct.
(2) Statement I is correct, but Statement II is incorrect.
(3) Statement I is incorrect, but Statement II is correct.
(4) Statement I and Statement II both are incorrect.

49. **Statement I**: Particle-1 is dropped from a tower and particle-2 is projected horizontal from the same tower, then both the particles reach the ground simultaneously.
Statement II. Both the particles strike the ground with different speeds.
Which of the following statement(s) is/are correct?

(1) Only I (2) Only II
(3) Both I and II (4) Neither I nor II

50. A steel ball of mass m falls in a viscous liquid with terminal velocity v, then the steel ball of mass $8m$ will fall in the same liquid with terminal velocity;

(1) v (2) $4v$
(3) $8v$ (4) $16\sqrt{2}v$