Sample Paper-04

Dropper NEET (2024)

PHYSICS

SECTION-A

1. Which of the following is not due to total internal reflection?

(1) Working of optical fibre
(2) Difference between apparent and real depth of pond
(3) Mirage on hot summer days
(4) Brilliance of diamond

2. NAND and NOR gates are called universal gates primarily because they;

(1) are available universally.
(2) can be combined to produce OR, AND and NOT gates.
(3) are widely used in Integrated circuit packages.
(4) are easiest to manufacture.

3. A needle of length 5 cm, placed 45 cm from a convex lens, forms an image on a screen placed 90 cm on the other side of the lens. The focal length of the lens and size of the image is;

(1) 30 cm, 12 cm respectively.
(2) 30 cm, 10 cm respectively.
(3) 25 cm, 12 cm respectively.
(4) 25 cm, 10 cm respectively.

4. An infinite number of masses, each of 1 kg, are placed on the positive x axis at lm, 2m, 4m, 8m, ... from the origin. The magnitude of the gravitational field at the origin due to this distribution of masses is;

(1) $2\,G$ (2) $\frac{4G}{3}$

(3) $\frac{3G}{4}$ (4) ∞

5. A 2 kg block is moving towards a horizontal massless spring of force constant 2 N/m. As the block collides, it compresses the spring by 4 m. If the coefficient of kinetic friction between the block and the surface is 0.3, what was the speed of the block at the instant of collision? (Take g = 10 m/s^2)

(1) $2\sqrt{10}\,ms^{-1}$ (2) $6\sqrt{2}\,ms^{-1}$

(3) $6\sqrt{10}\,ms^{-1}$ (4) $7\sqrt{5}\,ms^{-1}$

6. If P represents radiation pressure, c represents speed of light and Q represents radiation energy striking a unit area per second, then non-zero integers x, y and z, such that $P^x\,Q^y\,c^z$ is dimensionless, are;

(1) $x = 1, y = 1, z = -1$
(2) $x = 1, y = -1, z = 1$
(3) $x = -1, y = 1, z = 1$
(4) $x = 1, y = 1, z = 1$

7. The masses of neutron and proton are 1.0087 a.m.u. and 1.0073 a.m.u. respectively. If the neutrons and protons combine to form a helium nucleus (alpha particles) of mass 4.0015 a.m.u the binding energy of the helium nucleus will be;
(1 a.m.u. = 931 MeV)

(1) 28.4 MeV (2) 20.8 MeV
(3) 27.3 MeV (4) 14.2 MeV

8. A block of mass 50 kg can slide on a rough horizontal surface. The coefficient of friction between the block and the surface is 0.6. The least force of pull acting at 30° to the upward drawn vertical which causes the block to just slide is;
(g = 9.8 m/s^2)

(1) 29.42 N (2) 219.6 N
(3) 21.96 N (4) 294.2 N

9. The velocity of all radio waves in free space is 3×10^8 m/s.
The frequency of a radio wave of wavelength 150m is;

(1) 20 kHz (2) 2 kHz
(3) 2 MHz (4) 1 MHz

10. The variation of drift velocity v_d with the intensity of electric field is given by:

(1) $v_d \propto E$ (2) $v_d \propto \frac{1}{E}$

(3) v_d = constant (4) $v_d \propto E^2$

11. A boy starts from rest at time $t = 0$, accelerates uniformly and travels 320 m in 4s, its velocity at time $t = 10$ s is

(1) 200 m/s (2) 40 m/s
(3) 400 m/s (4) 20 m/s

12. How much current is drawn by the primary of an ideal transformer if it steps down 220 V to 11 V in order to operate a device with a resistance of 110 Ω?

(1) 0.01 *A* (2) 0.1 *A*
(3) 1 *A* (4) 10 *A*

13. The work function of metal is 4.5 eV its threshold wavelength will be

(1) 2750 Å (2) 3000 Å
(3) 3560 Å (4) 4750 Å

14. A liquid *A* and *a* suitably prepared mixture solution *B* have the same values of surface tension but their densities are in the ratio 2:3. Two capillary tubes, having diameters in the ratio 5:4, are dipped in the two containers of *A* and *B* respectively. If the angle of contact can be taken as zero for both cases then the heights to which the liquids will rise are in the ratio;

(1) 6 : 5 (2) 5 : 6
(3) 15 : 8 (4) 8 : 15

15. A particle of mass in is projected with a velocity *v* making an angle of 45° with the horizontal. The magnitude of the angular momentum of the projectile about the point of projection when the particle is at its maximum height *h* is;

(1) zero (2) $\frac{mv^3}{4\sqrt{2}g}$

(3) $\frac{mv^3}{\sqrt{2}g}$ (4) $m\sqrt{2gh^3}$

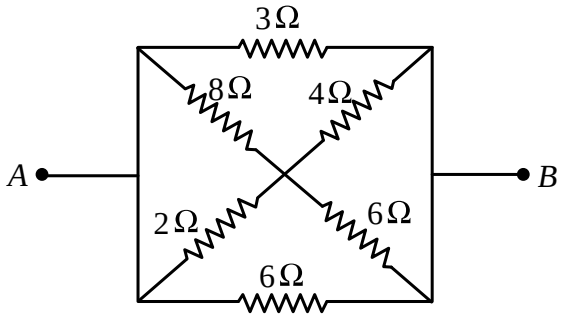
16. 100 g of water is heated from 30°C to 50°C. Ignoring the slight expansion of the water, the change in its internal energy is (Specific heat of water is 4184 J/kg K)

(1) 8.4 kJ (2) 84 kJ
(3) 2.1 kJ (4) 4.2 kJ

17. A rod of length 2.4 m and radius 4.6 mm carries a negative charge of 4.2×10^{-7} C spread uniformly over it surface. The electric field near the mid-point of the rod, at a point on its surface is;

(1) -8.6×10^5 NC^{-1} (2) 8.6×10^4 NC^{-1}
(3) -6.7×10^5 NC^{-1} (4) -6.7×10^4 NC^{-1}

18. In the network shown, the equivalent resistance between *A* and *B* is;



(1) $\frac{3}{4}\Omega$ (2) $\frac{4}{3}\Omega$
(3) $\frac{24}{17}\Omega$ (4) $\frac{17}{24}\Omega$

19. How much steam at 100°C will just melt 3200 *g* of ice at –10°C? (specific heat of ice = 0.5 cal/g°C, latent heat of steam = 540 cal/g, latent heat of ice = 80 cal/g)

(1) 400 *g* (2) 800 *g*
(3) 425 *g* (4) 900 *g*

20. Two long straight parallel wires *X* and *Y* are placed 50 cm apart and carry currents 20 ampere and 15 ampere respectively. A point *P* is 40 cm from wire *X* and 30 cm from wire *Y*. The magnitude of the resultant magnetic field at *P* is;

(1) 10^{-5}T (2) $\sqrt{2}\times10^{-5}$ T
(3) 2×10^{-5}T (4) $2\sqrt{5}\times10^{-5}$ T

21. A body of mass 8 kg, placed on a smooth horizontal table, is connected by a light string passing over a pulley to a hanging body of mass 2 kg. The acceleration of the masses and the tension in the string respectively are; (g = 10 m/s^2)

(1) 2 m/s^2, 10 N
(2) 2 m/s^2, 16 N
(3) 3 m/s^2, 10 N
(4) 3 m/s^2, 16 N

22. A coil of mean area 400 cm^2 and having 200 turns is held perpendicular to a uniform field of 0.4 gauss. The coil is turned through 180° in 0.5 s. The average induced emf, is;

(1) 0.0128 V (2) 0.0262 V
(3) 0.1872 V (4) 0.2507 V

23. **Assertion (A):** When two semiconductors of *p* and *n* type are brought in contact, they form *p-n* junction which act like a rectifier.
Reason (R): A rectifier is used to convent alternating current into direct current.
(1) Both **Assertion (A)** and **Reason (R)** are the true, and **Reason (R)** is a **correct** explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are the true, and **Reason (R)** is not a **correct** explanation of **Assertion (A)**.
(3) **Assertion (A)** is true, but **Reason (R)** is false.
(4) Both **Assertion (A)** and **Reason (R)** are false.

24. **Assertion (A):** The basic difference between various types of electromagnetic waves lies in their wavelength or frequencies.
Reason (R): Electromagnetic waves travel through vacuum with the same speed.
(1) Both **Assertion (A)** and **Reason (R)** are the true and **Reason (R)** is a **correct** explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are the true, and **Reason (R)** is not a **correct** explanation of the **Assertion (A)**.
(3) **Assertion (A)** is true, but **Reason (R)** is false.
(4) Both **Assertion (A)** and **Reason (R)** are false.

25. Two capacitors $C_1 = 2\mu F$ and $C_2 = 4\mu F$ are connected in series a potential difference (p.d) of 1200 V is applied across it the potential difference across 2μf will be.
(1) 400 V (2) 600 V
(3) 800 V (4) 900 V

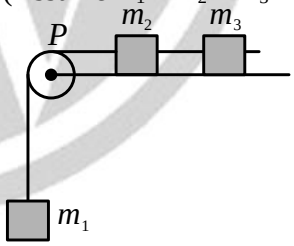
26. Turpentine oil is flowing through a tube of length *l* and radius *r*. The pressure difference between the two ends of the tube is *P*. The viscosity of oil is given by $\eta = \frac{P(r^2 + x^2)}{4vl}$ where *v* is the velocity of oil at a distance *x* from the axis of the tube. The dimensions of η are:
(1) $[M^0L^0T^0]$
(2) $[MLT^{-1}]$
(3) $[M^0L^2T^{-2}]$
(4) $[ML^{-1}T^{-1}]$

27. A particle moves along a straight line *OX*. At a time *t* (in seconds) the distance *x* (in metres) of the particle from O is given by $x = 60 + 75t - t^3$. How long would the particle travel before coming to rest?
(1) 250 m (2) 240 m
(3) 160 m (4) 170 m

28. A ship *A* is moving Westwards with a speed of 10 km h^{-1} and a ship *B* 100 km South of *A*, is moving Northwards with a speed of 10 km h^{-1}. The time after which the distance between them becomes shortest, is:
(1) $5\sqrt{2}$ h (2) $10\sqrt{2}$ h
(3) 0 h (4) 5 h

29. A 1 kg ball moving with a speed of 36 m/s strikes a hard wall at an angle of 30° with the wall. It is reflected with the same speed at the same angle. If the ball is in contact with the wall for 0.15 seconds, the average force acting on the wall is:
(1) 960 N (2) 480 N
(3) 240 N (4) 120 N

30. A system consists of three masses m_1, m_2 and m_3 connected by a string passing over a pulley *P*. The mass m_1 hangs freely and m_2 and m_3 are on a rough horizontal table (the coefficient of friction = μ). The pulley is frictionless and of negligible mass. The downward acceleration of mass m_1 is: (Assume $m_1 = m_2 = m_3 = m$)



(1) $\frac{g(1-g\mu)}{9}$ (2) $\frac{g\mu}{3}$
(3) $\frac{g(1-2\mu)}{3}$ (4) $\frac{g(1-2\mu)}{2}$

31. A solid cylinder of mass 5 kg is rolling on a horizontal surface with velocity 3 ms^{-1}. It collides with a horizontal spring of force constant 100 N m^{-1}. The maximum compression produced in the spring will be:
(1) 0.52 m
(2) 0.82 m
(3) 0.72 m
(4) 0.12 m

32. A particle is projected making an angle of 45° with horizontal having kinetic energy K. The kinetic energy at highest point will be:

(1) $\frac{K}{\sqrt{2}}$ (2) $\frac{K}{2}$

(3) $2K$ (4) K

33. A ball rolls without slipping. The radius of gyration of the ball about an axis passing through its centre of mass is K. If radius of the ball be R, then the fraction of total energy associated with its rotational energy will be:

(1) $\frac{K^2+R^2}{R^2}$ (2) $\frac{K^2}{R^2}$

(3) $\frac{K^2}{K^2+R^2}$ (4) $\frac{R^2}{K^2+R^2}$

34. A particle of mass M is situated at the centre of a spherical shell of same mass and radius a. The magnitude of the gravitational potential at a point situated at $a/4$ distance from the centre, will be:

(1) $\frac{GM}{a}$ (2) $\frac{2GM}{a}$

(3) $\frac{5GM}{a}$ (4) $\frac{4GM}{a}$

35. Two metal rods 1 and 2 of same lengths have same temperature difference between their ends. Their thermal conductivities are K_1 and K_2 and cross-sectional areas A_1 and A_2, respectively. If the rate of heat conduction in 1 is 6 times that in 2, then

(1) $K_1A_1 = 6K_2A_2$ (2) $K_1A_1 = 2K_2A_2$

(3) $4K_1A_1 = K_2A_2$ (4) $K_1A_1 = K_2A_2$

36. The cylindrical tube of a spray pump has radius R, one end of which has n fine holes, each of radius r. If the speed of the liquid in the tube is V, the speed of the ejection of the liquid through the holes is:

(1) $\frac{VR^2}{n^3r^2}$ (2) $\frac{V^2R}{nr}$

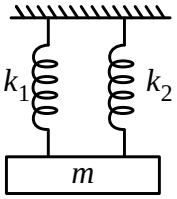
(3) $\frac{VR^2}{n^2r^2}$ (4) $\frac{VR^2}{nr^2}$

37. A monoatomic gas at a pressure P, having a volume V expands isothermally to a volume $2V$ and then adiabatically to a volume $16V$. The final pressure of the gas is (Take $\gamma = 5/3$):

(1) $64P$ (2) $32P$

(3) $P/64$ (4) $16P$

38. A mass is suspended separately by two different springs in successive order then time periods are t_1 and t_2 respectively. If it is connected by both springs as shown in figure then time period is t_0, the correct relation is:



(1) $t_0^2 = t_1^2 + t_2^2$

(2) $t_0^{-2} = t_1^{-2} + t_2^{-2}$

(3) $t_0^{-1} = t_1^{-1} + t_2^{-1}$

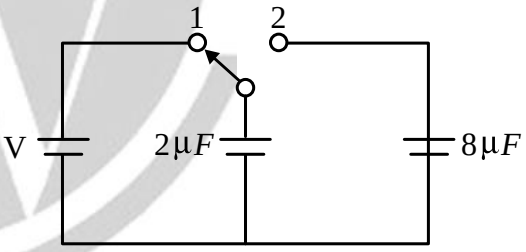
(4) $t_0 = t_1 + t_2$

39. Each of the two strings of length 51.6 cm and 49.1 cm are tensioned separately by 20 N force. Mass per unit length of both the strings is same and equal to 1 g/m. When both the strings vibrate simultaneously the number of beats is:

(1) 7 (2) 8

(3) 3 (4) 5

40. A capacitor of 2 μF is charged as shown in the diagram. When the switch S is tuned to position 2, the percentage of its stored energy dissipated is:



(1) 75%

(2) 80%

(3) 0%

(4) 20%

41. The electric potential at a point (x, y, z) is given by $V = -x^2y - xz^3 + 4$.

The electric field at that point is

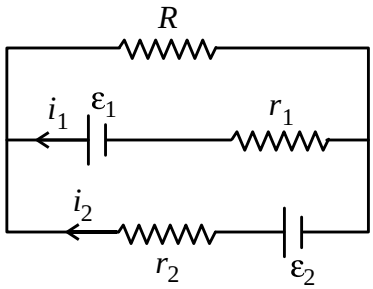
(1) $\vec{E} = \hat{i}2xy + \hat{j}(x^2+y^2) + \hat{k}(3xy - y^2)$

(2) $\vec{E} = \hat{i}z^3 + \hat{j}xyz + \hat{k}z^2$

(3) $\vec{E} = \hat{i}(2xy - z^3) + \hat{j}xy^2 + \hat{k}3z^2x$

(4) $\vec{E} = \hat{i}(2xy + z^3) + \hat{j}x^2 + \hat{k}3xz^2$

42. In the electrical circuit shown in this figure, which of the following equation is **correct**?



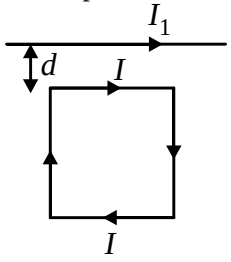
(1) $\varepsilon_2 - i_2r_2 - \varepsilon_1 - i_1r_1 = 0$
(2) $-\varepsilon_2 - (i_2 + i_2)\,R + i_2r_2 = 0$
(3) $\varepsilon_1 - (i_1 + i_2)\,R + i_1r_1 = 0$
(4) $\varepsilon_1 - (i_1 + i_2)\,R - i_1r_1 = 0$

43. **Assertion (A):** If the current in a solenoid is reversed in direction while keeping the same magnitude, the magnetic field energy stored in the solenoid decreases.

Reason (R): Magnetic field energy density is proportional to square of current.

(1) Both **Assertion (A)** and **Reason (R)** are the true, and **Reason (R)** is a correct explanation of **Assertion (A)**.
(2) Both **Assertion (A)** and **Reason (R)** are the true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.
(3) **Assertion (A)** is true, and **Reason (R)** is false.
(4) **Assertion (A)** is false, and **Reason (R)** is true.

44. A square loop, carrying a steady current I, is placed in a horizontal plane near a long straight conductor carrying a steady current I_1 at a distance d from the conductor as shown in figure. The loop will experience.



(1) A net attractive force towards the conductor.
(2) A net repulsive force away from the conductor.
(3) A net torque acting upward perpendicular to the horizontal plane.
(4) A net torque acting downward normal to the horizontal plane.

45. A short bar magnet of magnetic moment of 0.4 J T^{-1} is placed in a uniform magnetic field of 0.16 T. The magnet is in stable equilibrium when the potential energy is:

(1) 0.064 J
(2) – 0.064 J
(3) zero
(4) – 0.082 J

46. A long solenoid has 500 turns. When a current of 2 ampere is passed through it, the resulting magnetic flux linked with each turn of the solenoid is 4×10^{-3} Wb. The self-inductance of the solenoid is:

(1) 1.0 henry
(2) 4.0 henry
(3) 2.5 henry
(4) 2.0 henry

47. Match **List-I** with **List-II** to find out the **correct** option.

List I		**List II**	
(A)	Plane mirror	(I)	Always virtual, erect and diminished image for real objects
(B)	Convex mirror	(II)	Image is erect and of the same size as the object
(C)	Convex lens	(III)	Used by dentists to see enlarged image of teeth
(D)	Concave mirror	(IV)	Used in microscope.

(1) (A) – (I), (B) – (II), (C) – (III), (D) - (IV)
(2) (A) – (III), (B) – (I), (C) – (II), (D) - (IV)
(3) (A) – (I), (B) – (II), (C) – (IV), (D) - (III)
(4) (A) – (II), (B) – (I), (C) – (IV), (D) – (III)

48. Two radiations of photon energies 2 eV and 5 eV, successively illuminate a photosensitive metallic surface of work function 1 eV. The ratio of the maximum speeds of the emitted electrons is:

(1) 1 : 4
(2) 1 : 2
(3) 1 : 1
(4) 1 : 5

49. **Assertion (A):** The Bohr model is not applicable to atoms having many electrons.

Reason (R): In atoms having many electrons, each electron interacts not only with positively charged nucleus but also with all the other remaining electrons.

(1) Both **Assertion (A)** and **Reason (R)** are the true, and **Reason (R)** is a correct explanation of **Assertion (A)**.

(2) Both **Assertion (A)** and **Reason (R)** are the true, but **Reason (R)** is not a correct explanation of **Assertion (A)**.

(3) **Assertion (A)** is true, and **Reason (R)** is false.

(4) **Assertion (A)** is false, and **Reason (R)** is false.

50. Match **List-I** with **List-II** to find out the **correct** option.

List I		**List II**	
(A)	In a parallel combination of resistances	(I)	If the same voltage is applied across a resistance
(B)	In a series combination of resistances	(II)	If the same current is passed
(C)	Greater the resistance smaller the power	(III)	Current through all the resistors is same
(D)	Greater the resistance greater the power	(IV)	Current flow will be more in the branch having small resistance

(1) (A) – (III), (B) – (I), (C) – (II), (D) - (IV)

(2) (A) – (I), (B) – (III), (C) – (II), (D) - (IV)

(3) (A) – (III), (B) – (I), (C) – (IV), (D) - (II)

(4) (A) – (IV), (B) – (III), (C) – (I), (D) – (II)