**Sample Paper-02**

**Dropper NEET (2024)**

# PHYSICS

## SECTION-A

**1.** Two small spheres each having the charge $+Q$ are suspended by insulating threads of length $L$ from a hook. This arrangement is taken in space where there is no gravitational effect, then the angle between the two suspensions and the tension in each will be;

(1) $180°, \frac{1}{4\pi\varepsilon_0}\frac{Q^2}{(2L)^2}$ (2) $90°, \frac{1}{4\pi\varepsilon_0}\frac{Q^2}{L^2}$

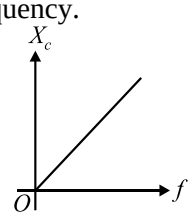
(3) $180°, \frac{1}{4\pi\varepsilon_0}\frac{Q^2}{2L^2}$ (4) $180°, \frac{1}{4\pi\varepsilon_0}\frac{Q^2}{L^2}$

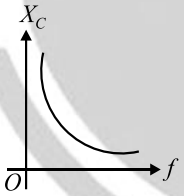
**2.** A galvanometer has a resistance $G$ ohm and range $V$ volt. The value of resistance used in series to convert it into voltmeter of range $nV$ volt is;

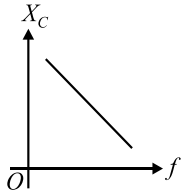
(1) n $G$ (2) $(n-1)\,G$

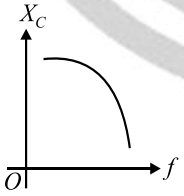
(3) $\frac{G}{n}$ (4) $\frac{G}{(n-1)}$

**3.** Identify the graph which **correctly** represents the variation of capacitive reactance $X_C$ with frequency.

(1) 


(2) 


(3) 


(4) 


**4.** The length of a wire of a potentiometer is 100 cm, and the e.m.f. of its standard cell is $E$ volt. It is employed to measure the e.m.f. of a battery whose internal resistance is 0.5Ω. If the balance point is obtained at $\ell$ = 30 cm from the positive end, the e.m.f. of the battery is;
where $i$ is the current in the potentiometer wire.

(1) $\frac{30E}{100.5}$ (2) $\frac{30E}{(100-0.5i)}$

(3) $\frac{30(E-0.5i)}{100}$ (4) $\frac{30E}{100}$

**5.** A circular coil having $N$ turns and radius $r$ carries a current $I$. It is held in the $XZ$ plane in a magnetic field $B\hat{i}$. The torque on the coil due to the magnetic field is;

(1) $\frac{Br^2I}{\pi N}$

(2) $B\pi r^2IN$

(3) $\frac{B\pi r^2I}{N}$

(4) Zero

**6.** Which of the following has/have zero average value in a plane electromagnetic wave?

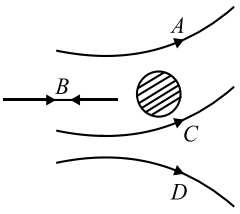
(1) Both magnetic and electric fields
(2) Electric field only
(3) Magnetic field only
(4) Magnetic energy

**7.** In the ideal double-slit experiment, when a glass-plate (μ = 1.5) of thickness t is introduced in the path of one of the interfering beams (wavelength λ), the intensity at the position where the central maximum occurred previously remains unchanged. The minimum thickness of the glass-plate is;

(1) 2λ (2) $\frac{2\lambda}{3}$

(3) $\frac{1}{3}$ (4) λ

**8.** In the Rutherford's experiment, α- particles are scattered from a nucleus as shown. Out of the four paths, which path is not passible?



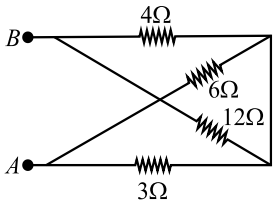

(1) $D$ (2) $B$
(3) $C$ (4) $A$

**9.** If the ratio of the concentration of electrons to that of holes in a semiconductor is $\frac{7}{5}$ and the ratio of their currents is $\frac{7}{4}$, then what is the ratio of their drift velocities?

(1) $\frac{5}{8}$ (2) $\frac{4}{5}$

(3) $\frac{5}{4}$ (4) $\frac{4}{7}$

**10.** In the given network, the equivalent resistance between *A* and *B* is;




(1) 6 Ω (2) 16 Ω

(3) 7 Ω (4) 5 Ω

**11.** When light enters from air to water, then its;

(1) frequency increases and speed decreases.

(2) frequency is same, but the wavelength is smaller in water than in air.

(3) frequency is same but the wavelength in water is greater than in air.

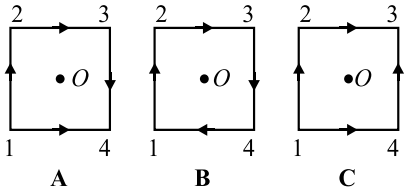
(4) frequency decreases and wavelength is smaller in water than in air.

**12.** Order of magnitude of density of uranium nucleus is; ($m_p$ = 1.67 × $10^{-27}$ kg)

(1) $10^{20}$ kg/m$^3$ (2) $10^{17}$ kg/m$^3$

(3) $10^{14}$ kg/m$^3$ (4) $10^{11}$ kg/m$^3$

**13.** The figure shows three identical current carrying square loops *A*, *B*, and *C*. Identify the **correct** statement related to magnetic field *B* at the centre *O* of the square loop. Current in each wire is *I*.




(1) *B* is zero in all cases.

(2) *B* is zero only in case of *C*.

(3) *B* is non-zero in all cases.

(4) *B* is non-zero only in case of *B*.

**14.** The operating potential in an *X*-ray tube is increased by 2%. The percentage change in the cut off wavelength is;

(1) 1% increase (2) 2% increase

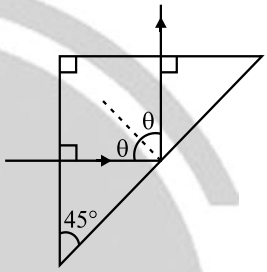
(3) 2% decrease (4) 1% decrease

**15.** Two plane mirrors are inclined to each other at 90°. A ray of light is incident on one mirror. The ray will undergo a total deviation of

(1) 180° (2) 90°

(3) 45° (4) None of these

**16.** A light ray is incident perpendicularly to one face of the prism shown in figure and is totally reflected if θ = 45°, we conclude that the refractive index *n* of the prism;




(1) $n > \frac{1}{\sqrt{2}}$ (2) $n < \sqrt{2}$

(3) $n < \frac{1}{\sqrt{2}}$ (4) $n > \sqrt{2}$

**17.** The electric field is given by $\vec{E} = (5\hat{i} + 8\hat{j} + 9\hat{k})$, the electric flux through surface, whose area vector is given by $\vec{A} = 10\hat{i}$, would be

(1) 5 units (2) 10 units

(3) 50 units (3) 100 units

**18.** Which of the following is **incorrect**?

(1) Photon is a particle with zero rest mass.

(2) Photon is a particle with zero momentum.

(3) Photon travel with velocity of light in vacuum.

(4) Photon even feel the pull of gravity.

**19.** Maximum intensity in YDSE is $I_0$. The intensity at a point on the screen where the path difference between the two interfering waves is $\frac{\lambda}{3}$ will be;

(1) $I_0$ (2) $\frac{I_0}{2}$

(3) $\frac{I_0}{3}$ (4) $\frac{I_0}{4}$

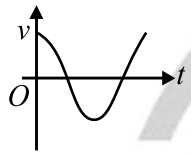
**20.** An *AC* circuit has $R = 100\Omega$, $C = 2\ \mu F$ and $L = 80$ mH, connected in series. The quality factor of the circuit is;

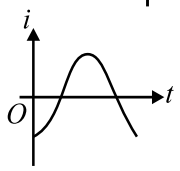
(1) 2 (2) 0.5
(3) 20 (4) 400

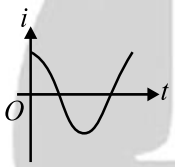
**21.** Two concentric circular coils of ten turns each are situated in the same plane. Their radii are 20 cm and 40 cm and they carry respectively 0.2 ampere and 0.4 ampere current in opposite direction. The magnetic field in weber/$m^2$ at the centre is;

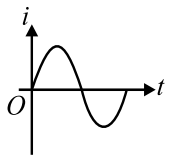
(1) $\frac{\mu_0}{80}$ (2) $\frac{7\mu_0}{80}$
(3) $\frac{5\mu_0}{4}$ (4) Zero

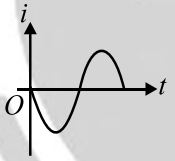
**22.** The figure represents the voltage applied across a pure inductor. The diagram which correctly represents the variation of current *i* with time *t* is given by;




(1) 

(2) 

(3) 

(4) 


**23.** As the frequency of an alternating current increases, the impedance of the circuit _____.

(1) increases continuously
(2) decreases continuously
(3) remains constant
(4) None of the above

**24.** Two-point charges + 8*q* and –2*q* are located at $x = 0$ and $x = L$ respectively. The location of a point on the *x*-axis at which the net electric field due to these two-point charges is zero;

(1) 8*L* (2) 4*L*
(3) 2*L* (4) $\frac{L}{4}$

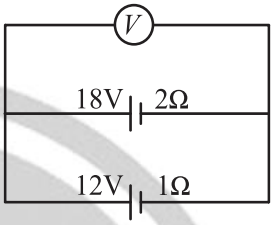
**25.** The equation of an equi-potential line in an electric field is $y = 2x$, then the electric field strength vector at (1, 2) may be;

(1) $4\hat{i} + 3\hat{j}$ (2) $4\hat{i} + 8\hat{j}$
(3) $8\hat{i} + 4\hat{j}$ (4) $-8\hat{i} + 4\hat{j}$

**26.** A body of mass 5 kg under the action of constant force $\vec{F} = F_x\hat{i} + F_y\hat{j}$ has velocity at $t = 0$s as $\vec{v} = (6\hat{i} - 2\hat{j})$ m/s and at $t = 10$s as $\vec{v} = +6\hat{j}$ m/s. The force $\vec{F}$ is;

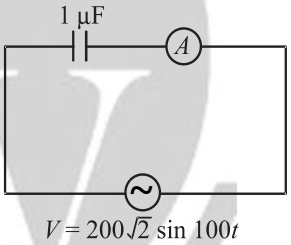
(1) $(-3\hat{i} + 4\hat{j})N$ (2) $\left(-\frac{3}{5}\hat{i} + \frac{2}{5}\hat{j}\right)$N
(1) $\left(3\hat{i} - 4\hat{j}\right)$N (4) $\left(\frac{3}{5}\hat{i} - \frac{4}{5}\hat{j}\right)$N

**27.** The batteries, one of emf 18 volt and internal resistance 2Ω and the other of emf 12 volt and internal resistance 1Ω are connected as shown. The voltmeter *V* will record a reading of;




(1) 15 V (2) 30 V
(3) 14 V (4) 18 V

**28.** In the circuit shown in figure, the reading of the *AC* ammeter is;




(1) $20\sqrt{2}$ mA (2) $40\sqrt{2}$ mA
(3) 20 mA (4) 40 mA

**29.** **Assertion (A):** If acceleration of a particle moving in a straight line varies as $a \propto t^n$, then $s \propto t^{n+2}$.

**Reason (R):** If *a* – *t* graph is a straight line, then *s* – *t* graph may be a parabola.

(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.

**30.** An alternating voltage $V(t) = 220 \sin 100 \pi t$ volt is applied to a purely resistive load of 50Ω. The time taken for the current to rise from half of the peak value to the peak value is;

(1) 5 ms (2) 2.2 ms
(3) 7.2 ms (4) 3.3 ms

**31.** The fundamental frequency of a closed organ pipe of length 20 cm is equal to the second overtone of an organ pipe open at both the ends. The length of organ pipe open at both the ends is;

(1) 100cm (2) 120cm
(3) 140 cm (4) 80 cm

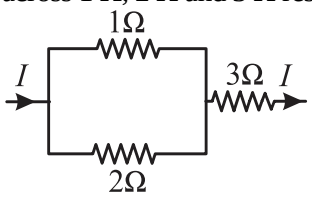
**32.** A simple pendulum attached to the ceiling of a stationary lift has a time period $T$. The distance $y$ covered by the lift moving upwards varies with time $t$ as $y = t^2$ where $y$ is in meters and $t$ in seconds. If $g = 10$ m/s$^2$, the time period of pendulum will be;

(1) $\sqrt{\frac{4}{5}}$ T (2) $\sqrt{\frac{5}{6}}$ T
(3) $\sqrt{\frac{5}{4}}$ T (4) $\sqrt{\frac{6}{5}}$ T

**33.** A red LED emits light at 0.1 watt uniformly around it. The amplitude of the electric field of the light at a distance of 1 m from the diode is;

(1) 5.48 V/m (2) 7.75 V/m
(3) 1.73 V/m (4) 2.45 V/m

**34.** In the circuit shown in the figure, power developed across 1 Ω, 2 Ω and 3 Ω resistance are in the ratio;




(1) 1 : 2 : 3 (2) 4 : 2 : 27
(3) 6 : 4 : 9 (4) 2 : 1 : 27

**35.** A thin equi-convex lens is made of glass of refractive index 1.5 and its focal length is 0.2 m. If it acts as a concave lens of 0.5 m focal length when dipped in a liquid, the refractive index of the liquid is;

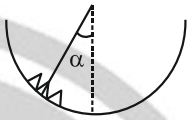
(1) $\frac{17}{8}$ (2) $\frac{15}{8}$
(3) $\frac{13}{8}$ (4) $\frac{9}{8}$

**36.** A uniform chain of length $L$ and mass $M$ is lying on a smooth table and one third of its length is hanging vertically down over the edge of the table. If $g$ is acceleration due to gravity, the work required to pull the hanging part on to the table is;

(1) $MgL$ (2) $\frac{MgL}{3}$
(3) $\frac{MgL}{9}$ (4) $\frac{MgL}{18}$

## SECTION-B

**37.** An insect crawls up a hemispherical surface very slowly. The coefficient of friction between the insect and the surface is 1/3. If the line joining the centre of the hemispherical surface to the insect makes an angle α with the vertical, the maximum possible value of α so that the insect does not slip is given by;




(1) cot α = 3 (2) sec α = 3
(3) cosec α = 3 (4) cos α = 3

**38.** **Assertion (A):** In our houses when we start switching on different light buttons, main current goes on decreasing.
**Reason (R):** Different connections in houses are in parallel. When we start switching on different light buttons, then net resistance of the circuit decreases. Therefore, main current increases.

(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.

**39.** At what altitude will the value of the acceleration due to gravity be half of its value at the surface of the earth? ($R$ = radius of earth)

(1) $\frac{R}{2}$ (2) $\frac{R}{\sqrt{2}}$
(3) $(\sqrt{2}+1)R$ (4) $(\sqrt{2}-1)R$

**40.** Water falls from a height of 60 m at the rate of 15 kg/s to operate a turbine. The losses due to frictional force are 10% of energy. How much power is generated by the turbine? (g = 10 m/s$^2$)

(1) 8.1 kW (2) 10.2 kW
(3) 12.3 kW (4) 7.0 kW

**41.** The radius of curvature of a convex mirror is 60 cm. When an object is placed at *A*, its image is formed at *B*. If the size of image is half that of the object, then the distance between *A* and *B* is;

(1) 30 cm (2) 60 cm
(3) 45 cm (4) 90 cm

**42.** A steel wire of length 20 cm and uniform cross-section 1 $mm^2$ is tied rigidly at both the ends. The temperature of the wire is altered from 40°C to 20°C. Coefficient of linear expansion for steel $\alpha = 1.1 \times 10^{-5}$/°C and *Y* for steel is $2.0 \times 10^{11}$ $N/m^2$. The change in tension of the wire is;

(1) $2.2 \times 10^6$ newtons
(2) 16 newtons
(3) 8 newtons
(4) 44 newtons

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

| List-I | | List-II | |
|---|---|---|---|
| (A) | *R*/*L* | (I) | Time |
| (B) | *CR* | (II) | Frequency |
| (C) | *E*/*B* | (III) | Speed |
| (D) | $\sqrt{\varepsilon_0\mu_0}$ | (IV) | None |

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

**44.** A particle is projected horizontally from a tower with velocity 10 $ms^{-1}$. Taking, g = 10 $ms^{-2}$. Match the following two column at time *t* = 1 s and mark the **correct** option given below.

| List-I | | List-II | |
|---|---|---|---|
| (A) | Horizontal component of velocity | (I) | 5 SI units |
| (B) | Vertical component of velocity | (II) | 10 SI units |
| (C) | Horizontal displacement | (III) | 15 SI units |
| (D) | Vertical displacement | (IV) | 20 SI units |

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

**45.** **Statement I:** If momentum of a body increases by 50%, its kinetic energy will increase by 125%.
**Statement II:** Kinetic energy is proportional to square of velocity.

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

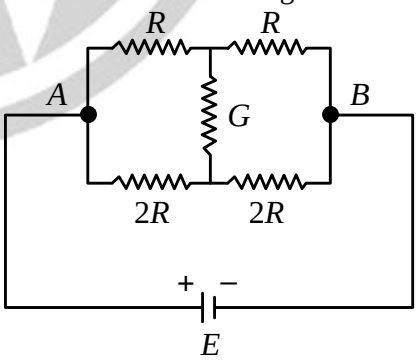
**46.** **Statement I:** A body is moving along a circle with a constant speed. Its angular momentum about the centre of the circle remains constant.
**Statement II:** In this situation, a constant non-zero torque acts on the body.

(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.

**47.** An electrical cable of copper has just one wire of radius 9 mm. Its resistance is 5 ohms. This single copper wire of the cable is replaced by 6 different well insulated copper wires of same length in parallel, each of radius 3 mm. The total resistance of the cable will now be equal to;

(1) 7.5 ohms (2) 45 ohms
(3) 90 ohms (4) 270 ohms

**48.** Consider the following statements regarding the network shown in the figure




I. The equivalent resistance of the network between points *A* and *B* is independent of value of *G*.
II. The equivalent resistance of the network between points *A* and *B* is 4 / 3 *R*.
III. The current through *G* is zero.

Which of the above statement (s) is/are true?

(1) Only I (2) Only II
(3) Both II and III (4) I, II and III

**49.** If the moment of inertia of a disc about an axis tangential and parallel to its surface be $I$, then what will be the moment of inertia about the axis tangential but perpendicular to the surface?

(1) $\frac{6}{5}I$ (2) $\frac{3}{4}I$

(3) $\frac{3}{2}I$ (4) $\frac{5}{4}I$

**50.** Electric field on the axis of a small electric dipole at a distance $r$ is $\vec{E}_1$ and $\vec{E}_2$ at a distance of $2r$ on a line of perpendicular bisector. Then;

(1) $\vec{E}_2 = \frac{-\vec{E}_1}{8}$ (2) $\vec{E}_2 = -\frac{\vec{E}_1}{16}$

(3) $\vec{E}_2 = -\frac{\vec{E}_1}{4}$ (4) $\vec{E}_2 = \frac{\vec{E}_1}{8}$