SIR .CV. RAMAN COACHING CENTRE – IDAPPADI, SALEM -637101

XLL PHYSICS FULL PORTION

Xll-PHYSICS ONE MARK TEST QUESTION PAPER – 2025

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TOTAL MARK: 32 m

Choose the correct best answer :(32 X 1`= 32 m)

1. If the magnetic monopole exists, then which of the Maxwell's equation to be modified?

(a) $\oint_s \vec{E}\cdot d\vec{A} = \frac{Q_{enclosed}}{\epsilon_0}$

(b) $\oint \vec{B}\cdot d\vec{A} = 0$

(c) $\oint_l \vec{B}.\vec{dl} = \mu_0 i_c + \mu_0\epsilon_0 \frac{d}{dt}\oint_s \vec{E}.\vec{dA}$

(d) $\oint_l \vec{E}\cdot d\vec{l} = -\frac{d}{dt}\Phi_B$

2.The electric and the magnetic fields, associated with an electromagnetic wave, propagating along negative X axis can be represented by

(a) $\vec{E} = E_0\hat{i}$ and $\vec{B} = B_0\hat{k}$

(b) $\vec{E} = E_0\hat{k}$ and $\vec{B} = B_0\hat{j}$

(c) $\vec{E} = E_0\hat{i}$ and $\vec{B} = B_0\hat{j}$

(d) $\vec{E} = E_0\hat{j}$ and $\vec{B} = B_0\hat{i}$

3.In an electromagnetic wave travelling in free space the rms value of the electric field is 3 V/ m. The peak value of the magnetic field is

(a) 1.414×10^{-8} T (b) 1.0×10^{-8} T

(c) 2.828×10^{-8} T (d) 2.0×10^{-8} T

4.A circular coil with a cross-sectional area of 4 cm2 has 10 turns. It is placed at the centre of a long solenoid that has 15 turns/cm and a cross-sectional area of 10 cm2. The axis of the coil coincides with the axis of the solenoid. What is their mutual inductance

(a) 7.54 μH (b) 8.54 μH

(c) 9.54 μH (d) 10.54 μH

5.In an oscillating LC circuit, the maximum charge on the capacitor is Q. The charge on the capacitor when the energy is stored equally between the electric and magnetic fields is

(a) $\frac{Q}{2}$ (b) $\frac{Q}{\sqrt{3}}$ (c) $\frac{Q}{\sqrt{2}}$ (d) Q

6.A particle having mass *m* and charge *q* accelerated through a potential

difference *V*. Find the force experienced when it is kept under perpendicular magnetic field B.

(a) $\sqrt{\frac{2q^3BV}{m}}$ (b) $\sqrt{\frac{q^3B^2V}{2m}}$ (c) $\sqrt{\frac{2q^3B^2V}{m}}$ (d) $\sqrt{\frac{2q^3BV}{m^3}}$

7. A thin insulated wire forms a plane spiral of $N = 100$ tight turns carrying a current $I = 8$ m A (milli ampere). The radii of inside and outside turns are $a = 50$ mm and $b = 100$ mm respectively. The magnetic induction at the centre of the spiral is

(a) 5 μT (b) 7 μT (c) 8 μT (d) 10 μT

8.A non-conducting charged ring carrying a charge of q, mass m and radius r is rotated about its axis with constant angular speed ω. Find the ratio of its magnetic moment with angular momentum is

(a) $\frac{q}{m}$ (b) $\frac{2q}{m}$ (c) $\frac{q}{2m}$ (d) $\frac{q}{4m}$

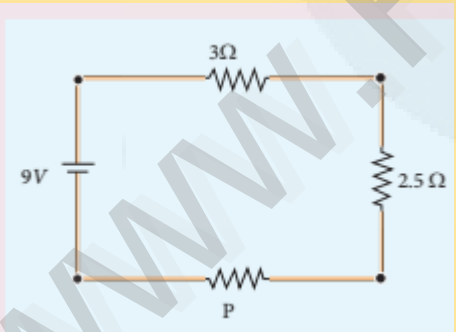
9.A flat dielectric disc of radius R carries an excess charge on its surface. The surface charge density is σ. The disc rotates about an axis perpendicular to its plane passing through the centre with angular velocity ω. Find the magnitude of the torque on the disc if it is placed in a uniform magnetic field whose strength is B which is directed perpendicular to the axis of rotation

(a) $\frac{1}{4}\sigma\omega\pi BR$ (b) $\frac{1}{2}\sigma\omega\pi BR^2$ (c) $\frac{1}{4}\sigma\omega\pi BR^3$ (d) $\frac{1}{4}\sigma\omega\pi BR^4$

10.In India electricity is supplied for domestic use at 220 V. It is supplied at 110 V in USA. If the resistance of a 60W bulb for use in India is R, the resistance of a 60W bulb for use in USA will be

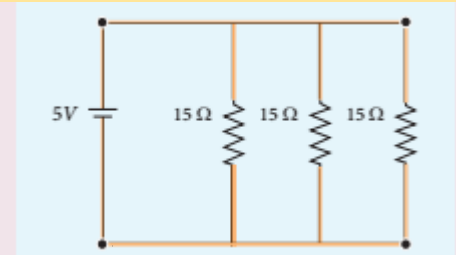
(a) R (b) $2R$ (c) $\frac{R}{4}$ (d) $\frac{R}{2}$

11.There is a current of 1.0 A in the circuit shown below. What is the resistance of P?



a) 1.5 Ω b) 2.5 Ω
c) 3.5 Ω d) 4.5 Ω

12.What is the current drawn out from the battery

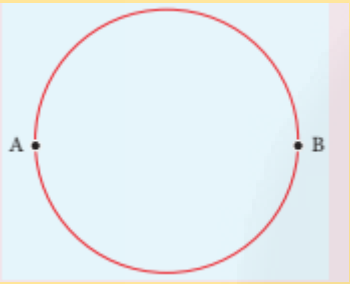


a) 1A b) 2A
c) 3A d) 4A

13.In a large building, there are 15 bulbs of 40 W, 5 bulbs of 100 W, 5 fans of 80 W and 1 heater of 1k W are connected. The voltage of electric mains is 220 V. The maximum capacity of the main fuse of the building will be

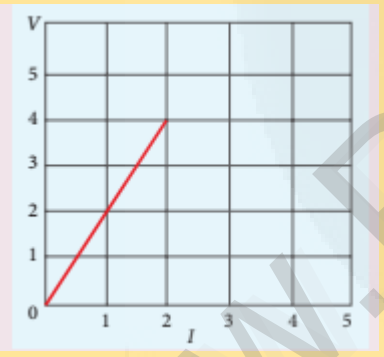
(a) 14 A (b) 8 A (c) 10 A (d) 12 A

14.A wire of resistance 2 ohms per meter is bent to form a circle of radius 1m. The equivalent resistance between its two diametrically opposite points, A and B as shown in the figure is



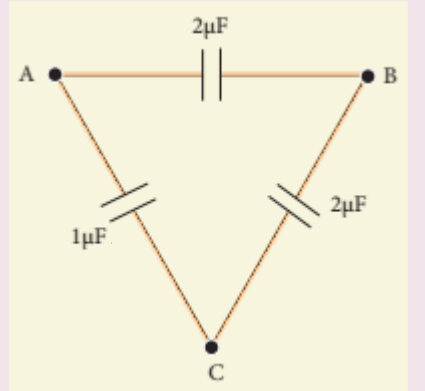
(a) $\pi\ \Omega$ (c) $\frac{\pi}{2}\ \Omega$
(c) $2\pi\ \Omega$ (d) $\frac{\pi}{4}\ \Omega$

15.The following graph shows current versus voltage values of some unknown conductor. What is the resistance of This conductor?



(a) 2 ohm (b) 4 ohm
(c) 8 ohm (d)1 ohm

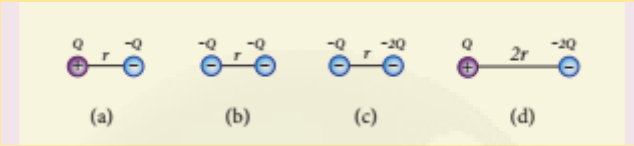
16.Three capacitors are connected in triangle as shown in the figure. The equivalent capacitance between the points A and C is



(a) 1μF (b) 2 μF

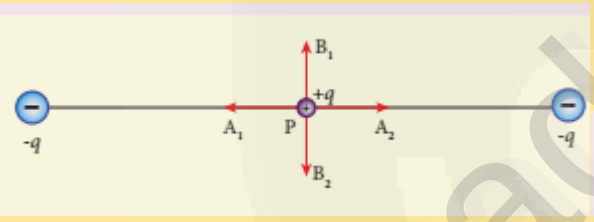
(c) 3 μF (d) $\frac{1}{4}$μF

17.Rank the electrostatic potential energies for the given system of charges in increasing order



(a) 1 = 4 < 2 < 3 (b) 2 = 4 < 3 < 1 (c) 2 = 3 < 1 < 4 (d) 3 < 1 < 2 < 4

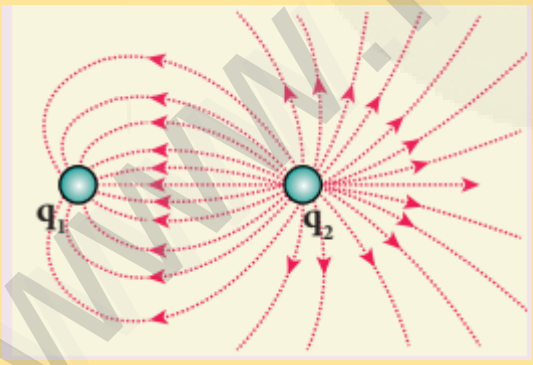
18.Two identical point charges of magnitude $-q$ are fixed as shown in the figure below. A third charge $+q$ is placed midway between the two charges at the point P. Suppose this charge $+q$ is displaced a small distance from the point P in the directions indicated by the arrows, in which direction(s) will $+q$ be stable with respect to the displacement?



(a) A_1 and A_2 (b) B_1 and B_2

(c) both directions (d) No stable

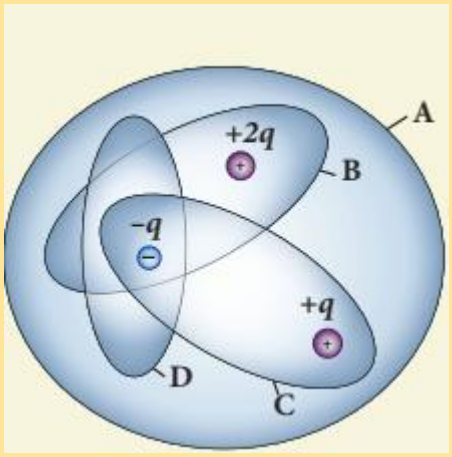
19. What is the ratio of the charges $\left|\frac{q_1}{q_2}\right|$ for the following electric field line pattern?



(a) $\frac{1}{5}$ (b) $\frac{25}{11}$

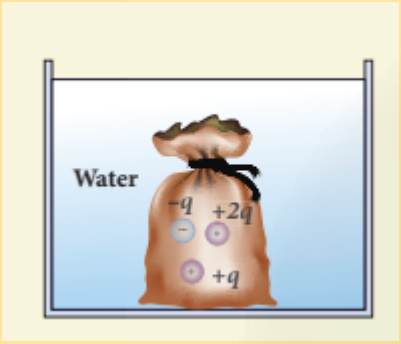
(c) 5 (d) $\frac{11}{25}$

20. Four Gaussian surfaces are given below with charges inside each Gaussian surface. Rank the electric flux through each Gaussian surface in increasing order



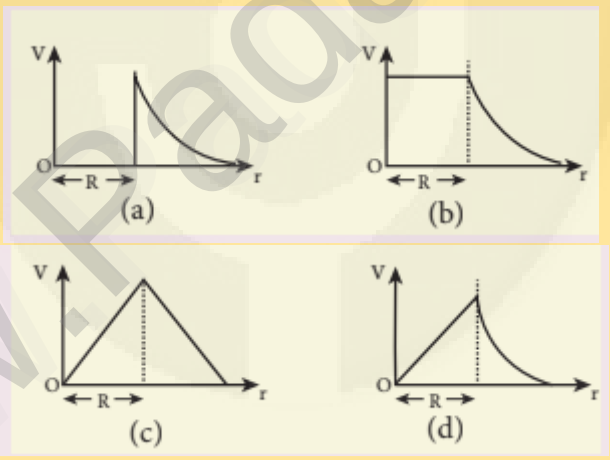
(a) D < C < B < A
(b) A < B = C < D
(c) C < A = B < D
(d) D > C > B > A

21. The total electric flux for the following closed surface which is kept inside water



(a) $\frac{80q}{\epsilon_0}$
(b) $\frac{q}{40\epsilon_0}$
(c) $\frac{q}{80\epsilon_0}$
(d) $\frac{q}{160\epsilon_0}$

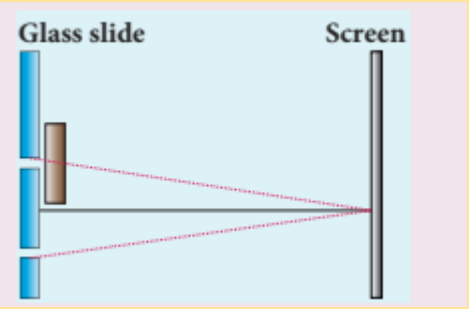
22. A thin conducting spherical shell of radius *R* has a charge *Q* which is uniformly distributed on its surface. The correct plot for electrostatic potential due to this spherical shell is



23. A ray of light strikes a glass plate at an angle 60o. If the reflected and refracted rays are perpendicular to each other, the refractive index of the glass is,

(a) $\sqrt{3}$
(b) $\frac{3}{2}$
(c) $\sqrt{\frac{3}{2}}$
(d) 2

24. One of the of Young's double slits is covered with a glass plate as shown in figure. The position of central maximum will



(a) get shifted downwards
(b) get shifted upwards
(c) will remain the same
(d) data insufficient to conclude

25. In a Young's double-slit experiment, the slit separation is doubled. To maintain the same fringe spacing on the screen, the screen-to-slit distance D must be changed to,

(a) $2D$ (b) $\frac{D}{2}$ (c) $\sqrt{2}D$ (d) $\frac{D}{\sqrt{2}}$

26. In photoelectric emission, a radiation whose frequency is 4 times threshold frequency of a certain metal is incident on the metal. Then the maximum possible velocity of the emitted electron will be

a) $\sqrt{\frac{hv_0}{m}}$ b) $\sqrt{\frac{6hv_0}{m}}$ c) $2\sqrt{\frac{hv_0}{m}}$ d) $\sqrt{\frac{hv_0}{2m}}$

27. Photons of wavelength λ are incident on a metal. The most energetic electrons ejected from the metal are bent into a circular arc of radius R by a perpendicular magnetic field having magnitude B. The work function of the metal is

a) $\frac{hc}{\lambda} - m_e + \frac{e^2B^2R^2}{2m_e}$
b) $\frac{hc}{\lambda} + 2m_e\left[\frac{eBR}{2m_e}\right]^2$
c) $\frac{hc}{\lambda} - m_ec^2 - \frac{e^2B^2R^2}{2m_e}$
d) $\frac{hc}{\lambda} - 2m_e\left[\frac{eBR}{2m_e}\right]^2$

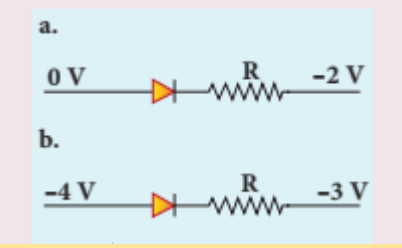
28. $M\,p$ denotes the mass of the proton and $M\,n$ denotes mass of a neutron. A given nucleus of binding energy B, contains Z protons and N neutrons. The mass M(N,Z) of the nucleus is given by(where c is the speed of light)

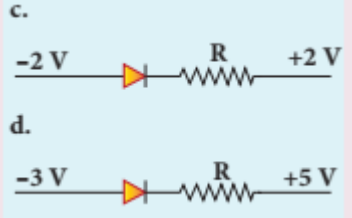
(a) $M(N,Z) = NM_n + ZM_p - Bc^2$
(b) $M(N,Z) = NM_n + ZM_p + Bc^2$
(c) $M(N,Z) = NM_n + ZM_p - B/c^2$
(d) $M(N,Z) = NM_n + ZM_p + B/c^2$

29. A radioactive nucleus (initial mass number A and atomic number Z) emits two α-particles and 2 positrons. The ratio of number of neutrons to that of proton in the final nucleus will be

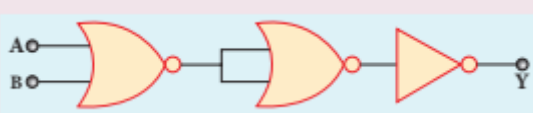
(a) $\frac{A-Z-4}{Z-2}$ (b) $\frac{A-Z-2}{Z-6}$ (c) $\frac{A-Z-4}{Z-6}$ (d) $\frac{A-Z-12}{Z-4}$

30. Which one of the following represents forward bias diode?



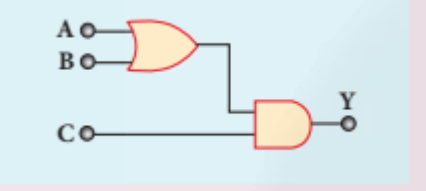


31. The given electrical network is equivalent to



a) AND gate b) OR gate c) NOR gate d) NOT gate

32. The output of the following circuit is 1 when the input ABC is



a) 101 b) 100
c) 110 d) 010

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