KCET EXAMINATION – 2021
SUBJECT : PHYSICS

VERSION : D1

DATE :- 29-08-2021　　　　　　　**TIME : 10.30 AM TO 11.50 AM**
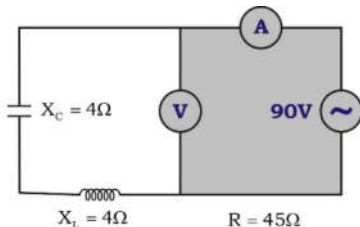
1. The physical quantity which is measure in the unit of wb A^{-1} is
   a) Self inductance　　b) Mutual inductance
   c) Magnetic flux　　d) Both A and B

Ans. d

Sol. $M = L = \dfrac{\phi}{I}$

2. What will be the reading in the voltmeter and ammeter of the circuit shown ?

   a) 90V, 2A　b) 0V, 2A　c) 90V, 1A　d) 0V, 1A

Ans. b

Sol. $X_L = X_C$ circuit is in resonance
$V = V_L - V_C = 0$
$I = \dfrac{V}{R} = \dfrac{90}{45} = 2$

3. LC osillations are similar and analogous to the mechanical oscillations of a block attached to a spring. The electrical equivalent of the force constant of the spring is
   a) reciprocal of capacitive reactance
   b) capacitive reactance
   c) reciprocal of capacitance
   d) capacitance

Ans. c

Sol. $K = \dfrac{1}{LC} \Rightarrow K \propto \dfrac{1}{C}$

4. In an oscillating LC circuit, L=3.00mH and C=2.70μF. At t=0 the charge on the capacitor is zero and the current is 2.00A. The maximum charge that will appear on the capacitor will be
   a) $1.8 \times 10^{-5} C$　　b) $18 \times 10^{-5} C$
   c) $9 \times 10^{-5} C$　　d) $90 \times 10^{-5} C$

Ans. b

Sol. $\dfrac{1}{2} L I_0^2 = \dfrac{Q_0^2}{2C} \Rightarrow Q_0 = I_0 \sqrt{LC}$

5. Suppose that the electric field amplitude of electromagnetic wave is $E_0 = 120 NC^{-1}$ and its frequency if f=50 MHz. Then which of the following value is incorrectly computed ?
   a) Magnetic field amplitude is 400nT.
   b) Angular frequency of EM wave is $\pi \times 10^8 \, rad/s$
   c) Propagation constant (angular wave number) is 2.1 rad/m
   d) Wavelength of EM wave is 6m.

Ans. c

Sol. Conceptual

6. The source of electromagnetic wave can be a charge.
   a) Moving with a constant velocity
   b) Moving in a circular orbit
   c) At rest
   d) Moving parallel to the magnetic field

Ans. b

Sol. Accelerated charges can produce electromagnetic waves

7. In refraction, light waves are bent on passing from one medium to second medium because, in the second medium.
a) frequency is different
b) speed is different
c) coefficient of elasticity is different
d) amplitude is smaller

Ans. b

Sol. Conceptual

8. If the refractive index from air to glass is $\dfrac{3}{2}$ and that from air to water is $\dfrac{4}{3}$, then the ratio of focal lengths of a glass lens in water and in air is
a) 1:2   b) 2:1   c) 1:4   d) 4:1

Ans. d

Sol. $\dfrac{f_w}{f_a} = \dfrac{\left(\mu_g - 1\right)}{\left(\dfrac{\mu_g}{\mu_w} - 1\right)}$

9. Two thin biconvex lenses have focal lengths f_1 and f_2. A third thin biconcave lens has focal length of f_3. If the two biconvex lenses are in contact, the total power of the lenses is P_1. If the first convex lens is in contact with the third lens, the total power is P_2. If the second lens is in contact with the third lens, the total power is P_3 then
a) $P_1 = \dfrac{f_1 f_2}{f_1 - f_2}$, $P_2 = \dfrac{f_1 f_3}{f_3 - f_1}$ and $P_3 = \dfrac{f_2 f_3}{f_3 - f_2}$
b) $P_1 = \dfrac{f_1 - f_2}{f_1 f_2}$, $P_2 = \dfrac{f_3 - f_1}{f_3 + f_1}$ and $P_3 = \dfrac{f_3 - f_2}{f_2 f_3}$
c) $P_1 = \dfrac{f_1 - f_2}{f_1 f_2}$, $P_2 = \dfrac{f_3 - f_1}{f_1 f_3}$ and $P_3 = \dfrac{f_3 - f_2}{f_2 f_3}$
d) $P_1 = \dfrac{f_1 + f_2}{f_1 f_2}$, $P_2 = \dfrac{f_3 - f_1}{f_1 f_3}$ and $P_3 = \dfrac{f_3 - f_2}{f_2 f_3}$

Ans. d

Sol. $p_1 = \dfrac{1}{f_1} + \dfrac{1}{f_2}, p_2 = \dfrac{1}{f_1} - \dfrac{1}{f_3}, p_3 = \dfrac{1}{f_2} - \dfrac{1}{f_3}$

10. The size of the image of an object, which is at infinity, as formed by a convex lens of focal length 30cm is 2cm. If a concave lens of focal length 20cm is placed between the convex lens and the image at a distance of 26cm from the lens, the new size of the image is :
a) 1.25 cm   b) 2.5 cm   c) 1.05 cm   d) 2 cm

Ans. b

Sol. $V = f = 30\,cm, \dfrac{I}{O} = m = \dfrac{f}{f - u'}, u' = (30 - 26)cm$

11. A slit of width 'a' is illuminated by red light of wavelength $6500\,\overset{\circ}{A}$. If the first diffraction minimum falls at 30°, then the value of 'a' is
a) $6.5 \times 10^{-4}\,mm$ b) 1.3 micron
c) $3250\,\overset{\circ}{A}$ d) $2.6 \times 10^{-4}\,cm$

Ans. b

Sol. $n\lambda = a\sin\theta$

12. Which of the statements are correct with reference to single slit diffraction pattern?
(i) Fringes are of unequal width
(ii) Fringes are of equal width
(iii) Light energy is conserved
(iv) Intensities of all bright fringes are equal
a) (i) and (iii)   b) (i) and (iv)
c) (ii) and (iv)   d) (ii) and (iii)

Ans. a

Sol. Conceptual

13. In the Young's double slit experiment a monochromatic source of wavelength λ is used. The intensity of light passing through each slit is I_0. The intensity of light reaching the screen S_C at a point P, a distance X from O is given by (Take $d \ll D$)
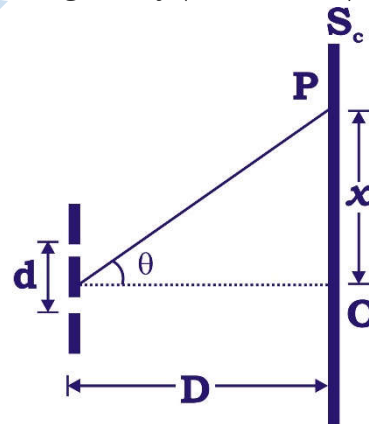
a) $I_0 \cos^2\left(\dfrac{\pi D}{\lambda d}x\right)$ b) $4I_0 \cos^2\left(\dfrac{\pi d}{\lambda D}x\right)$
c) $I_0 \sin^2\left(\dfrac{\pi d}{2\lambda D}x\right)$ d) $4I_0 \cos\left(\dfrac{\pi d}{2\lambda D}x\right)$

Ans. b

Sol. $I_R = 4I_0 \cos^2\dfrac{\phi}{2}, \dfrac{\phi}{2} = \pi(\Delta x) = \pi d\dfrac{x}{D}$

14. The work function of a metal is 1eV. Light of wavelength $3000 \overset{\circ}{A}$ is incident on this metal surface. The velocity of emitted photoelectrons will be

   a) 10ms^{-1}
   b) $1 \times 10^3 \text{ ms}^{-1}$
   c) $1 \times 10^4 \text{ ms}^{-1}$
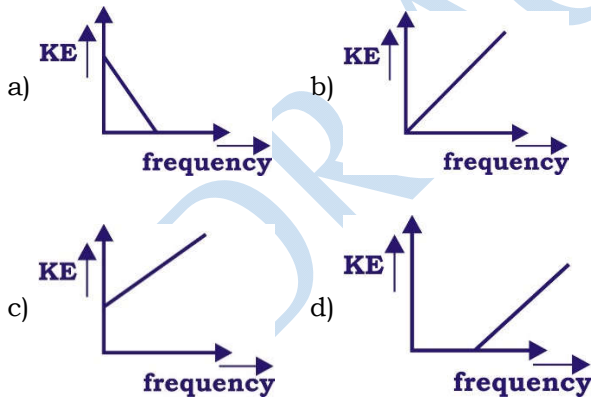   d) $1 \times 10^6 \text{ ms}^{-1}$

Ans. d

Sol. $\frac{1}{2}mv^2 = E - W_0$

15. A proton moving with a momentum P_1 has a kinetic energy $\frac{1}{8}$th of its rest mass energy. Another light photon having energy equal to the kinetic energy of the possesses a momentum P_2. Then the ratio $\frac{P_1 - P_2}{P_1}$ is equal to

   a) 1
   b) $\frac{1}{4}$
   c) $\frac{1}{2}$
   d) $\frac{3}{4}$

Ans. d

Sol. $\frac{p_1^2}{2m} = \frac{1}{8}mc^2$, $p_2 = mc$

16. According to Einstein's photoelectric equation to the graph between kinetic energy of photoelectrons ejected and the frequency of incident radiation is

   a)
   KE↑ (curve decreasing to frequency axis)
   frequency→

   b)
   KE↑ (line starting above origin increasing)
   frequency→

   c)
   KE↑ (curve increasing)
   frequency→

   d)
   KE↑ (line starting from frequency axis increasing)
   frequency→

Ans. d
Sol. Conceptual

17. Energy of an electron in the second orbit of hydrogen atom is E_2. The energy of electron in the third orbit of He^+ will be

   a) $\frac{9}{16}E_2$
   b) $\frac{16}{9}E_2$
   c) $\frac{3}{16}E_2$
   d) $\frac{16}{3}E_2$

Ans. b

Sol. $E = -13.6 \text{ eV} \frac{Z^2}{n^2}$

18. The figure shows standing de Broglie waves due to the revolution of electron in a certain orbit of hydrogen atom. Then the expression for the orbit radius is (all notations have their usual meanings)
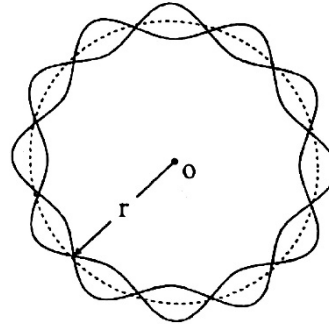
   a) $\frac{h^2 \epsilon_0}{\pi m e^2}$
   b) $\frac{4h^2 \epsilon_0}{\pi m e^2}$
   c) $\frac{9h^2 \epsilon_0}{\pi m e^2}$
   d) $\frac{16h^2 \epsilon_0}{\pi m e^2}$

Ans. NO OPTION

Sol. $n\lambda = 2\pi r_n$

$$mv_n r_n = \frac{6h}{2\pi}$$

$$\frac{me^2}{2nh \epsilon_0} r_n = \frac{3h}{\pi}$$

$$r_n = \frac{6nh^2 \epsilon_0}{me^2 \pi}$$

$$= \frac{36h^2 \epsilon_0}{me^2 \pi}$$

19. An electron in an excited state of Li^{2+} ion has angular momentum $\frac{3h}{2\pi}$. The de Broglie wavelength of electron in this state is $P\pi a_0$ (where $a_0 = \text{Bohr radius}$). The value of P is

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

Ans. b

Sol. $\lambda = \frac{h}{p} = \frac{hr}{mvr} = \frac{hr}{\left(\frac{3h}{2\pi}\right)}$

$$r = a_0 \left(\frac{n^2}{z}\right)$$

20. Which graph in the following diagram correctly represents the potential energy of a pair of nucleons as a function of their separation?


a) $U(MeV)$ vs $r(fm)$

b) $U(keV)$ vs $r(fm)$

c) $U(eV)$ vs $r(m)$

d) $U(MeV)$ vs $r(fm)$
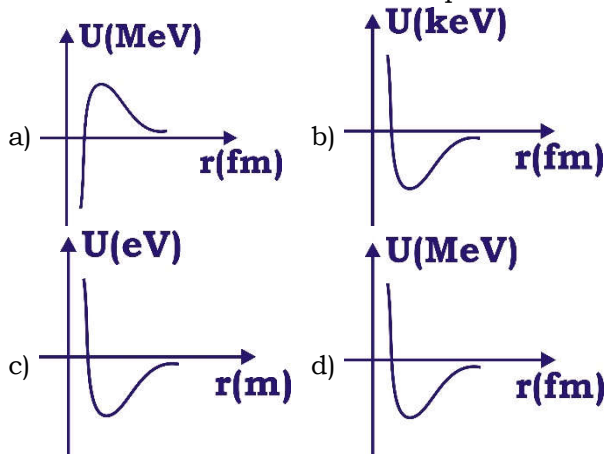
Ans. d

Sol. Conceptual

21. In a nuclear reactor heavy nuclei is not used as moderators because
    a) They will break up
    b) Elastic collision of neutrons with heavy nuclei will not slow them down
    c) The net weight of the reactor would be unbearably high
    d) Substance with heavy nuclei do not occur in liquid or gaseous state at room temperature

Ans. b

Sol. Conceptual

22. The circuit given represents which of the logic operations?
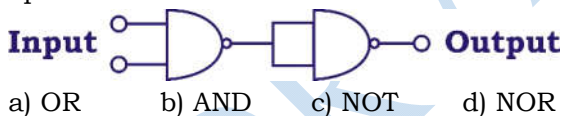
a) OR b) AND c) NOT d) NOR

Ans. b

Sol. Conceptual

23. Identify the incorrect statement:
    a) when a P-N junction diode is forward biased, the width of the depletion region decreases.
    b) when a P-N junction diode is reverse biased, the barrier potential increases
    c) a photon diode is operated in the reverse bias
   d) an LED is a lightly doped P-N junction diode which emits spontaneous radiation of forward biasing.

Ans. d

Sol. LED is heavily doped operates in forward bias.

24. Three phtodiodes D_1, D_2 and D_3 are made of semiconductors having band gaps of 2.5eV, 2eV and 3eV respectively. Which one will be able to detect light of wavelength 600 nm?
    a) D_1 only
    b) both D_1 and D_3
    c) D_2 only
    d) All the three diodes

Ans. c

Sol. Conceptual

25. For a body moving along a straight line, the following v-t graph is obtained.
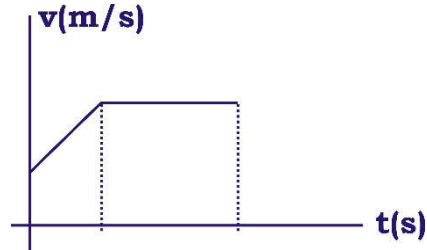
According to the graph, the displacement during
    a) Uniform acceleration is greater than that during uniform motion
    b) Uniform acceleration is less than that during uniform motion
    c) Uniform acceleration is equal to that during uniform motion
    d) Uniform motion zero

Ans. b

Sol. Conceptual

26. A particle starts from rest. Its acceleration 'a' versus time 't' is shown in the figure. The maximum speed of the particle will be:
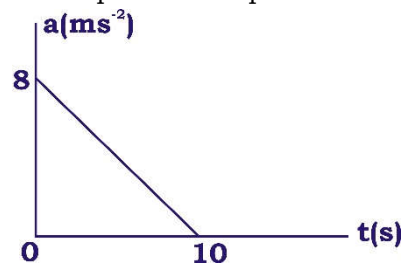
    a) 80 ms^{-1} b) 40 ms^{-1} c) 18 ms^{-1} d) 2 ms^{-1}

Ans. b

Sol. $V_{max} = $ area of $a - t$ graph

$V_{max} = \frac{1}{2}(10)(8) = 40 \, m/s$

27. The maximum range of a gun on horizontal plane is 16 km. If $g = 10\,ms^{-2}$, then muzzle velocity of a shell is
   a) $160\,ms^{-1}$ b) $200\sqrt{2}\,ms^{-1}$
   c) $400\,ms^{-1}$ d) $800\,ms^{-1}$

Ans. c

Sol. $\dfrac{u^2}{g} = 16(10)^3 \Rightarrow u = \sqrt{16 \times 10^3 \times g} = 400\,m/s$

28. The trajectory of projectile is
   a) Semicircle
   b) An ellipse
   c) A parabola always
   d) A parabola in the absence of air resistance

Ans. d

Sol. Conceptual

29. For a projectile motion, the angle between the velocity and acceleration is minimum and acute at
   a) Only one point b) Two points
   c) Three points d) Four points

Ans. a

Sol. Conceptual

30. A particle starts from the origin at t=0s with a velocity of $10\,\hat{j}\,ms^{-1}$ and move in the x-y plane with a constant acceleration of $\left(8\,\hat{j} + 2\hat{j}\right)ms^{-2}$.
   At an instant when the x-coordinate of the particle is 16 m, y-coordinate of the particle is:
   a) 16m b) 28m c) 36m d) 24m

Ans. d

Sol. $x = u_x t + \dfrac{1}{2}a_x t^2 \Rightarrow 16 = 0 + \dfrac{1}{2}(8)t^2 \Rightarrow t = 2s$

$\therefore y = u_y t + \dfrac{1}{2}a_y t^2 \Rightarrow y = 10(2) + \dfrac{1}{2}(2)(2)^2 = 24\,m$

31. A coin placed on a rotating turn table just slips if it is placed at a distance of 4cm from the centre. If the angular velocity of the turn table is doubled it will just slip at a distance of
   a) 1cm b) 2cm c) 4cm d) 8cm

Ans. a

Sol. $mr\omega^2 = \mu mg \Rightarrow r \propto \dfrac{1}{\omega^2} \Rightarrow r_2 = r_1\left(\dfrac{\omega_1}{\omega_2}\right)^2$

32. A 1kg ball moving at $12\,ms^{-1}$ collides with a 2kg ball moving in opposite direction at $24\,ms^{-1}$. If the coefficient of restitution is $\dfrac{2}{3}$, the their velocities after the collision are
   a) $-4\,ms^{-1}, -28\,ms^{-1}$ b) $-28\,ms^{-1}, -4\,ms^{-1}$
   c) $4\,ms^{-1}, 28\,ms^{-1}$ d) $28\,ms^{-1}, 4\,ms^{-1}$

Ans. b

Sol. $V_1 = \dfrac{(m_1 - em_2)u_1 + m_2(1+e)u_2}{m_1 + m_2}$

$V_2 = \dfrac{m_1(1+e)u_1 + (m_2 - em_1)u_2}{m_1 + m_2}$

$u_1 = 12\,m/s, u_2 = -24\,m/s, m_1 = 1kg, m_2 = 2kg$

33. A ball hits the floor and rebounds after an inelastic collision. In this case
   a) The momentum of the ball is conserved
   b) The mechanical energy of the ball is conserved
   c) The total momentum of the ball and the earth is conserved
   d) The total mechanical energy of the ball and the earth is conserved

Ans. c

Sol. Conceptual

34. In figure E and V_{cm} represent the total energy and speed of centre of mass of an object of mass 1kg in pure rolling. The object is:
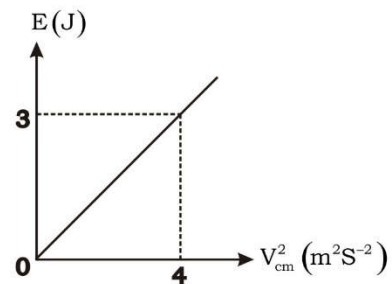
   a) Sphere b) Ring
   c) Disc d) Hollow Cylinder

Ans. c

Sol. $\dfrac{1}{2}mv^2(1+\beta) = E$

$\dfrac{1}{2}m(1+\beta) = \dfrac{3}{2}$

$1+\beta = \dfrac{3}{2}$

$\beta = \dfrac{1}{2}$

35. Two bodies of masses 8kg are placed at the vertices A and B of an equilateral triangle ABC. A third body of mas 2kg is placed at the centroid G of the triangle. If AG=BG=CG=1m, where should a fourth body of mass 4kg be placed so that the resultant force on the 2kg body is zero?

a) At C

b) At a point P on the line CG such that $PG = \dfrac{1}{\sqrt{2}} m$

c) At a point P on the line CG such that PG=0.5 m

d) At a point P on the line CG such that PG=2m

Ans. b

Sol. $F = \dfrac{Gm_1m_2}{r^2}$

$F_1 = \dfrac{G(16)}{1}$

$F_2 = G(16)$

$F' = \sqrt{F_1^2 + F_2^2 + 2F_1F_2}\cos\theta$

$= 16h$

$F' + F'' = 0$

$16G + \dfrac{8G}{r^2} = 0$
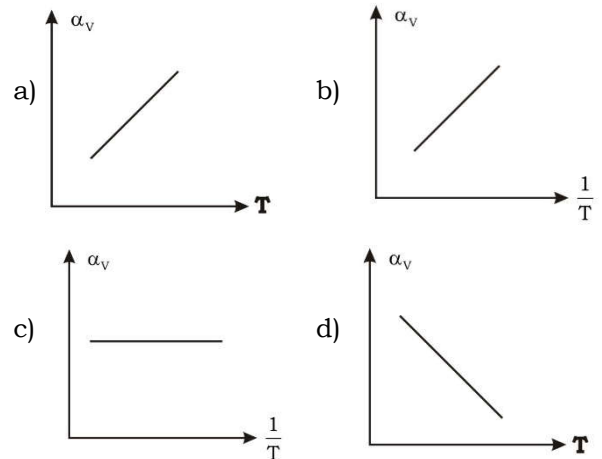
$\dfrac{8G}{r^2} = -16G$

$r^2 = \dfrac{1}{2} \Rightarrow r = \dfrac{1}{\sqrt{2}}$

36. Two capillary tubes P and Q are dipped vertically in water. The height of water level in capillary tube P is $\dfrac{2^{rd}}{3}$ of the height in capillary tube Q. The ratio of their diameter is ____

a) 2:3   b) 3:2   c) 3:4   d) 4:3

Ans. b

Sol. $h \propto \dfrac{1}{r}$

37. Which of the following curves represent the variation of coefficient of volume expansion of an ideal gas at constant pressure?

Ans. b

38. A number of cannot engines are operated at identical cold reservoir temperatures (T_L). However, their hot reservoir temperatures are kept different. A graph of the efficiency of the engines versus hot reservoir temperature (T_H) is plotted. The correct graphical representation is
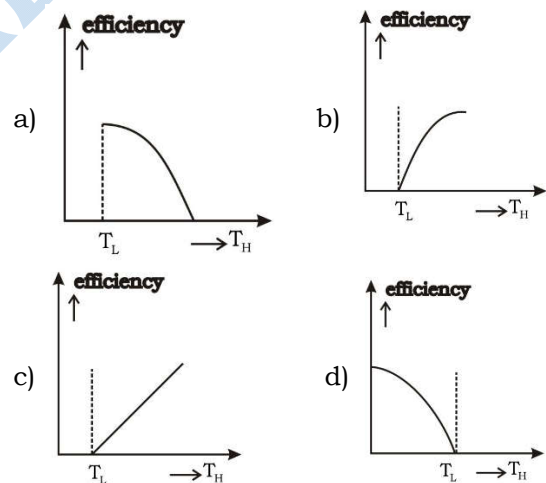
Ans. b

Sol. Conceptual

39. A gas mixture contains monoatomic and diatomic molecules of 2 moles each. The mixture has a total internal energy of (symbols have usual meanings)

a) 3RT   b) 5RT   c) 8RT   d) 9RT

Ans. c

Sol. $du = \dfrac{f}{2}nRT$

40. A pendulum oscillates simple harmonically and only if
    i. The sizer of the bob of pendulum is negligible in comparison with the length of the pendulum
    ii. The angular amplitude is less than $10°$
    a) Both i and ii are correct
    b) Both i and ii are incorrect
    c) Only i is correct
    d) Only ii is correct

Ans. a

Sol. Conceptual

41. To propagate both longitudinal and transverse waves, a material must have
    a) Bulk and shear moduli
    b) Only bulk modulus
    c) Only shear modulus
    d) Young's and Bulk modulus

Ans. a

Sol. Conceptual

42. A copper rod AB of length l is rotated about end A with a constant angular velocity ω. The electric field at a distance x from the axis of rotation is

    a) $\dfrac{m\omega^2 x}{e}$ b) $\dfrac{m\omega x}{el}$ c) $\dfrac{mx}{\omega^2 l}$ d) $\dfrac{me}{\omega^2 x}$

Ans. a

Sol. $F = ma$
    $qE = m\omega^2 x$

43. Electric field due to infinite, straight uniformly charged wire varies with distance 'r' as

    a) r b) $\dfrac{1}{r}$ c) $\dfrac{1}{r^2}$ d) r^2

Ans. b

Sol. $E = \dfrac{\lambda}{2\pi\varepsilon_0 r}$

44. A 2 – gram object, located in a region of uniform electric field $\vec{E} = \left(300\,N\,C^{-1}\right)\hat{i}$ carries a charge Q. The object released from rest at $x = 0$, has a kinetic energy of $0.12\,J$ at $x = 0.5$ m. Then Q is
    a) $400\,\mu c$ b) $-400\,\mu c$ c) $800\,\mu c$ d) $-800\,\mu c$

Ans. c

Sol. $EqX = \dfrac{1}{2}mv^2$

45. If a slab of insulating material (conceptual). $4\times10^{-3}\,m$ thick is introduced between the plates of a parallel plate capacitor, the separation between the plates has to be increased by $3.5\times10^{-3}\,m$ to restore the capacity to original value. The dielectric constant of the material will be
    a) 6   b) 8   c) 10   d) 12

Ans. b

Sol. $x = t\left(1 - \dfrac{1}{k}\right)$

46. Eight drops of mercury of equal radii combine to form a big drop. The capacitance of a bigger drop as compared to each smaller drop is
    a) 2 times   b) 8 times   c) 4 times   d) 16 times

Ans. a

Sol. $C' = n^{\frac{1}{3}}c$

47. Which of the statements is false in the case of polar molecules?
    a) Centers of positive and negative charges are separated in the absence of external electric field.
    b) Centers of positive and negative charges are separated in the presence of external electric field.
    c) Do not possess permanent dipole moments
    d) Ionic molecule HCl is the example of polar molecule.

Ans. c

Sol. Conceptual

48. An electrician requires a capacitance of $6\,\mu F$ in a circuit across a potential difference of $1.5\,kV$. A large number of $2\,\mu F$ capacitors which can withstand a potential difference of not more than $500\,V$ are available. The minimum number of capacitors required for the purpose is
    a) 3   b) 9   c) 6   d) 27

Ans. d

Sol. No. of capacitors in a row,
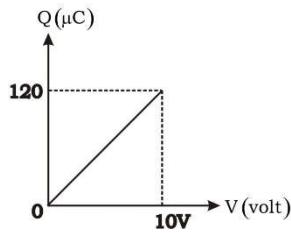 $n = \dfrac{\text{desired voltage}}{\text{voltage across each capacitor}}$
    $n = \dfrac{1500}{500} = 3$
    No. of rows, $m = \dfrac{\text{desired capacitance}}{\text{Total capacitance in each row}}$
    $m = \dfrac{6}{\left(\dfrac{2}{3}\right)} = 9$

    Total no. of capacitors = $n \times m = 3 \times 9 = 27$

49. In figure, charge on the capacitor is plotted against potential difference across the capacitor. The capacitance and energy stored in the capacitor are respectively.

a) 12 μF, 1200 μJ   b) 12 μF, 600 μJ

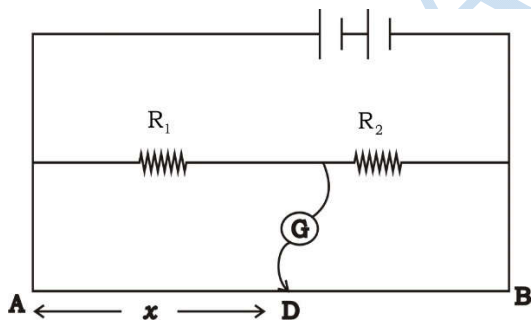c) 24 μF, 600 μJ   d) 24 μF, 1200 μJ

Ans. b

Sol. $C = \dfrac{Q}{V}$

$U = \dfrac{1}{2}QV$

50. A wire of resistance $3\,\Omega$ is stretched to twice its original length. The resistance of the new wire will be

a) $1.5\,\Omega$ b) $3\,\Omega$ c) $6\,\Omega$ d) $12\,\Omega$

Ans. d

Sol. $R \propto \ell^2$

51. In the given arrangement of experiment on metre bridge, if AD corresponding to null deflection of the galvanometer is X, what would be its value if the radius of the wire AB is doubled?

a) X   b) $\dfrac{X}{4}$ c) 4 X   d) 2 X

Ans. a

Sol. Balancing length is independent of area of cross section of the wire.

52. A copper wire of length 1 m and uniform cross sectional area $5\times10^{-7}\,m^2$ carries a current of 1 A. Assuming that there are 8×10^{28} free electrons per m^3 in copper, how long will an electron take to drift from one end of the wire to the other?

a) $0.8\times10^3\,S$ b) $1.6\times10^3\,S$

c) $3.2\times10^3\,S$ d) $6.4\times10^3\,S$

Ans. d

Sol. $\text{time}\,T = \dfrac{L}{V_d}$, $\ I = neAV_d$

53. Consider an electrical conductor connected across a potential difference V. Let Δq be a small charge moving through it in time Δt. If I is the electric current through it,

(i) the kinetic energy of the charge increases by $IV\Delta t$.

(ii) the electric potential energy of the charge decreases by $IV\Delta t$.

(iii) the thermal energy of the conductor increases by $IV\Delta t$.

Then the correct statements is/are

a) (i)   b) (i), (ii)

c) (i) and (iii)   d) (ii), (iii)

Ans. b

Sol. If charges mode without collisions through the conductor, kinetic energy would also change so that the total energy is unchanged.

Then $\Delta K = -\Delta U = IV\Delta t$

54. A strong magnetic field is applied on a stationary electron. Then the electron

a) Moves in the direction of the field

b) Moves in an opposite direction of the field

c) Remains stationary

d) Starts spinning

Ans. c

Sol. Conceptual

55. Two parallel wires in free space are 10 cm apart and each carries a current of 10 A in the same direction. The force exerted by one wire on the other [per unit length] is

a) $2\times10^{-4}\,Nm^{-1}$[attractive]

b) $2\times10^{-7}\,Nm^{-1}$[attractive]

c) $2\times10^{-4}\,Nm^{-1}$[repulsive]

d) $2\times10^{-7}\,Nm^{-1}$[repulsive]

Ans. a

Sol. $\dfrac{F}{L} = \dfrac{\mu_0 I_1 I_2}{2\pi r}$

56. A toroid with thick windings of N turns has inner and outer radii R_1 and R_2 respectively. If it carries certain steady current I, the variation of the magnetic field due to the toroid with radial distance is correctly graphed in
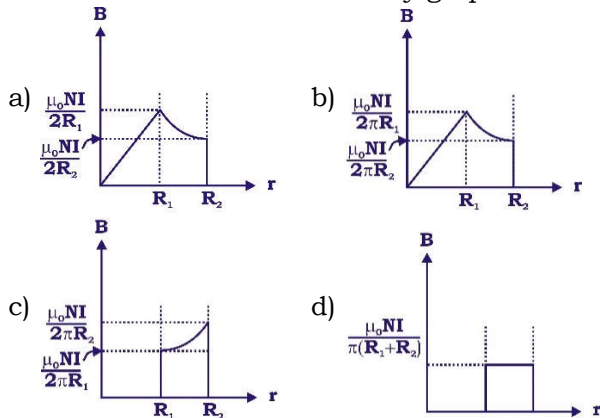
Ans. d

Sol. for $r < R_1$, $B = 0$

for $R_1 < r < R_2$, $B = \text{Constant}$

57. A tightly wound long solenoid has 'n' turns per unit length, a radius 'r' and carries a current I. A particle having charge 'q' and mass 'm' is projected from a point on the axis in a direction perpendicular to the axis. The maximum speed of the particle for which the particle does not strike the solenoid is

a) $\dfrac{\mu_0 nIqr}{m}$

b) $\dfrac{\mu_0 nIqr}{2m}$

c) $\dfrac{\mu_0 nIqr}{4m}$

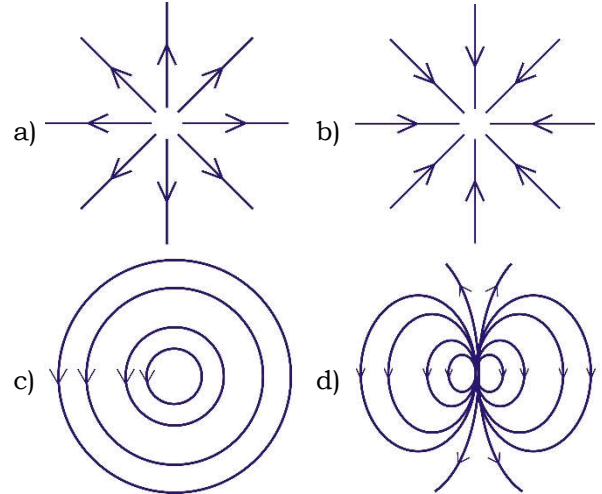d) $\dfrac{\mu_0 nIqr}{8m}$

Ans. b

Sol. $V = \dfrac{BqR}{2m}$

58. Earth's magnetic field always has a horizontal component except at

a) equator

b) magnetic poles

c) a latitude of $60°$

d) an altitude of $60°$
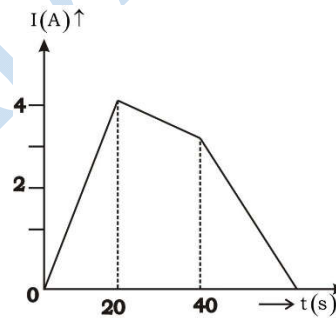
Ans. b

Sol. Conceptual

59. Which of the field pattern given below is valid for electric field as well as for magnetic field?

Ans. c

Sol. Time varying magnetic field causes time varying electric field.

60. The current following through an inductance coil of self inductance 6 mH at different time instants is as shown. The emf induced between $t = 20\,s$ and $t = 40\,s$ is nearly

a) $2 \times 10^{-2}\,V$

b) $3 \times 10^{-2}\,V$

c) $4 \times 10^{-3}\,V$

d) $30 \times 10^2\,V$

Ans. NO OPTION

Sol. $e = L\dfrac{dI}{dt}$

$= 3 \times 10^{-4}$

No option.