ANSWER KEY – CLASS 12 – PHYSICS – P-1 – SET 1 – 2023 – 24

[1] [c] resultant force is zero, resultant torque anti - clockwise

[2] [b] direction B

[3] [c] graph /[a]

[4] [b]10 ohm

[5] [b] away from the wire ab

[6] [a] 12 x 10^{-7}T

[7] [c] diamagnetic

[8] [a] fig.[i] diamagnetic & fig.[ii] paramagnetic

[9] [d] energy

[10] [a] 2 x10^{-4} F

[11] [b] $\frac{\lambda}{2}$

[12] [a] 1:2

[13] (c) If assertion is true, but reason is false.

[14] (d) If both assertion and reason are false.

[15] [a] If both assertion and reason are true, and reason is the true explanation of the assertion.

[16] (c) If assertion is true, but reason is false.

[17] Fig/explanation [$\frac{1}{2}$]

Steps [1]

Final expression [$\frac{1}{2}$]

[18] I = $\frac{E1}{r1} + \frac{E2}{r2}$ [1/2]

E = $\{\frac{E1}{r1} + \frac{E2}{r2}\}$ x $\frac{r1r2}{r1+r2}$ [1/2]

E= 1.7V [1/2]

and r = 0.12 ohm [1/2]

OR

loop DACD -1 x R + 1 + 1 x 2 = 0 or R = 3 ohm – any 1 loop ---[1]

loop DCBD →-2 X1 – 2X R1 + 2 = 0 [1/2]

VB = 1v [1/2]

[19] ray diagram is wrong and M.P is correct - [1]

Objective smaller aperture

M.P = mo x me alone –[1/2]

Final image at 'D' [1/2]

[20]direct answer transition D ------[1]

E_D=-1.5 -(-13.6)=12.1 eV

$E = \frac{hc}{\lambda} = \frac{6.63 \times 10^{-34} \times 3 \times 10^{8}}{102.7 \times 10^{-9}}$ -------1/2]

$= 1.94 \times 10^{-18}$ J ------[1/2]

$= \frac{1.94 \times 10^{-18}}{1.6 \times 10^{-19}} eV$=12.1eV ------1/2]

[21] full wave rectifier circuit -[1]

Input [1/2]

Output [1/2]

[22] State Gauss's law. -----[1]

Fig/explanation [$\frac{1}{2}$]

Steps ---- [1/2 + ½]

Final expression ---- [$\frac{1}{2}$]

[23] Biot's Savarts law------[1]

Fig/explanation [$\frac{1}{2}$]

Steps ---- [1/2 + ½]

Final expression ---- [$\frac{1}{2}$]

[24] E1 = $-\frac{d\emptyset}{dt}$ = $-A[\frac{1-0}{2-0}]$ = - [2.25 x 10^{-2}]volt - [1/2]

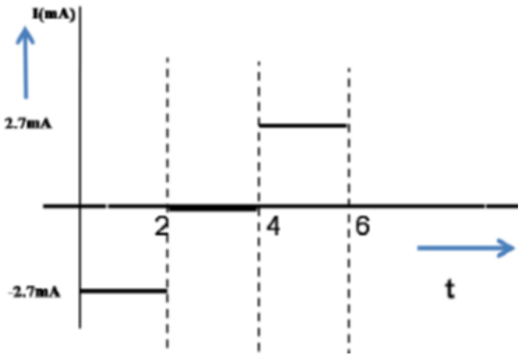
I1 = $\frac{E1}{R} = =\frac{-2.25 \text{ x } 10^{-2}}{8.5}$ = -2.7 mA ----[1/2]

E2 =$-A[\frac{1-1}{4-2}]$ = 0 volt ------[1/2]

I2 = $\frac{E2}{R} = 0 volt$

E3 $= -A[\frac{0-1}{6-4}]$ = - [-2.25 x 10^{-2}] volt –[1/2]

I3 = $\frac{[2.25 \times 10-2\ ]}{8.5} = +2.7mA$ [1/2]

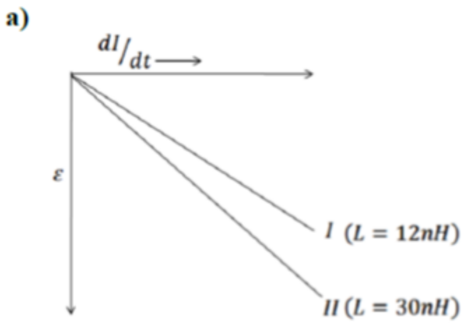


-----[1/2]

Graph not necessary

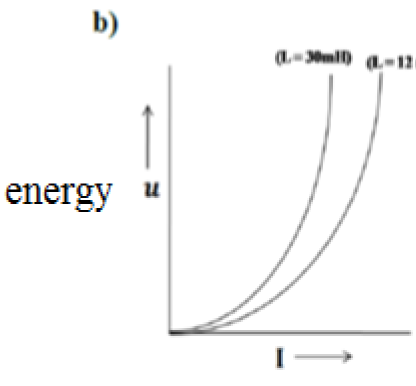
OR

e2 $> e1$



[½ + ½]

[b]



[1/2 + ½]

[c] L1 dI/dt x I1 = L2 dI/dt x I2

Or $\frac{I2}{I1} = \frac{L1}{L2}$ -----[1/2]

$$\therefore \frac{E_2}{E_1} = \frac{\frac{1}{2}L_2I_2^2}{\frac{1}{2}L_1I_1^2} = \frac{L_2}{L_1}\left(\frac{I_2}{I_1}\right)^2 = \frac{30}{12}\left(\frac{12}{30}\right)$$
$$= \frac{12}{30} = \frac{2}{2} = 0.4$$

[1/2]

[25]

The displacement current is due to change in electric flux and in dc , there is no change in electric flux. Hence no displacement current. As a result there being no continuity, capacitor does not conduct. [1]

But in ac , the voltage varies and hence there is change in electric field[E = v/d].As a result of this there is displacement current [1]

$I_d = \varepsilon o \frac{d\,\psi_E}{dt}$ [1]

[26] ray diagram [1]

Steps ---- [1/2 + ½ + ½ + 1/2]

[27]

Steps ---- [1/2]

K.E = 1

P.E =1

Final expression ---- [$\frac{1}{2}$]

[28] formula or correct substitution

Δm = [26x 1.007277u + 28x 1.008665u] - 53.9396u ----[1+1/2]

Mass defect = 0.492222u --[1/2]

B.E = 0.492222x 931.5Mev [1/2]

B.E = 458.5Mev ----[1/2]

B.E/ nucleon = B.E/ nucleon no. = 471.5Mev/54 = 8.49Mev/nucleon

Any 1 final answer is required

[29][i] [c] more in cladding as the refractive index is less
[ii] [d] provide maximum brighter image
[iii][b] 1.5 x 30^8m/s

OR

[iii][a] 4×10^{-7} m

[iv] [c] total internal reflection
[30] [i]b 1.1 ev
[b] increases
[iii] [b] 4.3 Kohm

OR

[iii] [d] 717 ohm
[iv] [c] fig[c]

[31][a] [i] Region II

$\frac{\sigma 1-\sigma 2}{2\varepsilon o}$ towards right [formula or direction is needed [$\frac{1}{2}$ + $\frac{1}{2}$]

Region III

$\frac{\sigma 1+\sigma 2}{2\varepsilon o}$ towards right [$\frac{1}{2}$ + $\frac{1}{2}$]

[b] [i] $C = \frac{\varepsilon_{0A}}{d}$

$= \frac{8.85 \times 10^{-12} \times 5 \times 10^{-3}}{2.5 \times 10^{-3}}$F $= 17.7 \times 10^{-12}$F ----[$\frac{1}{2}$ + $\frac{1}{2}$]
[ii]$Q = CV = 17.7 \times 10^{-12} \times 100$C $= 17.7 \times 10^{-10}$C ---[$\frac{1}{2}$ + $\frac{1}{2}$]
[iii]

Q^1 = k C x v = 8 x 17.7 x 10^{-12} x 100 = 1.16 x 10^{-8} C ---- [$\frac{1}{2}$ + $\frac{1}{2}$]

<u>OR</u>

[i]

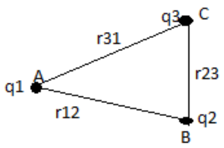


Figure [$\frac{1}{2}$]

$U_A = 0$ [$\frac{1}{2}$]
$U_B = \frac{Kq1q2}{r12}$ [$\frac{1}{2}$]
$Uc = \frac{kq1q3}{r31} + \frac{kq2q3}{r23}$ [$\frac{1}{2}$ + $\frac{1}{2}$]
$U = \frac{Kq1q2}{r12} + \frac{kq2q3}{r23} + \frac{kq3q1}{r31}$ [$\frac{1}{2}$]

[ii][a]

Flux through S_1 , $\Phi_1 = \frac{Q}{\epsilon_o}$ [1/2]

Flux through S_2 , $\Phi_2 = \frac{Q+2Q}{\epsilon_o} = \frac{3Q}{\epsilon_o}$ [1/2]

Ratio of flux = 1:3 1/2]

No change in flux through S_1 with dielectric medium inside the sphere S_2 [1/2]

[32] [a] phasor diagram [1]

Steps ---- [1/2 + ½ + ½]

Circuit diagram alone –[1/2]

Final expression ---- [$\frac{1}{2}$]

Resonant frequency---steps--- [1]

Final expression---[1/2]

(b) $\frac{\pi}{2} - -\frac{\pi}{2} = \pi$ [1/2]

OR

[a][i] fig. of step down transformer ------[1]

[ii]Electromagnetic induction /mutual induction ---[1]

[iii]Any 2 losses ---[1]

[b]Total resistance 40 x 0.5 = 20 ohm ---[1/2]

I = P/V = 1200 x1000/4000 = 300A [1/2]

P = I^2R = [300] x [300] x20 = 1800Kw [1/2 + ½]

[33] [a]diagram [1]

Steps ---- [1/2 + ½ + ½ +1/2+1/2]

Final expression ---- [$\frac{1}{2}$]

[ii] No – energy depends on the amplitude /frequency of the wave [$\frac{1}{2}$ + $\frac{1}{2}$]

OR

Huygens's Principle ------[1]

a ray diagram ------[1]

Explanation in terms of wave front-------[1/2]

condition for maxima

$\sin \Theta_n = \frac{[2n+1]}{d}\frac{\lambda}{2}$ [n = 1,2,---] ------[1/2]] two differences -----[1]

[c] $\sin\theta = \frac{n\lambda}{d}$ *and* n=1

d = 1.4 x 10^{-6} m [1/2 + ½]