Code Number: A

Aakash
Medical | IIT-JEE | Foundations

Corp. Office: Aakash Educational Services Limited, 3rd Floor, Incuspaze Campus- 2, Plot No. 13, Sector- 18, Udyog Vihar, Gurugram, Haryana – 122015

Time: 2 Hrs.

Mock Test for Class XII

Max. Marks: 60

PHYSICS

1. Electric flux density $\left(\frac{\Phi_E}{A} = E\right)$ or electric intensity

2. Polarization

3. Paramagnetic

4. Visible light

5. Hertz

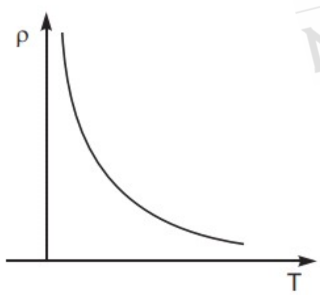
6. $\frac{h}{2\pi}$

7. Insulator

8. Linear charge density → charge distribution per unit length of a wire

   $\lambda = \frac{q}{\ell}$

   Surface charge density – charge distribution per unit area $\sigma = \frac{q}{A}$

9. 

10. (i) Whenever magnetic flux linked with a conductor /coil changes an emf is induced in the coil. This induced emf last as so long as the change in magnetic flux lasts.

    (ii) Induced emf $e = \frac{d\phi_E}{dt}$

OR

11. $P = \frac{V^2}{R}$ $\quad R = \frac{V^2}{P} = \frac{220^2}{100} = 484\,\Omega$

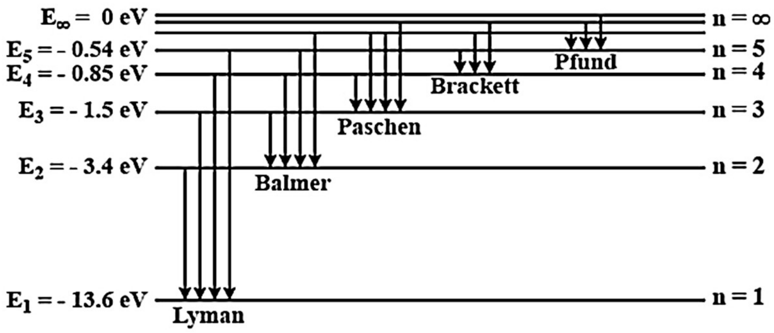
12. Sources which emits, light with same frequency, wavelength and zero or constant phase difference. When light waves from coherent sources superimposed, sustained inference patterns produces.

13. $h\nu = \phi_0 + KE_{max}$

$$h\nu = h\nu_0 + \frac{1}{2}mv^2$$

When light having particular frequency incident on a photosensitive substance, one part is used for emission of electron (ϕ_0) and remaining is used as kinetic energy. If frequency is less than threshold frequency (ν_0) no photoelectric emission takes place.

14.



15. (a) $E = \frac{1}{4\pi\varepsilon_0}\frac{q}{x^2}$

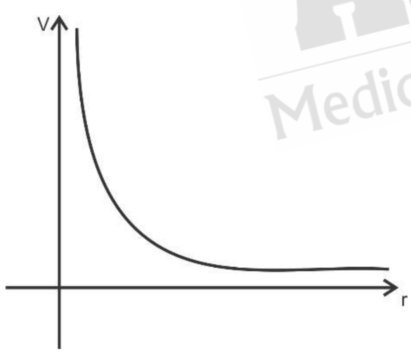
$$dw = \int_{x_1}^{x_2} \vec{E}\,.\,\vec{dx}$$

$$= \int_{\infty}^{r} \frac{1}{4\pi\varepsilon_0}\frac{q}{x^2}\,dx\cos\theta \qquad \cos\theta = -1$$

$$= \frac{-q}{4\pi\varepsilon_0}\left(\frac{x^{-2+1}}{-2+1}\right)_{\infty}^{r}$$

$$V = \frac{1}{4\pi\varepsilon_0}\frac{q}{r}$$

(b)



16. (a) Statement

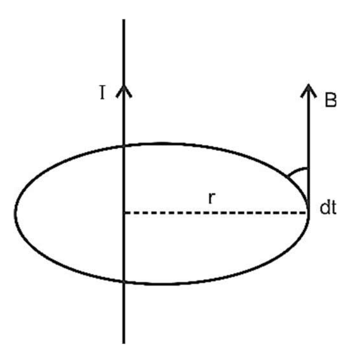
OR

$$\oint \vec{B}\cdot\vec{dl} = \mu_0 I_{enclosed}$$

(b) $\int \vec{B}\,\vec{dl} = \mu_0 I$

$$B\int \vec{dl} = \mu_0 I \qquad B \times 2\pi r = \mu_0 I$$

$$B = \frac{\mu_0}{2\pi}\frac{I}{r}$$



17. Rate of work done $\frac{dw}{dt} = eI = LI\frac{dI}{dt}$

$dw = LIdI$

$$U = w = \int_0^I LI\,dI = L\left(\frac{I^2}{2}\right)_0^I = \frac{1}{2}LI^2$$

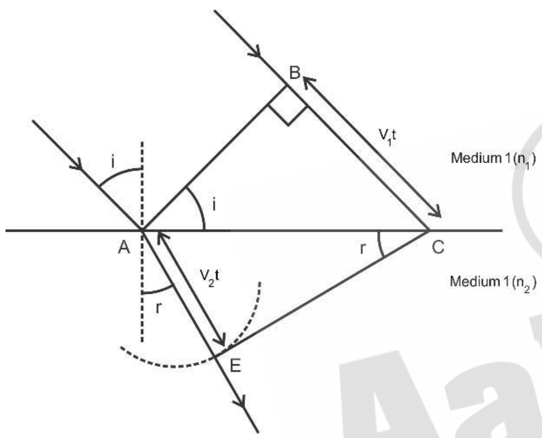
$$L = \frac{\mu_0 N^2 A}{\ell} \qquad B = \mu_0 nI = \frac{\mu_0 NI}{\ell}$$

$$U = \frac{1}{2} \times \frac{\mu_0 N^2 A}{\ell} \times \frac{B^2\ell^2}{\mu_0^2 N^2} \qquad U = \frac{1}{2\mu_0}B^2 \ell A$$

18. (a) An oscillating charged particle like electrons or ions produced oscillating electric field and magnetic field in space which results in em waves.

(b) When infrared waves passes through water molecules, CO_2, NH_3 etc., they readily absorb it and their thermal motion increases. They heat up and heat the surroundings. So IR called heat waves.

19.



AB is incident wave front CE is refracted wave front

$\Delta ABC \quad \sin i = \frac{BC}{AC} = V_1 t$

$\Delta AEC \quad \sin r = \frac{AE}{AC} = \frac{V_2 t}{AC}$

$$\frac{\sin i}{\sin r} = \frac{BC}{AE} = \frac{V_1 t}{V_2 t} = \frac{V_1}{V_2}$$

We have $n_1 = \frac{C}{V_1}$ and $n_2 = \frac{C}{V_2}$

$$\frac{V_1}{V_2} = \frac{n_2}{n_1}$$

$$\therefore \quad \frac{\sin i}{\sin r} = \frac{V_1}{V_2} = \frac{n_2}{n_1} \Rightarrow \text{Snell's law}$$

20. (a) It is the spontaneous disintegration of heavier unstable nucleus with the emission of particles or radiation and release of energy

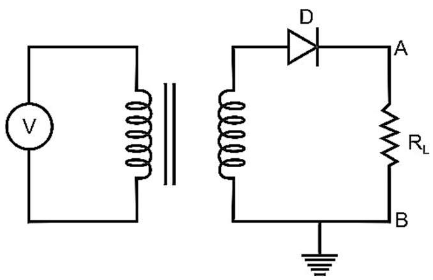
(b) ${}_1H^1 + {}_1H^1 \longrightarrow {}_1H^2 + e^+ + V + 0.42 \text{ MeV}$

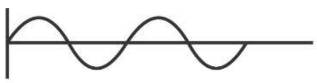
$$_1H^2 + {}_1H^1 \longrightarrow {}_2He^3 + \gamma + 5.49 \text{ MeV}$$

$$_2He^3 + {}_2He^3 \longrightarrow {}_2He^4 + {}_1H^1 + {}_1H^1 + 12.86 \text{ MeV}$$

This is the proton-proton cycle occurs in stars.

21. (a) During positive half cycle of ac diode D is forward biased and it conducts current from A to B. During negative half cycle D is reverse biased it acts as insulator, does not conduct so we get a unidirectional pulsating output.



(b) 

22. (a) $U = \frac{1}{2}CV^2$ Derivation not required

(b) When 2 capacitors are connected together they attain same potential

$V_1 = V_2$

$$\frac{Q_1}{C} = \frac{Q_2}{C} \Rightarrow Q_1 = Q_2$$

Also $\frac{Q_1}{C} = \frac{Q_2}{C} \Rightarrow Q_1 = Q_2$

$$Q_1 + Q_2 = Q \Rightarrow Q_1 = Q_2 = \frac{Q}{2}$$

$\therefore$ $V_1 = \frac{Q_1}{C} = \frac{Q}{2C} = \frac{V}{2} = \frac{100}{2} = 50\text{ V}$

Also $V_2 = 50\text{ V}$

$\therefore$ $U = \frac{1}{2}C_1V_1^2 + \frac{1}{2}C_2V_2^2$

$$= \frac{1}{2} \times 900 \times 10^{-12}(50^2 + 50^2)$$

$$= \frac{1}{2} \times 900 \times 10^{-12} \times 5000$$

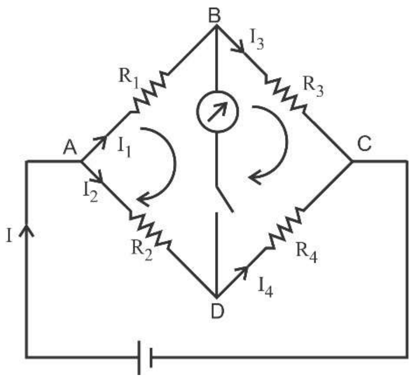
$$= 2.25 \times 10^{-6}\text{J}$$

23. (a) Statement

OR

$\Sigma IR + \Sigma E = 0$

(b)



For loop ABDA

$I_1R_1 + I_gR_G + -I_2R_2 = 0$ …(1)

For loop BCPB

$I_3R_3 + {}^{-}I_4R_4 + {}^{-}I_gR_G = 0$ ….(2)

When bridge is balanced $I_g = 0$

$I_1 = I_3$

$I_2 = I_4$

$\therefore$ $I_1R_1 = I_2R_2$ …..(3)

$I_1R_3 = I_2R_4$ …..(4)

$\frac{3}{4}$ $\Rightarrow \frac{R_1}{R_3} = \frac{R_2}{R_4}$ or $\frac{R_1}{R_2} = \frac{R_3}{R_4}$

24. (a) Statement

OR

$\int \vec{B} \cdot \vec{ds} = 0$

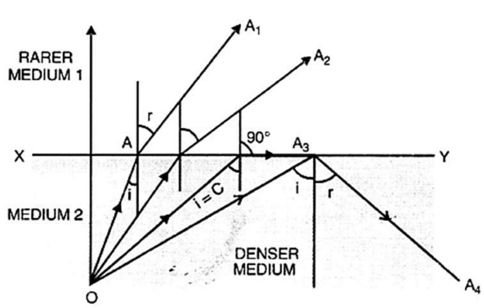
(b) If monopoles exits then law becomes

$\int \vec{B} \cdot \vec{ds} = \mu_0 q_m$ $q_m \rightarrow$ monopole (magnetic charge)

25. (a) (i) Incident ray, normal, refracted ray in the same plane

(ii) $\frac{\sin i}{\sin r} = \frac{n_2}{n_1}$ = constant $\rightarrow$ Snell's law

(b)



When light ray travels from denser to rarer and if the angle of incidence is greater than critical angle ($i > i_C$), light ray totally reflected back to the same medium. This is total internal reflection.

26. (a) $E_{-q} = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2+\ell^2}$ along OA ….(1)

$E_{+q} = \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2+\ell^2}$ along BO ….(2)

$E = 2E_{+q}\cos\theta$

$$= 2 \times \frac{1}{4\pi\varepsilon_0}\frac{q}{r^2+\ell^2} \times \frac{l}{(r^2+\ell^2)^{1/2}}$$

$$= \frac{1}{4\pi\varepsilon_0}\frac{P}{(r^2+\ell^2)^{3/2}}$$

Since $\ell^2 << r^2$

$$E = \frac{1}{4\pi\varepsilon_0}\frac{P}{r^3}$$

(b) $|q_A| = |q_B| = 2.5 \times 10^{-7}C$

$2\ell = Z_2 - Z_1 = 15 - -15 = 30$ cm $= 30 \times 10^{-2}$ m

Total charge, q = qA + qB = 0

Dipole moment $P = q \times 2\ell = 2.5 \times 10^{-7} \times 30 \times 10^{-2} = 7.5 \times 10^{-8}$ cm.

27. (a) $s_I = \frac{\Phi}{I}$, deflection per unit current

(b) Galvanometer can be converted into voltmeter by connecting a high resistance in series with it.

$V = I_g(G+R)$

$R = \frac{V}{I_g} - G$

(c) $R_A = 60\Omega$

$R_1 = 3\ \Omega$

$R = R_1 + R_A = 63\ \Omega$

V = 3V

$I = \frac{V}{R} = \frac{3}{63} = 0.048$ A

28. (a) Mutual induction

(b)

	Step up		Step down
(i)	$N_P < N_S$	(i)	$N_P > N_S$
(ii)	$V_S > V_P$	(ii)	$V_S < V_P$
(iii)	Thickness of primary is more	(iii)	This is secondary is more
(iv)	$I_S < I_P$	(iv)	$I_S > I_P$

(c) Copper loss flux leakage loss Eddy current loss hysteresis loss.

29. (a) Deviation of $n = \dfrac{\sin\dfrac{A+D}{2}}{\text{Sin}\dfrac{A}{2}}$

OR

$A = r_1 + r_2$

$D = i + e - A$

$n = \dfrac{\sin i}{\sin r}$

(b) For small angle $n \approx \dfrac{\dfrac{A+D}{2}}{A/2} = 1 + \dfrac{D}{A}$

$D = (n - 1)\,A$

❑ ❑ ❑