Class XII Physics

Sample Question Paper

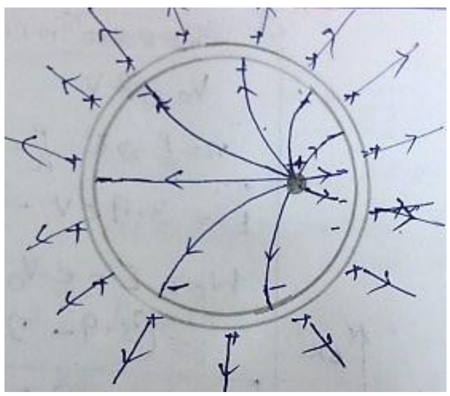
(Applicable for March 2016 Examination)

(Marking Scheme)

Time Allowed: 3 Hours *Maximum Marks: 70*

Section A

1.



Inside (1/2)
Outside (1/2)

2. (i) Cu (metals, alloys) (1/2)
   (ii) Si (semiconductor) (1/2)

3. (i) A (1/2)
   (ii) Capacitor (1/2)

4. $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$, $\frac{1}{f} = (\frac{\mu l}{\mu m} - 1)(\frac{1}{R1} - \frac{1}{R2})$ (1/2)
   If μ_m increases, 1/f decreases , ∴ v increases. (1/2)

5. LAN (1)

SECTION B

6. $\boldsymbol{\varepsilon}_{eq} = (\frac{\varepsilon 1}{r1} + \frac{\varepsilon 2}{r2}) / (\frac{1}{r1} + \frac{1}{r2})$ (1/2)

$\boldsymbol{\varepsilon}_{eq} = (10/10 - 2/5)/ (1/10 + 1/5)$ (1)

$\boldsymbol{\varepsilon}_{eq} = 2V$ (1/2)

7. $I_1 = I_o/2$ (1/2)
$I_2 = I_1 \cos^2 60^0$ (1/2)
$I_2 = I_o/8$ (1)

OR

7. Huygens' Principle (1)

Ray diagram using Huygen's construction (1)

8. $P = 5 X 10^{-3}$ W
$n = \frac{P}{E}$,
$E = \frac{P}{n} = 6.25 X 10^{-19}$ J (1/2)
$E = 3.9$ eV (1/2)
$W_o = E - eV_o$ (1/2)
$= (3.9 - 2) eV_o$
$W_o = 1.9$ eV (1/2)

9. $R = Ro\, e^{-\lambda t}$ (1/2)
$\ln R = \ln Ro - \lambda t$
$\ln R = -\lambda t + \ln Ro$ (1/2)
slope of ln R v/s t is '$-\lambda$'
$-\lambda = \frac{0-1.52}{218-164}$ (1/2)
$\lambda = 0.028$ minute^{-1} (1/2)

10.

	Frequency range	Use
Ground wave	500-1500KHz (1/2)	Standard AM broadcast (1/2)
Space wave	Above 40 MHz (1/2)	Television (1/2)

SECTION C

11. (i) at A, $E = \frac{\sigma}{2\varepsilon o}$ (1/2)

$E = 1.1 \times 10^{28}$ N/C (1/2)

Directed away from the sheet (1/2)

(ii) Point Y (1/2)

Because at 50cm, the charge sheet acts as a finite sheet and thus the magnitude remains same towards the middle region of the planar sheet.

(1)

12. (i) V = Ir (without voltmeter) R_v

$V' = \frac{I\, r\, Rv}{r+Rv} = \frac{I\, r}{1+\frac{r}{Rv}}$ (1/2)

$V' < V$ (1/2)

(ii) Percentage error

$(\frac{V-V'}{V}) \times 100$ (1/2)

$= (\frac{r}{r+Rv}) \times 100$ (1)

(iii) $Rv \rightarrow \infty$, $V' = I\, r = V$ (1/2)

OR

12 (a) $I = \frac{\varepsilon}{R+\frac{\rho 1\, l}{A1}}$ for Set A (1/2)

$I = \frac{\varepsilon}{R+\frac{\rho 1\, l}{2A1}+\frac{\rho 2 l}{2A2}}$ for set B (1/2)

Equating the above two expressions and simplifying

$\frac{\rho 1}{A1} = \frac{\rho 2}{A2}$ (1/2)

(b) Potential gradient of the potentiometer wire for set A, K= I$\frac{\rho 1}{A1}$

Potential drop across the potentiometer wire in set B

V = I ($\frac{\rho 1 l}{2A1} + \frac{\rho 2 l}{2A2}$)

V = $\frac{I}{2}$ ($\frac{\rho 1}{A1} + \frac{\rho 2}{A2}$) l (1/2)

K' = $\frac{I}{2}$ ($\frac{\rho 1}{A1} + \frac{\rho 2}{A2}$), using the condition obtained in part (i) (1/2)

K'= I $\frac{\rho 1}{A1}$, which is equal to K.

Therefore, balancing length obtained in the two sets is same. (1/2)

13. (i) Machine : Cyclotron (1/2)

Diagram (1/2)

Resonance condition (1)

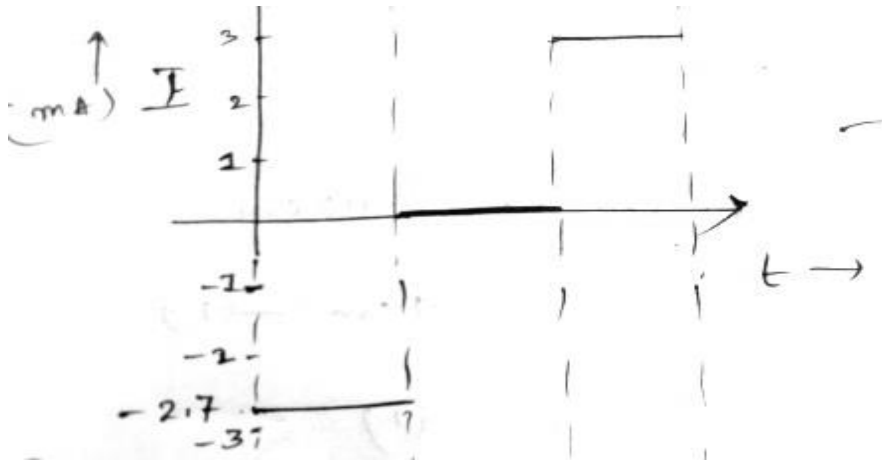
(ii) Particle will accelerate and decelerate alternately. However, the radius of the path will remain unchanged (1)

14. $\boldsymbol{\varepsilon} = -\frac{d\phi}{dt}$,

$\boldsymbol{\varepsilon}$ = -0.023 V ,

I = $\boldsymbol{\varepsilon}$/R = -2.7 mA for 0<t<2s.

	0<t<2s	2<t<4s	4<t<6s
ε (V)	-0.023	0	+0.023
I (A)	-2.7	0	+2.7



(3)

15.

	Type of wave	Application
(a)	Gamma rays (1/2)	Treatment of tumors (1/2)
(b)	Radio waves (1/2)	Radio and television Communication systems (1/2)
(c)	X- rays (1/2)	Study of crystals (1/2)

16. $T_2P = D + x$, $T_1\,P = D - x$ (1/2)

$S_1\,P = [\,(S_1T_1)^2 + (PT_1)^2]^{1/2}$ (1/2)

$= [D_2 + (D - x)^2]^{1/2}$ (1/2)

$S_2P = [D^2 + (D + x)^2]^{1/2}$ (1/2)

Minima will occur when $S_2P - S_1P = \lambda/2$ (1/2)

$D = \dfrac{\lambda}{2(\sqrt{5}-1)}$ (1/2)

17. $\frac{1}{fe} = \frac{1}{ve} - \frac{1}{ue}$ solving $u_e = -4.2$ cm (1)

$\frac{1}{fo} = \frac{1}{vo} - \frac{1}{uo}$, solving $u_o = -1.1$ cm (1)

$m = \frac{v}{u}\left(1+\frac{D}{fe}\right) = -44$ (1)

18.Explanation of Photo electric effect (1)

Explanation of the effect using particle concept (1)

Explanation of the failure of wave theory in the explanation (1)

19. $mv^2/r = e^2/4\pi\boldsymbol{\varepsilon}_o r^2$

$v^2 = e^2/m\,4\pi\boldsymbol{\varepsilon}_o r$ (1/2)

Bohr's quantisation condition

$Mvr = nh/2\pi$ (1/2)

Solving, $v = e^2/2\boldsymbol{\varepsilon}_o h$, $r = \boldsymbol{\varepsilon}_o h^2/\pi me^2$ (1/2)

Magnetic field at the centre

$B = \mu_o I/2r$ (1/2)

$I = ev/2\pi r$ (1/2)

$B = \mu_o e^7 \pi m^2/8\boldsymbol{\varepsilon}_o^3 h^5$ (1/2)

20. B : reverse biased (1/2)

C: forward biased (1/2)

Justification (2)

21.(i) Emitter base junction is forward biased whereas base collector junction is reverse biased. (1)

(ii) Small change in the current I_B in the base circuit controls the larger current I_C in the collector circuit. $I_C = \beta I_B$ (1)

(iii) Elemental semiconductor's band gap is such that the emitted wavelength lies in IR region. Hence cannot be used for making LED (1)

22. (i) size of the antenna (1/2)

Effective power radiated by the antenna (1/2)

Mixing up of signals from different transmitters (1/2)

(ii) modulation (1/2)

Block diagram of amplitude modulation (1)

SECTION D

23. (i) Any meaningful activity and values which could be inculcated (2)
(ii) Diagram with labelling three magnetic elements of earth (1+1)

SECTION E

24. (a) (i) $C_A = 4\pi\boldsymbol{\varepsilon}_o R$, $C_B = 4\pi\boldsymbol{\varepsilon}_o(2R)$ (1/2)

$C_B > C_A$ (1/2)

(ii) $u = \frac{1}{2}\boldsymbol{\varepsilon}_o E^2$ (1/2)

$E = \frac{\sigma}{\varepsilon o} = \frac{Q}{A\varepsilon o}$, $u \propto 1/A^2$

$\therefore u_A > u_B$ (1/2)

(b) (i) $E = -\frac{dV}{dr}$ (1/2)

For same change in dV, $E \propto 1/dr$ (1/2)

where 'dr' represents the distance between equipotential surfaces.

Diagram of equipotential surface due to a dipole (1)

(ii) Polarity of charge – negative (1/2)

Direction of electric field – radially inward (1/2)

OR

24 (a)

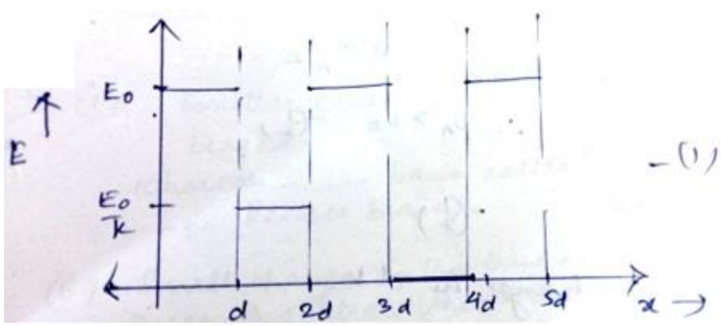
	Non-Polar (O_2) –(1/2)	Polar (H_2O)- (1/2)
Absence of electric field (1)		
Individual	No dipole moment exists	Dipole moment exists
Specimen	No dipole moment exists	Dipoles are randomly oriented. Net **P**=0

Presence of electric field(1)		
Individual	Dipole moment exists (molecules become polarised)	Torque acts on the molecules to align them parallel to **E**
Specimen	Dipole moment exists	Net dipole moment exists parallel to Dipole moment exists **E**.

(b) (i) $V = E_o d + \frac{E_o}{k} d + E_o d + 0 + E_o d$ (1/2)

$V = 3 E_o d + \frac{E_o}{k} d$ (1/2)

(ii) Graph (1)



25. (a) AC generator

Diagram (1)

Principle (1)

Working (1)

(b) (i) Capacitor – electric field (1/2)

Inductor – magnetic field (1/2)

(ii) resistance of the circuit (1/2)

Radiation in the form of EM waves (1/2)

OR

25 (a) B : inductive reactance (1/2)

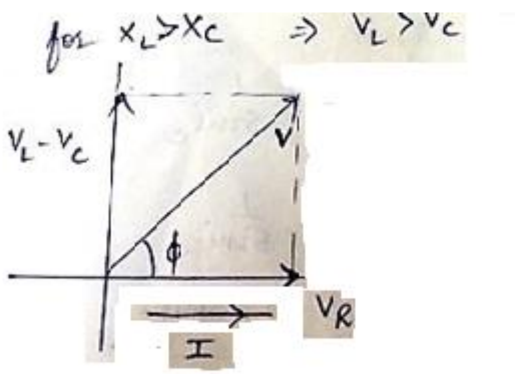
C: resistance (1/2)

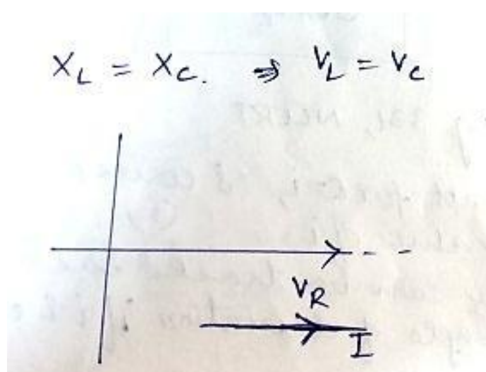
(b) At resonance $X_L = X_C$ (1/2)

$Z = [(X_L - X_C)^2 + R^2]^{1/2}$, Z =R (1/2)

Phasor diagrams (1+1)

phase difference is ϕ





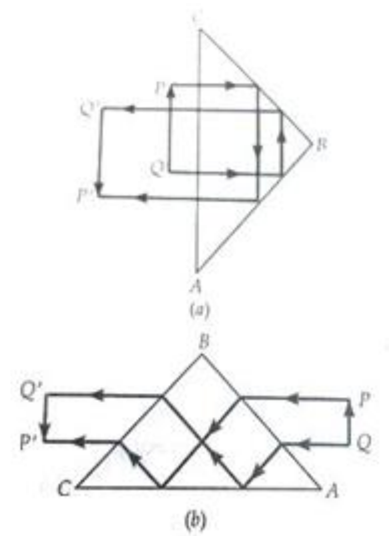
same phase

(c) Acceptor circuit: Series LCR circuit (1/2)

Radio tuning (1/2)

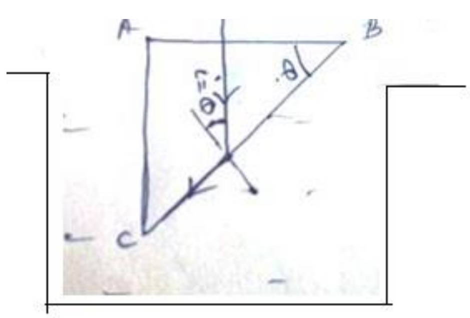
26. (a) To derive $\frac{\mu 2}{v} - \frac{\mu 1}{u} = \frac{\mu 2 - \mu 1}{R}$, (3)

(b) Diagram (2)



OR

26 (a) Diagram -



(1)

$\mu_g/\mu_w = 1/\sin i_c$ (1/2)

$\sin i_c = 8/9$ (1/2)

(b) Graph (1)

Interpretation: Path of the ray can be traced back resulting in same angle of deviation if i & e are interchanged (1/2)

$\delta + A = i + e$ (1/2)

To derive $\mu = \frac{\sin(A+\delta m)/2}{\sin A/2}$ (1)

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