

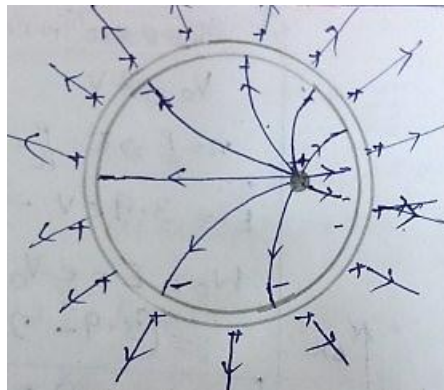
Class XII Physics
Sample Question Paper
(Applicable for March 2016 Examination)
(Marking Scheme)

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. $\frac{1}{f} = \frac{1}{v} - \frac{1}{u}$, $\frac{1}{f} = \left(\frac{\mu_l}{\mu_m} - 1\right) \left(\frac{1}{R_1} - \frac{1}{R_2}\right)$ (1/2)

If μ_m increases, $1/f$ decreases, $\therefore v$ increases. (1/2)

5. LAN (1)

SECTION B

$$6. \epsilon_{eq} = \left(\frac{\epsilon_1}{r_1} + \frac{\epsilon_2}{r_2} \right) / \left(\frac{1}{r_1} + \frac{1}{r_2} \right) \quad (1/2)$$

$$\epsilon_{eq} = (10/10 - 2/5) / (1/10 + 1/5) \quad (1)$$

$$\epsilon_{eq} = 2V \quad (1/2)$$

$$7. I_1 = I_o/2 \quad (1/2)$$

$$I_2 = I_1 \cos^2 60^\circ \quad (1/2)$$

$$I_2 = I_o/8 \quad (1)$$

OR

7. Huygens' Principle (1)

Ray diagram using Huygen's construction (1)

$$8. P = 5 \times 10^{-3} \text{ W}$$

$$n = \frac{P}{E},$$

$$E = \frac{P}{n} = 6.25 \times 10^{-19} \text{ J} \quad (1/2)$$

$$E = 3.9 \text{ eV} \quad (1/2)$$

$$W_o = E - eV_o \quad (1/2)$$

$$= (3.9 - 2) eV_o$$

$$W_o = 1.9 \text{ eV} \quad (1/2)$$

$$9. R = R_o e^{-\lambda t} \quad (1/2)$$

$$\ln R = \ln R_o - \lambda t$$

$$\ln R = -\lambda t + \ln R_o \quad (1/2)$$

slope of $\ln R$ v/s t is $-\lambda$

$$-\lambda = \frac{0 - 1.52}{218 - 164} \quad (1/2)$$

$$\lambda = 0.028 \text{ minute}^{-1} \quad (1/2)$$

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, $E = \frac{\sigma}{2\epsilon_0}$ (1/2)

$E = 1.1 \times 10^{28} \text{ N/C}$ (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

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

$$V' < V \quad (1/2)$$

(ii) Percentage error

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

$$= \left(\frac{r}{r + R_v} \right) \times 100 \quad (1)$$

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

OR

12 (a) $I = \frac{\epsilon}{R + \frac{\rho_1 l}{A_1}}$ for Set A (1/2)

$$I = \frac{\epsilon}{R + \frac{\rho_1 l}{2A_1} + \frac{\rho_2 l}{2A_2}} \text{ for set B} \quad (1/2)$$

Equating the above two expressions and simplifying

$$\frac{\rho_1}{A_1} = \frac{\rho_2}{A_2} \quad (1/2)$$

(b) Potential gradient of the potentiometer wire for set A, $K = I \frac{\rho_1}{A_1}$

Potential drop across the potentiometer wire in set B

$$V = I \left(\frac{\rho_1 l}{2A_1} + \frac{\rho_2 l}{2A_2} \right)$$

$$V = \frac{I}{2} \left(\frac{\rho_1}{A_1} + \frac{\rho_2}{A_2} \right) l \quad (1/2)$$

$$K' = \frac{I}{2} \left(\frac{\rho_1}{A_1} + \frac{\rho_2}{A_2} \right), \text{ using the condition obtained in part (i)} \quad (1/2)$$

$$K' = I \frac{\rho_1}{A_1}, \text{ which is equal to } K.$$

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

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

Diagram (1/2)

Resonance condition (1)

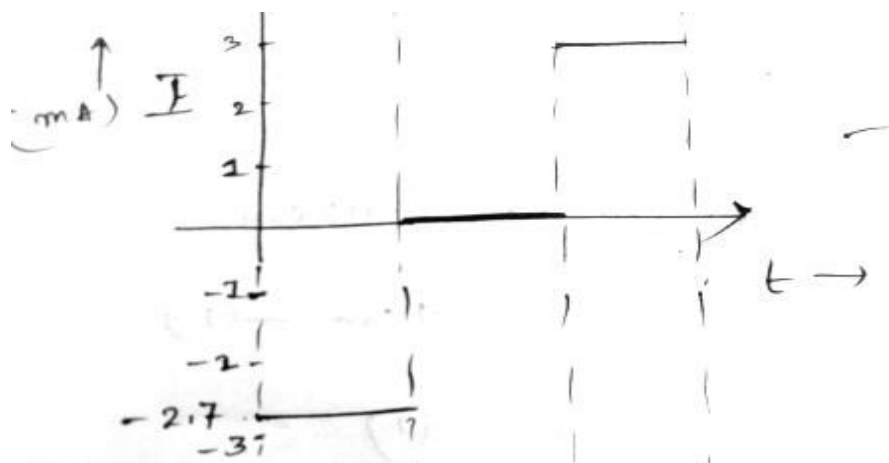
(ii) Particle will accelerate and decelerate alternately. However, the radius of the path will remain unchanged (1)

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

$$\epsilon = -0.023 \text{ V},$$

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

	$0 < t < 2\text{s}$	$2 < t < 4\text{s}$	$4 < t < 6\text{s}$
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)

$$16. \quad T_2P = D + x, \quad T_1P = D - x \quad (1/2)$$

$$S_1P = [(S_1T_1)^2 + (PT_1)^2]^{1/2} \quad (1/2)$$

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

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

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

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

$$17. \quad \frac{1}{f_e} = \frac{1}{v_e} - \frac{1}{u_e} \text{ solving } u_e = -4.2 \text{ cm} \quad (1)$$

$$\frac{1}{f_o} = \frac{1}{v_o} - \frac{1}{u_o}, \text{ solving } u_o = -1.1 \text{ cm} \quad (1)$$

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

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. $mv^2/r = e^2/4\pi\epsilon_0 r^2$
 $v^2 = e^2/m4\pi\epsilon_0 r$ (1/2)

Bohr's quantisation condition

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

$$\text{Solving, } v = e^2/2\epsilon_0 h, r = \epsilon_0 h^2/\pi m e^2 \quad (1/2)$$

Magnetic field at the centre

$$B = \mu_0 I/2r \quad (1/2)$$

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

$$B = \mu_0 e^7 \pi m^2 / 8 \epsilon_0^3 h^5 \quad (1/2)$$

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) $C_A = 4\pi\epsilon_0 R$, $C_B = 4\pi\epsilon_0(2R)$ (1/2)

$C_B > C_A$ (1/2)

(ii) $u = \frac{1}{2} \epsilon_0 E^2$ (1/2)

$E = \frac{\sigma}{\epsilon_0} = \frac{Q}{A\epsilon_0}$, $u \propto 1/A^2$

$\therefore u_A > u_B$ (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)

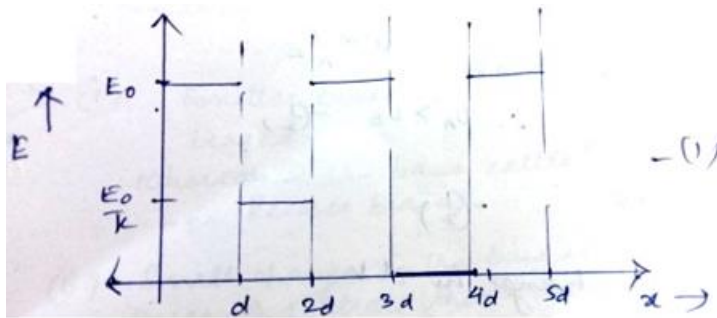
	Non-Polar (O ₂) –(1/2)	Polar (H ₂ O)- (1/2)
Absence of electric field (1)		
Individual	No dipole moment exists	Dipole moment exists
Specimen	No dipole moment exists	Dipoles are randomly oriented. Net P =0

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) $V = E_0 d + \frac{E_0}{k} d + E_0 d + 0 + E_0 d$ (1/2)

$V = 3 E_0 d + \frac{E_0}{k} d$ (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)

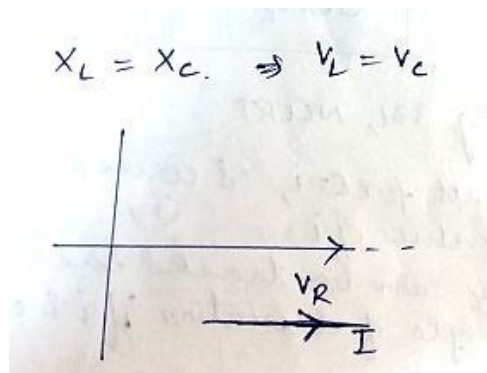
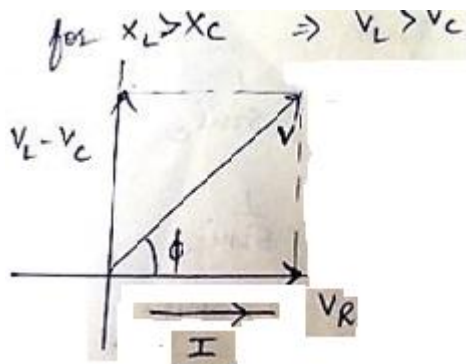
$$Z = [(X_L - X_C)^2 + R^2]^{1/2}, Z = R$$

(1/2)

Phasor diagrams

(1+1)

phase difference is ϕ



same phase

(c) Acceptor circuit: Series LCR circuit

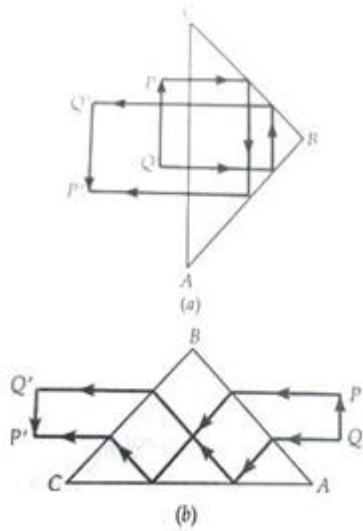
(1/2)

Radio tuning

(1/2)

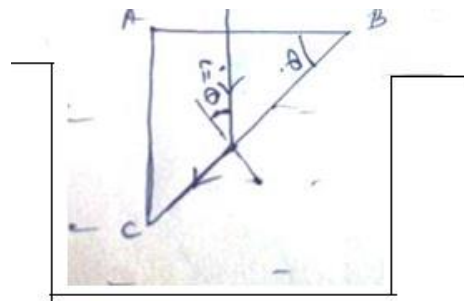
26. (a) To derive $\frac{\mu_2}{v} - \frac{\mu_1}{u} = \frac{\mu_2 - \mu_1}{R}$, (3)

(b) Diagram (2)



OR

26 (a) Diagram -



(1)

$$\mu_g/\mu_w = 1/\sin i_c$$

(1/2)

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

(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)

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

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

