INDIAN SCHOOL MUSCAT

SECOND PRE-BOARD EXAMINATION

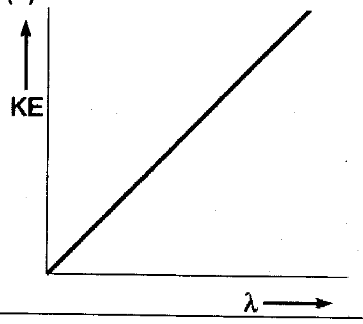
FEBRUARY 2020

SET A

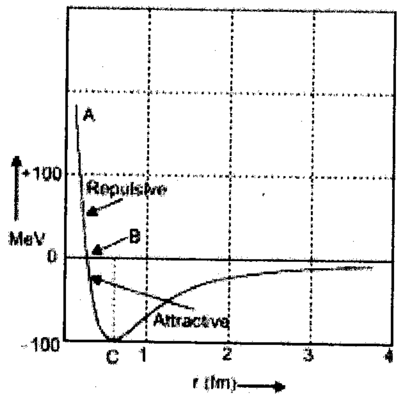
CLASS XII

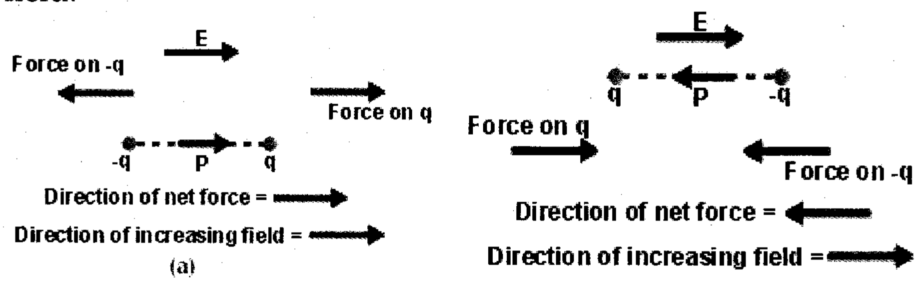
Marking Scheme-PHYSICS [THEORY]

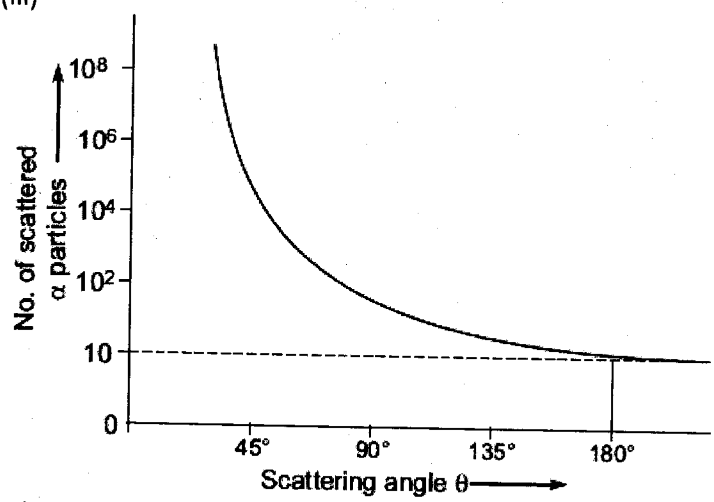
Q.NO.	Answers	Marks (with split up)
1.	(a) Decreases K times	1
2.	(d) four times	1
3.	(d) 9 ohm	1
4.	(b) 64W	1
5.	(d) torsional constant	1
6.	(c) four times	1
7.	(a) current and voltage are in phase	1
8.	b. The bulb glows dimmer	1
9.	a) 600Hz OR a. 7.14×10^{14}Hz	1
10.	b) holes	1
11.	zero	1
12.	Ampere-metre	1
13.	retentivity	1
14.	High retentivity, high coercivity, high permeability (any 2)	1
15.	7.5×10^{3}volt	1
16.	Convex mirror	1
17.	Spherical wavefront	1
18.	Photoelectric effect	1
19.	$R = R_0 A^{1/3}$	1
20.	100Hz OR (i) Width decreases (ii) width increases	1
21.	Deriving an expression for the magnetic field along the axis of a toroidal solenoid using Ampere's circuital law OR (i)Ratio of intensity of magnetization to the magnetizing field $\chi = (\mu_r - 1)$ (ii) 0.96 : **Diamagnetic** 500 : **Ferromagnetic**	1 1 ½ ½ ½ ½
22.	obtaining an expression for electric field intensity due to a uniformly charged spherical shell of radius	1+1

	R at a point (i) outside the shell and (ii) inside the shell.	
23.	(i) A thick copper strip offers negligible resistance so it does not alter the value of resistances used in the metre bridge. (ii) Manganin or constantan because of low temperature coefficient of resistivity.	1 1
24.	Cassegrain (reflecting type) telescope-labelled diagram	2
25.	Polarization by reflection-diagram Derivation of Brewster's law	½ 1½
26.	Obtaining the expression $r = \frac{\varepsilon_0 n^2 h^2}{\pi m e^2}$ OR Deriving $N = N_0 e^{-\lambda t}$	
27.	any two differences between an intrinsic semiconductor and a p-type semiconductor.	1+1
28.	$E = \frac{\lambda}{2\pi\varepsilon_0 r}$ ... (1) The revolving electron experience an electrostatic force and provides necessarily centripetal force. $eE = \frac{mv^2}{r}$ ... (2) $\frac{e.\lambda}{2\pi\varepsilon_0 r} = \frac{mv^2}{r}$ $\Rightarrow mv^2 = \frac{e\lambda}{2\pi\varepsilon_0}$ Kinetic energy of the electron $K = \frac{1}{2}mv^2 = \frac{e\lambda}{4\pi\varepsilon_0}$ (ii) 	½ ½ ½ ½ 1
29.	(i) Proving $T = \frac{2\pi m}{qB}$ The applied voltage is adjusted so that the polarity of dees is reversed in the same time that it takes the ion to complete one half of the revolution. (ii)	1 ½ ½

	ii) No, The mass of the two particles, i.e deuteron and proton, is different. Since (cyclotron) frequency depends inversely on the mass, they cannot be accelerated by the same oscillator frequency.	1
30.	$\epsilon = \frac{1}{2}\|B_l\| \cos \delta\, l^2 \omega$ $= \frac{1}{2} \times 0.4 \times 10^{-4} \cos 60^\circ \times (0.5)^2 \times 2\pi v$ $= \frac{1}{2} \times 0.4 \times 10^{-4} \times \frac{1}{2} \times (0.5)^2 \times 2\pi v \times \left(\frac{120 \text{ rev}}{60 \text{ sec}}\right)$ $= 10^{-5} \times 0.25 \times 2 \times 3.14 \times 2$ $= 3.14 \times 10^{-5}$ volt Emf induced is not dependent on the number of spokes. OR $R = \frac{V_R}{I_R} = 90/3 = 30\Omega$ $X_C = \frac{V_C}{I_C} = 120/3 = 40\Omega$ $impedance, z = \sqrt{R^2 + X_C{}^2} = \sqrt{30^2 + 40^2} = 50\Omega$ $X_L = X_C$ $as\ power\ \ factor = 1$ $2\pi \upsilon L = 40$ $100\pi L = 40$ $L = 2/5\pi\ Henry$	½ ½ ½ ½ 1 ½ ½ 1 ½ ½
31.	(i)If a charge particle oscillates with some frequency, produces an oscillating electric field in space, which produces an oscillating magnetic field, which inturn, is a source of electric field, and so on. Thus oscillating electric fields and magnetic fields regenerate each other, and an electromagnetic wave propagates in the space. (ii)In microwave oven, the frequency of the microwaves is selected to match the resonant frequency of water molecules so that energy from the waves get transferred efficiently to the kinetic energy of the molecules. This kinetic energy raises the temperature of any food containing water. (iii) Due to short wavelength, they have high penetrating power with respect to atmosphere and less diffraction in the atmospheric layers. So these waves are suitable for the radar systems used in aircraft navigation.	1 1 1

32.	**For lens L_1** $\frac{1}{f_1} = \frac{1}{v_1} - \frac{1}{u_1}$ $\frac{1}{20} = \frac{1}{v_1} - \frac{1}{-40} \Rightarrow v_1 = 40$ cm For lens L_3, $\frac{1}{f_3} = \frac{1}{v_3} - \frac{1}{u_3}$ $f_3 = +20$ cm, $v_3 = 20$ cm $\frac{1}{20} = \frac{1}{20} + \frac{1}{u_3}$ $u_3 = \infty$ It shows that L_2 must render the rays parallel to the common axis. It means that the image (I_1), formed by L_1, must be at a distance of 20 cm from L_2 (at the focus of L_2) Therefore, distance between L_1 and L_2 (= 40 + 20) = 60 cm distance between L, and L, can have any value.	1 1 ½ ½
33.	 The characteristic properties of nuclear force: i) The nuclear force is short range force. iii) The nuclear force is independent of electric charge.	1+1 ½ ½
34.	(i) Zener diode and solar cell (ii) Zener breakdown voltage (iii)Q-short circuit current, P-open circuit voltage	½+½ 1 ½+½
35.	(i) A suitable diagram showing An electric dipole is held in a uniform electric field proving that it does not undergo any translatory motion obtaining an expression for torque acting on it The direction of torque is perpendicular to the plane containing $\vec{p}$ and $\vec{E}$ given by right hand rule. (ii) If the field is not uniform, the net force will be non-zero in addition to torque.	½ 1 1 ½ 1

	(iii) If dipole is parallel to the direction of increasing field, as shown in figure there is a net force on electric dipole along the direction of increasing field. In same way if dipole is antiparallel, there is a net force on dipole in the direction opposite to the direction of increasing field.  OR (i) Obtaining the relation $\rho = \frac{m}{ne^2\tau}$ (ii) Length of conductor, cross sectional area, temperature and nature (any 2) (iii) They have a very high value of resistivity. Their value of resistivity does not change even for very high values of temperature.	1 3 1 1
	(i) Ray diagram (ii) Derivation (iii) Sign conventions used (iv) The focal length increases OR (i) Obtaining the conditions for constructive and destructive interference (ii) The fringe width decreases to ¾ times (iii) any 2 differences between interference and diffraction	1 2 1 1 3 1 ½ + ½
	(i) graph showing the variation of photoelectric current with intensity of light. (ii) Light consists of photons. When a photon inferacts with an electron it gives its entire energy to the electron and then exists no longer. Energy used to knock out the electron. (hv) is work function and rest energy is given to electron is kE. $\Rightarrow hv = \underbrace{\phi}_{\text{Work function}} + \underbrace{\frac{1}{2}mv^2}_{\text{kE of electron}}$ $h_v \rightarrow$ energy of photon. (i) Greater intensity has no effect on kE of an electron cannot be explained by wave theory.	1 2 ½ ½

	(ii) Wave theory also fails to explain the existence of threshold energy. (iii)(a) No (b) No	½ +½
	OR	
	i) According to Bohr's second postulate, we have $mvr_n = n\frac{h}{2\pi}$ $\Rightarrow 2\pi r_n = \frac{nh}{mv}$ But, as per De- broglie hypothesis $\frac{h}{mv} = \frac{h}{p} = \lambda$ Therefore, $2\pi r_n = n\lambda$; where is the de- broglie wavelength.	1 ½
	(ii) For third excited state, n = 4 For ground state, n = 1 Hence possible transitions are $n_i = 4$ to $n_f = 3, 2, 1$ $n_i = 3$ to $n_f = 2, 1$ $n_i = 2$ to $n_f = 1$ Total number of transitions = 6	1 ½
	(iii)  	1
	(iv) If impact parameter 'b' reduces to zero, coulomb force increases, and hence alpha particles are scattered at angle θ > 90°, and only one alpha particle is scattered at angle 180°.	1