DPP

DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 9

Topic :- Dual nature of radiation and matter

3 **(c)**

Potential difference $V = \frac{hc}{e\lambda}$

$= \frac{6.6 \times 10^{-34} \times 3 \times 10^{8}}{1.6 \times 10^{-19} \times 2 \times 10^{-10}}$

$= 6200 \text{ V}$

6 **(c)**

$E = \frac{hc}{\lambda} - W_0$ and $2E = \frac{hc}{\lambda'} - W_0$

$\Rightarrow \frac{\lambda'}{\lambda} = \frac{E + W_0}{2E + W_0} \Rightarrow \lambda' = \lambda\left(\frac{1 + W_0/E}{2 + W_0/E}\right)$

Since $\frac{(1 + W_0/E)}{(2 + W_0/E)} > \frac{1}{2}$ so $\lambda' > \frac{\lambda}{2}$

7 **(c)**

$mg = q\,E$ or $\frac{4}{3}\pi r^3\,\rho g = \frac{qV}{d}$ or $V \propto r^3$

$\therefore\ V_2 = V_1\left(\frac{r_2}{r_1}\right)^3 = 400 \times \left(\frac{2}{1}\right)^3 = 3200\text{V}$

8 **(a)**

$qvB = qE \Rightarrow v = \frac{E}{B}$

But $\frac{1}{2}mv^2 = qV$ so $\frac{q}{m} = \frac{v^2}{2V} = \frac{E^2}{2VB^2}$

9 **(c)**

When drop is stationary, then

$q_1 E = 6\pi\,\eta r\,v_0$ or $q_1 = 6\pi\,\eta r\,v_0/E$

When drop moves upwards, then

$3q = \frac{6\pi\,\eta r(v_0 + v_0)}{E} = 2 \times \left(\frac{6\pi\,\eta r v_0}{E}\right) = 2q_1$

$\therefore\ q_1 = \frac{3}{2}q$

10 **(b)**

According to Einstein's photoelectric equation the work function of metal is given by

$\therefore$ ϕ= hc/λ-KE_m

$$= \frac{6.6 \times 10^{-34} \times 3 \times 10^8}{4000 \times 10^{-10}} - 2eV$$

$$= 4.95 \times 10^{-19} - 2\ eV$$

$$= \frac{4.95 \times 10^{-19}}{1.6 \times 10^{-19}} - 2\ eV$$

= 3 eV-2 eV = 1 eV

11 **(b)**

$E_k = \frac{1}{2}\frac{q^2B^2r^2}{m}\ ie, r \propto \sqrt{E_k}$

So, $r_2 = r_1\sqrt{E_{k2}/E_{k1}} = R\sqrt{3} = \sqrt{3}\ R$

12 **(b)**

When the charged particle enters the magnetic field making angle other than 90^0 with it, the path is helix.

13 **(c)**

By Moseley's law, $\sqrt{v} = a(Z-b)$ or, $v = a^2(Z-b)^2$

Comparing with the equation of a parabola, $y^2 = 4ax$ it conforms to graph c

14 **(c)**

According to Einstein's photoelectric equation

15 **(c)**

According to the energy diagram of X-ray spectra

$\because \Delta E = \frac{hc}{\lambda} \Rightarrow \lambda \propto \frac{1}{\Delta E}$

($\Delta E =$ Energy radiated when e^- jumps from, higher energy orbit to lower energy orbit)

$\because (\Delta E)_{k_\beta} > (\Delta E)_{k_\alpha} > (\Delta E)_{L_\alpha}\ \therefore \lambda'_\alpha > \lambda_\alpha > \lambda_\beta$

Also $(\Delta E)_{k_\beta} = (\Delta E)_{k_\alpha} + (\Delta E)_{L_\alpha}$

$\Rightarrow \frac{hc}{\lambda_\beta} = \frac{hc}{\lambda_\alpha} + \frac{hc}{\lambda'_\alpha} \Rightarrow \frac{1}{\lambda_\beta} = \frac{1}{\lambda_\alpha} + \frac{1}{\lambda'_\alpha}$

16 **(c)**

$n \rightarrow 2 - 1$

$E = 10.2\ eV$

$kE = E - \phi$

$Q = 10.20 - 3.57$
$hv_0 = 6.63\ eV$

$$v_0 = \frac{6.63 \times 1.6 \times 10^{-19}}{6.67 \times 10^{-34}} = 1.6 \times 10^{15}$$

18 **(b)**

Minimum wavelength $= 5\text{Å}$

$$\lambda = \frac{12.2\ \text{Å}}{\sqrt{V}} = 5\text{Å}$$

Acceleration potential $= 6.25\ V$

19 **(c)**

$$\frac{1}{2}mv^2 = \frac{hc}{\lambda} - \phi \text{ (in eV)}$$

$$= \frac{6.6 \times 10^{-34} \times 3 \times 10^8}{4000 \times 10^{-10} \times 1.6 \times 10^{-19}} - 2$$

$$= 3.1 - 2 = 1.1 \text{ eV} = 1.1 \times 1.6 \times 10^{-19} \text{ J}$$

$$= 1.76 \times 10^{-19} \text{ J}$$

$$v = \frac{1.76 \times 10^{-19} \times 2}{9 \times 10^{-13}}$$

$$= 6.2 \times 10^5 \text{ ms}^{-1}$$

20 **(c)**

According to Mosley's law $v = a(Z - b)^2$ and $v \propto \frac{1}{\lambda}$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	A	C	C	D	C	C	A	C	B
Q.	11	12	13	14	15	16	17	18	19	20
A.	B	B	C	C	C	C	A	B	C	C