DPP

DAILY PRACTICE PROBLEMS

Class : XIIth
Date :

Solutions

Subject : PHYSICS
DPP No. : 2

Topic :- Dual nature of radiation and matter

1 **(a)**

$\delta p = \frac{\hbar}{\Delta x} = \frac{\hbar}{\lambda}$

2 **(b)**

Threshold wavelength for $Na, \lambda_{Na} = \frac{12375}{2} = 6187.5Å$

Also $\lambda_{Cu} = \frac{12375}{4} = 3093.75$

Since $\lambda_{Na} > 4000Å$; So Na is suitable

3 **(d)**

In photocell, at a particular negative potential (stopping potential V_0) of anode, photoelectric current is zero, as the potential difference between cathode and anode increases current through the circuit increases but after some time constant current (saturation current) flows through the circuit even if potential difference still increases

4 **(c)**

Energy of photon

$$E = \frac{hc}{\lambda} = \frac{6.63 \times 10^{-34} \times 3 \times 10^{8}}{590 \times 10^{-9}} = \frac{6.63 \times 3}{59} \times 10^{-18}$$

Light energy produced per second $= \frac{90}{100} \times 10 = 9W$

$\therefore$ Number of photons emitted per sec

$$= \frac{9 \times 59}{6.63 \times 3 \times 10} - 18 = 2.67 \times 10^{19}$$

5 **(b)**

$mvr = \frac{nh}{2\pi}$, according to Bohr's theory

$\Rightarrow \quad 2\pi r = n\left(\frac{h}{mv}\right) = n\lambda$ for n=2, $\lambda = \pi r$

7 **(b)**

$$\Delta p = m\Delta v = \frac{\hbar}{\Delta x}$$

or $\Delta v = \frac{\hbar}{m\Delta x} = \frac{1.034 \times 10^{-34}}{1.67 \times 10^{-27} \times 6 \times 10^{-8}}$

$\approx 1 \text{ms}^{-1}$

8 **(c)**

Momentum $p = \frac{E}{c} \Rightarrow E^2 = p^2c^2$

$= \frac{12375}{4100} = 3.01\ eV$

Work functions of metal A and B are less than $3.01eV$, so A and B will emit photo electrons

9 **(b)**

Energy of a photon, $E = \frac{hc}{\lambda}$

$\lambda_{\text{infrared}} > \lambda_{\text{red}} > \lambda_{\text{Blue}} > \lambda_{\text{Violet}}$

Therefore, violet has the highest energy

10 **(c)**

Higher the voltage, higher is the KE. Higher the work function, smaller is the KE

11 **(c)**

$$\frac{1}{2}mv^2 = eV$$

$$\frac{1}{2} \times 9 \times 10^{-31} \times v^2 = 1.6 \times 10^{-19} \times 182$$

$$v^2 = \frac{1.6 \times 10^{-19} \times 182 \times 2}{9.1 \times 10^{-31}}$$

$$v^2 = 64 \times 10^2 \text{ m/s}$$

$$v = 8 \times 10^6 \text{ m/}$$

14 **(b)**

$K = QV = e \times V = eV$

16 **(c)**

Work function $W_0 = h\nu_0 = 6.6 \times 10^{-34} \times 1.6 \times 10^{15}$

$= 1.056 \times 10^{-18} J = 6.6\ eV$

From $E = W_0 + K_{\max} \Rightarrow K_{\max} = E - W_0 = 1.4\ eV$

17 **(a)**

$$\lambda = \frac{h}{\sqrt{2mE}} = \frac{6.6 \times 10^{-34}}{\sqrt{2 \times 9.1 \times 10^{-31} \times 5 \times 1.6 \times 10^{-19}}}$$

$= 5.469 \times 10^{-10} m = 5.47\text{Å}$

18 **(a)**

$\because m_e < m_p < m_\alpha \Rightarrow \left(\frac{q}{m}\right)_e > \left(\frac{q}{m}\right)_p > \left(\frac{q}{m}\right)_\alpha$

19 **(d)**

$\because V_0 = \left(\frac{h}{e}\right)v - \left(\frac{W_0}{e}\right)$. From the graph $V_2 > V_1$

$\Rightarrow \frac{hv_2}{e} - \frac{W_0}{e} > \frac{hv_1}{e} - \frac{W_0}{e} \Rightarrow v_2 > v_1$

$\Rightarrow \lambda_1 > \lambda_2$ (as $\lambda \propto \frac{1}{v}$)

20 **(b)**

KE of fastest electron

$= E = \phi_0 = 6.2 - 4.2 = 2.0$ eV

$= 2 \times 1.6 \times 10^{-19} = 3.2 \times 10^{-19}$ J

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