DPP

DAILY PRACTICE PROBLEMS

**Class : XIIth**
**Date :**

**Solutions**

**Subject : PHYSICS**
**DPP No. : 6**

# Topic :- Dual nature of radiation and matter

1 **(a)**

According to Einstein, the energy of photon is given by

$$E = h\nu = \frac{hc}{\lambda}$$

Where $h$ is Planck's constant, $c$ the speed of light and $\lambda$ the wavelength.

$$\therefore \quad \frac{E_1}{E_2} = \frac{\lambda_2}{\lambda_1}$$

Given, $\lambda_1 = 150$ nm , $\lambda = 300$nm

$$\therefore \quad \frac{E_1}{E_2} = \frac{300}{150} = \frac{2}{1}$$

2 **(b)**

By using $h\nu - h\nu_0 = K_{\max}$

$\Rightarrow h(\nu_1 - \nu_0) = K_1$ ...(i)

And $h(\nu_2 - \nu_0) = K_2$ ...(ii)

$\Rightarrow \frac{\nu_1 - \nu_0}{\nu_2 - \nu_0} = \frac{K_1}{K_2} = \frac{1}{K}$, Hence $\nu_0 = \frac{K\nu_1 - \nu_2}{K - 1}$

4 **(c)**

Stopping potential $= 1.8eV - 1.2eV = 0.6\ eV$

5 **(a)**

The work function has no effect on current so long as $h\nu > W_0$. The photoelectric current is proportional to the intensity of light. Since there is no change in the intensity of light, therefore $I_1 = I_2$

6 **(b)**

The value of saturation current depends on intensity. It is independent of stopping potential

7 **(b)**

For similar parabola; $y^2 = \frac{B^2 l D}{E}\frac{q}{m}x$, will be same for two particles. It means $\frac{B^2 q}{m} =$ a constant for these two particles.

$\therefore \quad \frac{m_1}{m_2} = \frac{B_1^2 q_1}{B_2^2 q_2} = \left(\frac{0.8}{1.2}\right)^2 \times \frac{e}{2e} = \frac{2}{9}$

8 **(c)**

$E \propto \frac{1}{\lambda} \Rightarrow \frac{2.5}{E'} = \frac{1}{5000} \Rightarrow E' = (2.5) \times 5000\ eV$

9 **(d)**

According to Planck, energy emitted or absorbed from the objects is not continous while it is in small packets of energy which are called photons or quanta. Einstein explained photoelectric effect on the basic of Planck's hypothesis.

10 **(a)**

In tungsten, photoemission take place with a light of wavelength 2300 Å. As emission of electron is inversely proportional to wavelength, all the wavelengths smaller then 2300 Å will cause emission of electrons

11 **(c)**

When a charged particle (charge $q$, mass $m$) enters perpendicularly in a magnetic field ($B$) then, radius of the path described by it $r = \frac{mv}{qB} \Rightarrow mv = qBr$

Also de-Broglie wavelength $\lambda = \frac{h}{mv}$

$\Rightarrow \lambda = \frac{h}{qBr} \Rightarrow \frac{\lambda_\alpha}{\lambda_p} = \frac{q_p r_p}{q_\alpha r_\alpha} = \frac{1}{2}$

12 **(c)**

$\phi_0 = hc/\lambda_0$ (in eV)

$= \frac{6.62 \times 10^{-34} \times 3 \times 10^8}{5420 \times 10^{-10} \times 1.6 \times 10^{-19}} = 2.29$ e

13 **(c)**

Frequency of hard $X$-rays is greater than that of soft $X$-rays

14 **(b)**

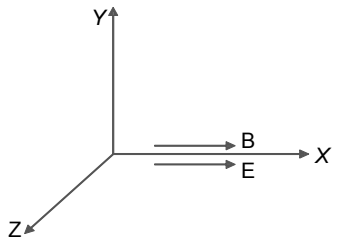
$\lambda = \frac{h}{\sqrt{2mE}} \Rightarrow \lambda \propto \frac{1}{\sqrt{m}} \quad [E = \text{same}]$

15 **(a)**

$\lambda_{\min} = \frac{12375}{40,000} = 0.30$ Å Hence wavelength less than 0.30 Å is not possible

17 **(b)**

Let **E** and **B** be along X-axis. When a charged particle is released from rest, it will experience an electric force along the direction of electric field or opposite to the direction of electric field depending on the nature of charge. Due to this force, it acquires some velocity along X-axis. Due to this motion of charge, magnetic force can not have non-zero value because angle between **v** and **B** would be either $0^0$ or $180^0$. So, only electric force is acting on particle and hence, it will move along a straight line.




18 **(a)**

According to Einstein's quantum theory, light propagates in the form of bundles (packet or quanta) of energy, each bundle is called a photon. The photoelectric effect represents that light has a particle nature.

20 **(c)**

When current in $X$-ray tube is increased, then the number of electrons striking the anticathode increases which in turn increases the intensity of $X$-rays

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