II MIDTERM TEST
KARUR DIST [25.11.24]
PHYSICS

I.

1. ஒற்றை பிளவினால் ஏற்படும் முதல் சிறுமம் அளவிலும் $n = 1$ $a = 1.0 \times 10^{-5}$ cm $= 1 \times 10^{-7}$ m

$$a \sin\theta = \lambda$$
$$1 \times 10^{-7} \times \frac{1}{2} = \lambda$$
$$0.5 \times 10^{-7} = \lambda$$
$$\boxed{500\ \text{Å} = \lambda}\ \text{(b)}$$

2. d) Polarisation (தளவிளைவு)

3. d) increased by 4 times

de Broglie wavelength $\lambda_1 = \frac{12.27}{\sqrt{V_1}}$ $V_1 = 224$ kV

$\lambda_2 = \frac{12.27}{\sqrt{V_2}}$ $V_2 = 14$ kV

$$\frac{\lambda_1}{\lambda_2} = \frac{\sqrt{V_2}}{\sqrt{V_1}}$$
$$\frac{\lambda_2}{\lambda_1} = \frac{\sqrt{V_1}}{\sqrt{V_2}} = \frac{\sqrt{224\ \text{kV}}}{\sqrt{14\ \text{kV}}} = 4$$
$$\boxed{\lambda_2 = 4\lambda_1}$$

4. $\phi_0 = \frac{hc}{\lambda_0}$ b) 3750 Å

$hc = 12400$ Å eV
$\phi_0 = 3.313$ eV

work function $\phi_0 = h\nu_0$

$$\lambda_0 = \frac{hc}{\phi_0} = \frac{12400\ \text{Å eV}}{3.313\ \text{eV}}$$
$$\boxed{\lambda_0 = 3750\ \text{Å}}$$

5. c) Thermionic

6. $r_n \propto n^2$ c) 1 : 4 : 9

7. $S.A = 4\pi R^2 = 4 \times \pi (R_0 A^{1/3})^2$

$$\boxed{S.A \propto A^{2/3}}$$

a) $A^{2/3}$

8. $n T_{1/2} = t$ b) $\frac{N_0}{\sqrt{2}}$

$t = \frac{T_{1/2}}{2}$

$n = \frac{T_{1/2}}{2 T_{1/2}}$

$\boxed{n = 1/2}$

$\frac{N}{N_0} = \left(\frac{1}{2}\right)^n$

$N = N_0 \left(\frac{1}{2}\right)^{1/2}$

$\boxed{N = \frac{N_0}{\sqrt{2}}}$

9) c) $-0.85 eV$

10) Energy $= \frac{hc}{\lambda}$ c) half the

$E' = \frac{hc}{2\lambda}$

$E' = \frac{1}{2}[E]$

11.

15. $V = 20000$

$\lambda_{min} = \frac{12400}{V} = 0.62 \text{ Å}$

$\lambda_{min} = \frac{12400}{20000} = \boxed{0.62 \text{ Å}}$

20. Energy released by the fission of a single $_{92}U^{235}$ nucleus $\times N$

= power.

Power = 1 J/s

N = No. of fission per second

E = 200 MeV

$200 MeV \cdot N = 1 \text{ J/s}$

$N = \frac{1}{200 \times 10^6 \times 1.6 \times 10^{-19}}$

$= \frac{1}{3.2} \times 10^{+11}$

$= 0.3125 \times 10^{11}$

$\boxed{N = 3.125 \times 10^{10} \text{ atoms}}$