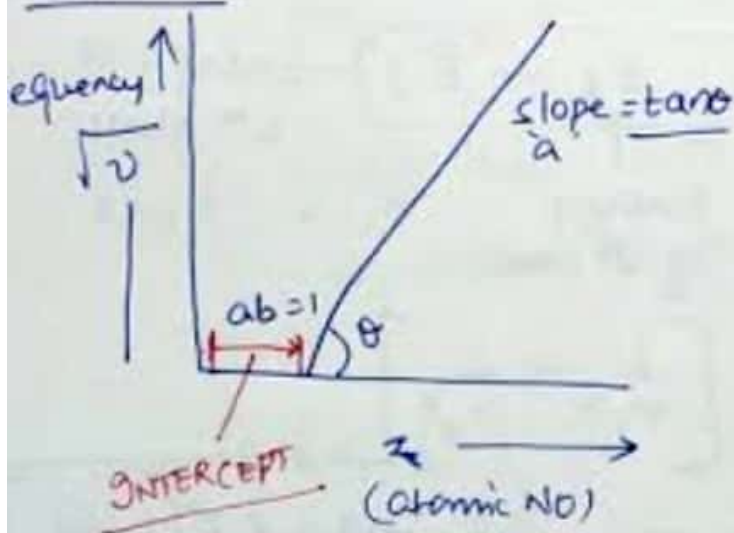


(Q) i) What is the nature of Moseley's graph if  $\sqrt{\nu}$  (square root frequency) is plotted against  $z$  atomic numbers on a-xis.

ii) When an element with atomic number ( $Z=50$ ) were exposed to cathode rays, then x-rays were obtained at  $45^\circ$ , having an intercept 1. Calculate the frequency of x-rays?

SOLUTION



According to Moseley's law

$$\sqrt{\nu}_{x\text{-rays}} \propto z$$

$$(a) \sqrt{\nu} = a(z-b)$$

$$\Rightarrow \sqrt{\nu} = az - ab$$

$$ab = 1 \text{ (Intercept)} \Rightarrow \text{given}$$

$$\text{slope 'a' = } \tan \theta \text{ (}\theta = 45^\circ\text{)}$$

$$\sqrt{\nu} = az - ab ; ab = 1$$

$$\therefore \sqrt{\nu} = az - 1 \Rightarrow \boxed{\sqrt{\nu}_{x\text{-rays}} = az}$$

$$\boxed{a = \tan \theta = \tan 45^\circ = 1}$$

$$z = \text{anode atomic number} = 1 ; z = 50$$

$$\therefore \sqrt{\nu} = az = (1 \times 50) - 1 = 49$$

Squaring both ends  $\Rightarrow (\sqrt{\nu})^2 = (49)^2 \Rightarrow \nu = 49 \times 49$

$$\therefore \nu_{x\text{-rays}} = 2401 \text{ sec}^{-1}$$