Answer on Question #46965-Physics-Atomic Physics

A certain metal when irradiated with light (frequency =3.2*10^16Hz) emits photoelectron with twice kinetic energy as did photoelectrons when the same metal is irradiated by light (frequency =2.0*10^16Hz). Calculate frequency of electron?

(1)1.2*10^14Hz

(2)8.0*10^15Hz

(3)1.2*10^16Hz

(4)4.0*10^12Hz

Solution

$$KE_1 = h(\nu_1 - \nu_0).$$

$$KE_2 = h(\nu_2 - \nu_0).$$

Thus

$$\frac{KE_1}{KE_2} = \frac{h(\nu_1 - \nu_0)}{h(\nu_2 - \nu_0)} = \frac{(\nu_1 - \nu_0)}{(\nu_2 - \nu_0)}.$$

But

$$\frac{KE_1}{KE_2} = 2 \rightarrow \frac{(\nu_1 - \nu_0)}{(\nu_2 - \nu_0)} = 2.$$

So

$$\nu_0 = 2\nu_2 - \nu_1 = 2 \cdot 2.0 \cdot 10^{16}\text{Hz} - 3.2 \cdot 10^{16}\text{Hz} = 8.0 \cdot 10^{15}\text{Hz}.$$

Answer: (2) $8.0 \cdot 10^{15}$Hz.