KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF PHYSICS
Term 032

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Physics 212 – Quiz #2
Chapter 2

Name: Key Id#:

1. A surface of zinc is illuminated and photoelectrons are observed. The work function of zinc is 4.31 eV and Planck's constant = 6.626×10^{-34} J.s

(a) What is the largest wavelength that will cause photoelectrons to be emitted from the surface of the metal?

(b) What is the stopping potential when light of wavelength 220 nm is used?

a) $eV_s = hf - \phi = \frac{hc}{\lambda} - \phi = 0 \Rightarrow \lambda = \frac{hc}{\phi} = \frac{1240\ eV.nm}{4.31\ eV}$

$\boxed{\lambda = 288\ nm}$

b) $eV_s = hf - \phi \Rightarrow V_s = \frac{hf}{e} - \frac{\phi}{e} = \frac{hc}{\lambda e} - \frac{\phi}{e}$

$V_s = \frac{1240\ eV.nm}{220nm \times e} - \frac{4.31\ eV}{e} = 5.64 - 4.31$

$\boxed{V_s = 1.33\ eV}$

2. X-rays of wavelength 0.02480 nm are incident on a target and the Compton-scattered photons are observed at 90°. What is the energy of the scattered photon? Compton's wavelength = 0.00243 nm.

$\lambda' - \lambda = \lambda_c (1 - \cos\theta)$

$\lambda' - 0.0248nm = 0.00243nm\,(1 - 0)$ because $[\cos 90^\circ = 0]$

$\lambda' = 0.02723\ nm$

$E_p' = \frac{hc}{\lambda'} = \frac{1240\ nmeV}{0.02723\ nm} = \boxed{45.5\ keV}$