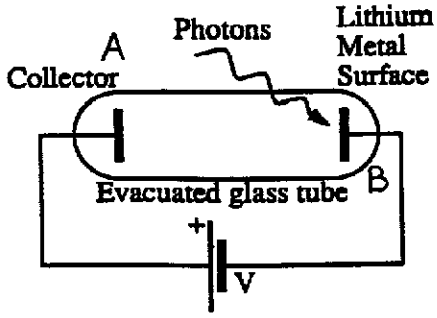
C3. The photoelectric effect is studied using the apparatus shown. Light of wavelength 450 nm is incident on the lithium surface which has a work function of 2.30 eV.

(a) Calculate the maximum kinetic energy of electrons emitted from the lithium surface (in eV).



0.460 eV

$hf = KE_{max} + W_o$

$\frac{hc}{\lambda} = KE_{max} + W_o$

$KE_{max} = \frac{hc}{\lambda} - W_o = \frac{(4.14 \times 10^{-15}\ eV \cdot s)(3.00 \times 10^{8}\ m/s)}{450 \times 10^{-9}\ m} - 2.30\ eV$

$KE_{max} =$ (0.46 eV)

(b) If the potential difference V is 1.00 V, calculate the maximum kinetic energy of the electrons that reach the collector plate.

1.46 eV

Let collector be A, metal surface B:

$KE_{max_A} + EPE_A = KE_{max_B} + EPE_B$

$KE_{max_A} = KE_{max_B} + EPE_B - EPE_A$

$KE_{max_A} = KE_{max_B} + q(V_B - V_A)$

$KE_{max_A} = KE_{max_B} + (-e)(V_B - V_A)$

$KE_{max_A} = 0.46\ eV - e(-1.00V) =$ (1.46 eV)