Q- The measurements of a photoelectric-effect experiment are graphed in in Figure P38.44, in which the intervals along the horizontal and vertical axes are respectively given by 5.9 × 10^{14} Hz and 2.50 V, respectively.

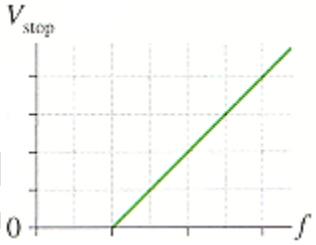
(a) What is the work function of the cathode?

If the stopping potential is zero means the electrons are having no kinetic energy and need not to be stopped. As the stopping potential graph starts from f = 2*5.9*10^{14} Hz before that the electron is not emitted or 2*5.9*10^{14} Hz is the threshold frequency f_0 and hence the work function is given by

$$\phi = hv_0 = 6.63 * 10^{-34} * 2 * 5.9 * 10^{14} = 7.82 * 10^{-19} J$$

Or $\phi = 4.89\ eV$

Hence the work function of the cathode is **4.89 eV**



(b) What experimental value of Planck's constant is obtained from these data?

The Einstein's equation can be written in terms of frequency f and stopping potential as

$$hf - \phi = eV_{stop}$$

Or $V_{stop} = \frac{hf}{e} - \frac{\phi}{e}$

The equation is of the form y = mx + c and h/e can be given as the slop of V_{stop}, f curve hence

h = e*slope of V_{stop}, f curve

or h = 1.6*10^{-19}*(4*2.5)/(4*5.9*10^{14}) = 6.78*10^{-34} J.s

Thus, the experimental value of planks constant is **6.78*10^{-34} J s**