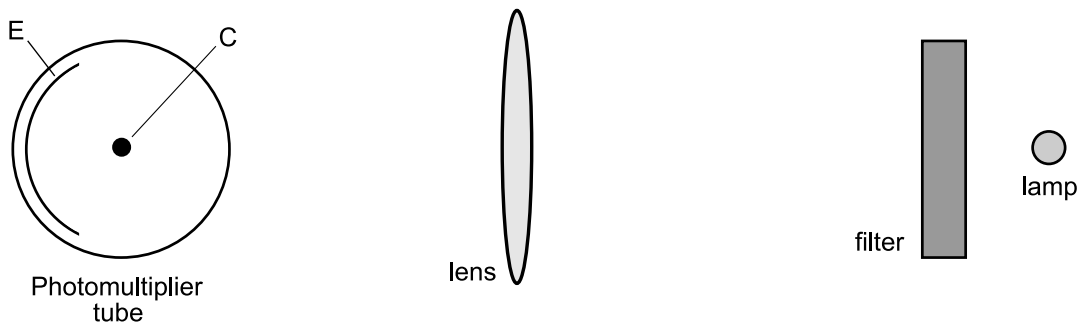
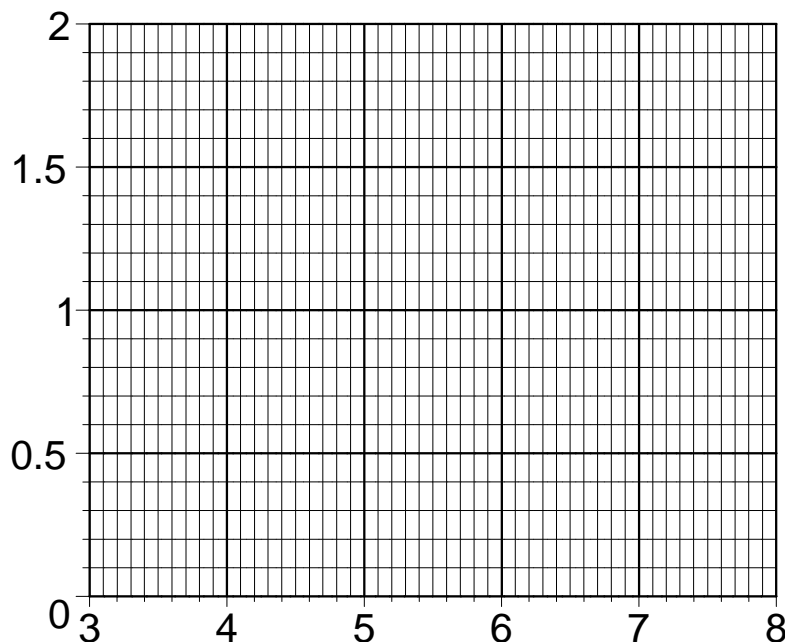


In this lab you will measure Planck's constant using the photoelectric effect. At one end of the apparatus is a mercury lamp. The housing around the lamp can be rotated, placing various filters in front of the lamp. A lens focuses the light on the emitter (E) of a photomultiplier tube. The photons in this light eject electrons from the emitter. Some of the electrons fall on the collector (C), charging it up and building a potential difference V between E and C. Eventually, V becomes so large that the collector repels *all* electrons ejected from the emitter. At this point, V reaches a steady-state value V_c such that eV_c is equal to the maximum possible kinetic energy K_{\max} of the electrons ejected from the emitter. From the textbook, we find that $K_{\max} = hf - \phi$, where f is the frequency of the light and ϕ is the work function of the emitter. If we plot K_{\max} as a function of f , we ought to obtain a straight line.



Put the light shield on the apparatus to prevent room light from striking the photomultiplier tube. Rotate the filter assembly to obtain the various wavelengths λ of light. For each wavelength, measure V_c using the high-impedance voltmeter provided. You must reset the voltmeter for each new V_c . Record the results below and plot the data on the graph (with K_{\max} on the y axis in eV and f on the x axis in units of 10^{14} Hz). Note: if $V_c = 1$ volt, then $K_{\max} = eV_c = 1\text{eV}$. Using a straight-edge, draw a straight line through the data points. From the x -intercept and slope of this line, find the work function ϕ (in eV) of the emitter and Planck's constant h . (Don't try to obtain the y -intercept directly from the graph.)



λ	f	K_{\max}

$\phi =$ _____ $h =$ _____