NAME_____

Year 11 Physics Assignment

Photons and Wave Behaviour of Particles

1.
   (a) Calculate the energy of a photon with a wavelength of 5.50×10^{-7} m.
   (b) If the work function of some metal "Metal A" is 1.00 eV, calculate the maximum energy of the electrons emitted when it is hit by photons of 5.50×10^{-7} m wavelength.
   Hint: Convert the work function into joules first.
   (c) Another imaginatively named metal, "Metal B", releases electrons with a maximum energy of 2.98×10^{-19} J. Calculate the work function of Metal B.
   (d) State whether Metal A or Metal B has the greater threshold frequency.

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2. In some photoelectric effect experiment, the voltage of electrons being emitted can be measured simply by attaching a variable voltage source in the opposite direction and an ammeter. The voltage source is increased until the current stops moving – at this point the two opposing voltages must be equal and hence we know the voltage of emitted electrons.

   State and explain the effect increasing the intensity of light during a photoelectric effect experiment will have on:
   (a) the 'stopping voltage' needed to reduce the current to zero,
   (b) the current flowing in the circuit due to electrons emitted.

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3. Calculate the de Broglie wavelength of an electron (mass 9.11×10^{-31} kg) travelling at a speed of 1.82×10^{6} ms^{-1}.

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4. Explain why electron microscopes are able to see so much greater detail than visible light microscopes. /2

TOTAL /16