

### 3.12 Photoelectric Effect

#### Worksheet

- 1) Which colour of light has the highest frequency: red or green?
- 2) Which colour of light has the longest wavelength: green or violet?
- 3) Hydrogen emits light with a wavelength of 410 nm. Find the frequency of this light
- 4) A radio station broadcasts at a frequency of 1310 kHz. What is the wavelength of this radio signal in nm?
- 5) Find the frequency of infrared light that has a wavelength of 770 nm.
- 6) A radio station broadcasts at a frequency of 106.9 kHz. What is the wavelength of this radio signal in nm?
- 7) Use two analogies to describe quantized change.
- 8) Use two analogies to describe continuous change.
- 9) Can prolonged exposure to highly intense infrared light cause electrons to be ejected from a clean metal surface? Explain.
- 10) Explain how Einstein was able to use experimental evidence related to the photoelectric effect to conclude that quantized energy must be contained by individual particles.
- 11) What is the difference between a continuous spectrum and an atomic emission spectrum?
- 12) Explain why every element has a distinct atomic emission spectrum.
- 13) An electron is promoted from the  $n=2$  to the  $n=3$  energy level in a hydrogen atom. Does the electron release or absorb energy during this transition?
- 14) Hydrogen atoms can absorb and emit photons containing  $4.8 \times 10^{-19}$  J of energy.
  - a. If a hydrogen atom absorbs a photon containing  $4.8 \times 10^{-19}$  J of energy, what component of the atom experienced an increase in energy?
  - b. What can be said about the difference in energy between two of the sublevels in a hydrogen atom. Justify your answer.
  - c. If a hydrogen atom emits a photon containing  $4.8 \times 10^{-19}$  J of energy, what component of the atom experienced a decrease in energy?