

Quantum physics

| Specification reference | Checklist questions | |
|-------------------------|--|--------------------------|
| 4.5.1 a | Can you explain the particulate nature (photon model) of electromagnetic radiation? | <input type="checkbox"/> |
| 4.5.1 b | Can you define a photon as a quantum of energy of electromagnetic radiation? | <input type="checkbox"/> |
| 4.5.1 c | Can you describe and calculate the energy of a photon using $E = hf$ and $E = \frac{hc}{\lambda}$? | <input type="checkbox"/> |
| 4.5.1 d | Can you define the electronvolt (eV) as a unit of energy? | <input type="checkbox"/> |
| 4.5.1 e i | Can you use LEDs and the equation $eV = \frac{hc}{\lambda}$ to estimate the value of the Planck constant h ? | <input type="checkbox"/> |
| 4.5.1 e ii | Can you determine the Planck constant using different coloured LEDs? | <input type="checkbox"/> |
| 4.5.2 a i | Can you explain the photoelectric effect, including a simple experiment to demonstrate this effect? | <input type="checkbox"/> |
| 4.5.2 a ii | Can you demonstrate the photoelectric effect using, for example, a gold-leaf electroscope and zinc plate? | <input type="checkbox"/> |
| 4.5.2 b | Can you describe the one-to-one interaction between a photon and a surface electron? | <input type="checkbox"/> |
| 4.5.2 c | Can you explain Einstein's photoelectric equation $hf = \phi + KE_{\max}$? | <input type="checkbox"/> |
| 4.5.2 d | Can you define work function and threshold frequency? | <input type="checkbox"/> |

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| 4.5.2 e | Can you explain the idea that the maximum kinetic energy of the photoelectrons is independent of the intensity of the incident radiation? | <input type="checkbox"/> |
| 4.5.2 f | Can you explain the idea that a rate of emission of photoelectrons above the threshold frequency is directly proportional to the intensity of the incident radiation? | <input type="checkbox"/> |
| 4.5.3 a | Can you explain electron diffraction, including experimental evidence of this effect? | <input type="checkbox"/> |
| 4.5.3 b | Can you describe diffraction of electrons travelling through a thin slice of polycrystalline graphite? | <input type="checkbox"/> |
| 4.5.3 c | Can you use the de Broglie equation $\lambda = \frac{h}{p}$? | <input type="checkbox"/> |