PHYA1 3.1.2 EM radiation & quantum phenomena

AS Physics:

what you need to know

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| **The photoelectric effect** | I can do this already | Covered in class | Strength | Weakness | I have  revised this | Book references |
| I can describe an experiment to demonstrate the **photoelectric effect**. |  |  |  |  |  | AQA: 30;  APfY: 166 |
| I understand that the photoelectric effect provides evidence for the **particle-nature of light** (electromagnetic radiation). |  |  |  |  |  | AQA: 31;  APfY: 166 |
| I understand that a **photon** is a quantum (‘particle’) of electromagnetic energy. |  |  |  |  |  | AQA: 8 & 31;  APfY: 166 |
| I can calculate the **energy of a photon** using or , where ***h*** is the **Planck constant**. |  |  |  |  |  | AQA: 31;  APfY: 167 |
| I can explain the meaning of the term ‘**work function**’ (φ). |  |  |  |  |  | AQA: 31;  APfY: 168 |
| I can explain the meaning of the term ‘**threshold frequency**’ (f**0**). |  |  |  |  |  | AQA: 30; APfY: 168 |
| I can recall and use **Einstein’s photoelectric equation** (**hf = φ +** ). |  |  |  |  |  | AQA: 31  APfY: 169 |

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| **Collisions of electrons with atoms** | | | | | | |
| I can explain the meaning of the term ‘**electronvolt**’ (eV). |  |  |  |  |  | AQA: 35;  APfY: 165 |
| I can explain the meaning of the term ‘**ionisation**’. |  |  |  |  |  | AQA: 34;  APfY: 180 |
| I can explain the meaning of the term ‘**excitation**’. |  |  |  |  |  | AQA: 35; |
| I can use the terms ionisation and excitation to explain how a **fluorescent tube** works. |  |  |  |  |  | AQA: 37; APfY: 339 & 340 |

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| **Energy levels and photon emission** | | | | | | |
| I can describe three types of spectra. |  |  |  |  |  | AQA: 39;  APfY: 178 & 182 |
| I can explain the meaning of the term ‘**line spectrum**’. |  |  |  |  |  | AQA: 39;  APfY: 178 |
| I can explain what line spectra tell us about the structure of atoms. |  |  |  |  |  | AQA: 36 & 39;  APfY: 180 & 181 |
| I can use the equation **hf = E1 – E2** to calculate the energy of photons emitted or absorbed by a particular atom. |  |  |  |  |  | AQA: 39; APfY: 181 |

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| **Wave-particle duality** | | | | | | |
| I can describe experimental evidence for the **wave-nature of particles** (and compare this with the photoelectric effect). |  |  |  |  |  | AQA: 41 & 42;  APfY: 170 |
| I can calculate the **de Broglie wavelength** of a particle using , where mv is the momentum of the particle. |  |  |  |  |  | AQA: 42;  APfY: 171 |

**Book references:** AQA = ***AQA Physics A*** by Breithaupt (Pub. Nelson Thornes) – the AQA endorsed textbook

APfY =***Advanced physics*** *for you* by Johnson, Hewett, Holt and Miller (Pub. Nelson Thornes)