



AS Level Physics

Chapter 2 – Particles and radiation

2.1.2 Photons

Worked Examples

Photons

Exam Style Question 1

(a) In atomic physics electron energies are often stated in electronvolts (eV)

Define the electronvolt. State its value in joule.

(b) An electron is accelerated from rest through a potential difference of 300 V.

(i) Calculate the final kinetic energy of the electron

1) in eV

2) in J.

(ii) Show that the final speed of the electron is about $1 \times 10^7 \text{ m s}^{-1}$.

Photons

Exam Style Question 1

(a) Define the electronvolt. State its value in joule.

An eV is the energy acquired by an electron accelerated through a p.d. of 1 V.

$$1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$$

(b) An electron is accelerated from rest through a potential difference of 300 V.

(i) Calculate the final kinetic energy of the electron

1) in eV

300 eV

2) in J.

$$300 \text{ eV} \times 1.6 \times 10^{-19} \text{ J} = 4.8 \times 10^{-17} \text{ J}$$

(ii) Show that the final speed of the electron is about $1 \times 10^7 \text{ m s}^{-1}$.

Use $KE = \frac{1}{2}mv^2$

$$\begin{aligned} 4.8 \times 10^{-17} \text{ J} &= \frac{1}{2}(9.1 \times 10^{-31} \text{ kg})v^2 \\ 4.8 \times 10^{-17} \text{ J} \times 2 &= (9.1 \times 10^{-31} \text{ kg})v^2 \\ 9.6 \times 10^{-17} &= (9.1 \times 10^{-31})v^2 \\ v &= \sqrt{\frac{9.6 \times 10^{-17}}{9.1 \times 10^{-31}}} = 1.03 \times 10^7 \text{ m s}^{-1} \end{aligned}$$



Photons

Exam Style Question 3

When a photon of sunlight is incident on a photovoltaic cell, an electron in the cell gains sufficient energy to move through a potential difference of 0.48 V .

(a) What is a photon?

Photons

Exam Style Question 3

(a) **What is a photon?**

A photon is a discrete packet of energy.

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Please see **'2.1.1 Photons notes'** pack for
revision notes.

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examples please visit www.tutorpacks.co.uk.

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