FREE REVISION PACK

Wave–Particle Duality

Pearson Edexcel International Advanced Level Physics · Unit 2 (WPH12) · Specification points 53–54

Easy | Multiple choice · past-paper questions

5	5	≈ 10 min
QUESTIONS	TOTAL MARKS	SUGGESTED TIME*

Contents

Q	LEVEL	FOCUS	SOURCE	MARKS
1	Easy	Electron speed from its de Broglie wavelength	Edexcel IAL January 2024 · Unit 2 · Q3	1 mark
2	Easy	Evidence that electrons behave as waves	Edexcel IAL June 2024 · Unit 2 · Q4	1 mark
3	Easy	Speed from de Broglie wavelength	Edexcel IAL January 2022 · Unit 2 · Q2	1 mark
4	Easy	de Broglie wavelength of an electron	Edexcel IAL October 2025 · Unit 2 · Q4	1 mark
5	Easy	Particle with a quarter of the wavelength	Edexcel IAL October 2024 · Unit 2 · Q7	1 mark

Key ideas to have ready

- de Broglie: $\lambda = h/p = h/(mv)$.
- Electron diffraction (e.g. through graphite) is evidence that electrons behave as waves.
- Larger momentum → shorter wavelength.
- Use the right mass: electron 9.11×10^{-31} kg, proton 1.67×10^{-27} kg.

How to use this pack

1. The questions are grouped into levels (Easy). Work through them in order, and check your answers at the end of each level before moving on.
2. Every question is multiple choice with one correct answer. Write down your working anyway; that is how you find mistakes.
3. The separate mark scheme uses the same numbers and explains every answer.

Levels are based on how students did in Pearson's examiner reports where that information exists, plus our own difficulty rating. *About 1.5 minutes per question.

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Easy

Definitions and one-step ideas. Most students get these right.

Questions 1–5

Choose **one** answer for each question and put a cross in the box next to it.

Edexcel IAL January 2024 · Unit 2 · Q3

1 An electron has a de Broglie wavelength of 3.5×10^{-10} m.

Which of the following expressions gives the velocity of the electron in $\mathrm{m\,s^{-1}}$?

☒ **A** $\dfrac{6.63 \times 10^{-34}}{9.11 \times 10^{-31} \times 3.5 \times 10^{-10}}$

☒ **B** $\dfrac{6.63 \times 10^{-34}}{3.5 \times 10^{-10}}$

☒ **C** $\dfrac{9.11 \times 10^{-31} \times 3.5 \times 10^{-10}}{6.63 \times 10^{-34}}$

☒ **D** $\dfrac{3.5 \times 10^{-10}}{6.63 \times 10^{-34}}$

Edexcel IAL June 2024 · Unit 2 · Q4

2 Which of the following is evidence that electrons can behave like waves?

☒ **A** Electrons are attracted towards positively charged objects.

☒ **B** Electrons can absorb photons and move between energy levels in an atom.

☒ **C** Electrons can be diffracted when passing through a thin sheet of graphite.

☒ **D** Electrons can be released by photons in the photoelectric effect.

Edexcel IAL January 2022 · Unit 2 · Q2

3 The de Broglie wavelength for a moving electron is 5.47×10^{-10} m.

Which of the following expressions gives the speed of the electron in $\mathrm{m\,s^{-1}}$?

☒ **A** $\dfrac{(6.63 \times 10^{-34})}{(9.11 \times 10^{-31})(5.47 \times 10^{-10})}$

☒ **B** $\dfrac{(6.63 \times 10^{-34})}{(1.60 \times 10^{-19})(5.47 \times 10^{-10})}$

☒ **C** $\dfrac{(9.11 \times 10^{-31})(5.47 \times 10^{-10})}{(6.63 \times 10^{-34})}$

☒ **D** $\dfrac{(1.60 \times 10^{-19})(5.47 \times 10^{-10})}{(6.63 \times 10^{-34})}$

Edexcel IAL October 2025 · Unit 2 · Q4

4 An electron has a velocity of $2 \times 10^{7}\,\text{m s}^{-1}$.

Which of the following expressions gives the de Broglie wavelength of the electron in metres?

☒ **A** $\dfrac{6.63 \times 10^{-34}}{1.67 \times 10^{-27} \times 2 \times 10^{7}}$

☒ **B** $\dfrac{6.63 \times 10^{-34}}{9.11 \times 10^{-31} \times 2 \times 10^{7}}$

☒ **C** $\dfrac{9.11 \times 10^{-31} \times 2 \times 10^{7}}{6.63 \times 10^{-34}}$

☒ **D** $\dfrac{1.67 \times 10^{-27} \times 2 \times 10^{7}}{6.63 \times 10^{-34}}$

Edexcel IAL October 2024 · Unit 2 · Q7

5 Particle X of mass m is moving with velocity v and has a de Broglie wavelength λ.

Particle Y has a de Broglie wavelength 0.25λ.

Which row of the table could give the mass and velocity of particle Y?

	Mass	Velocity
☒ **A**	$0.25m$	v
☒ **B**	$0.5m$	$8v$
☒ **C**	m	$2v$
☒ **D**	$2m$	$4v$

End of questions. Check your answers with the matching mark scheme. More free packs and 1-to-1 tuition: **www.getbetteratphysics.co.uk**