FREE REVISION PACK

High-Energy Particles

Pearson Edexcel International Advanced Level Physics · Unit 4 (WPH14) · Specification points 116–120

Easy | Multiple choice · past-paper questions

5	5	≈ 10 min
QUESTIONS	TOTAL MARKS	SUGGESTED TIME*

Contents

Q	LEVEL	FOCUS	SOURCE	MARKS
1	Easy	Why electrons can probe nuclei	Edexcel IAL June 2022 · Unit 4 · Q6	1 mark
2	Easy	Why high-energy electrons probe nucleons	Edexcel IAL January 2024 · Unit 4 · Q4	1 mark
3	Easy	Why fast muons live longer	Edexcel IAL June 2025 · Unit 4 · Q4	1 mark
4	Easy	Why electrons can probe nuclei: the odd one out	Edexcel IAL October 2021 · Unit 4 · Q8	1 mark
5	Easy	Relativistic effects on a fast muon	Edexcel IAL June 2022 · Unit 4 · Q7	1 mark

Key ideas to have ready

- $\Delta E = c^2 \Delta m$; 1 eV = 1.60×10^{-19} J; mass in MeV/c^2 or GeV/c^2.
- High-energy electrons have short de Broglie wavelengths, so they can probe nucleons.
- Near the speed of light, lifetimes are longer (time dilation) and masses larger.
- Convert: m (kg) = E (J)/c^2.

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 June 2022 · Unit 4 · Q6

1 Electrons can be used to probe the nuclei of atoms.

Which of the following best explains this?

- ☒ **A** Electrons can be accelerated to very high energies.
- ☒ **B** Electrons can be deflected by a magnetic field.
- ☒ **C** Electrons can be part of an atom.
- ☒ **D** Electrons can be released by thermionic emission.

Edexcel IAL January 2024 · Unit 4 · Q4

2 The structure of nucleons can be investigated using high energy electrons.

Which of the following is the reason high energies are needed?

- ☒ **A** to cause annihilation
- ☒ **B** to produce individual quarks
- ☒ **C** to produce short de Broglie wavelengths
- ☒ **D** to overcome the repulsive electrostatic forces

Edexcel IAL June 2025 · Unit 4 · Q4

3 In the upper atmosphere, high-energy cosmic rays collide with molecules of air to produce muons. The average speed of these muons is v.

The average lifetime of these muons is greater than the average lifetime of stationary muons.

Which of the following gives the reason for this increase in average lifetime?

- ☒ **A** $v > c$
- ☒ **B** $v = c$
- ☒ **C** $v \approx c$
- ☒ **D** $v \ll c$

Edexcel IAL October 2021 · Unit 4 · Q8

4 Which of the following statements does **not** help to explain why electrons can be used to probe the nuclei of atoms?

- ☒ **A** Electrons can be accelerated to high energies.
- ☒ **B** Electrons can be part of an atom.
- ☒ **C** Electrons can exhibit diffraction effects.
- ☒ **D** Electrons can have wavelengths similar in size to nuclear diameters.

Edexcel IAL June 2022 · Unit 4 · Q7

5 Muons can travel at speeds close to the speed of light. At these speeds the lifetime and mass of a muon are different from those of a stationary muon.

Which row of the table describes the lifetime and the mass of a high-speed muon compared to a stationary muon?

		Lifetime	Mass
☒	**A**	shorter	smaller
☒	**B**	shorter	larger
☒	**C**	longer	smaller
☒	**D**	longer	larger

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