GET BETTER AT PHYSICS · MARK SCHEME

High-Energy Particles: tiered multiple choice

Edexcel IAL Physics · Unit 4 (WPH14) · Specification points 116–120 · 5 questions · 5 marks

1 mark per correct letter | Worked reasoning for every question

How students did = from Pearson examiner reports, where available

Answer key

Q1	Q2	Q3	Q4	Q5
A	C	C	B	D

Easy

Questions 1–5

1 **A**

Why electrons can probe nuclei · Edexcel IAL June 2022 · Unit 4 · Q6

Electrons can be accelerated to very high energies, giving them very short de Broglie wavelengths, comparable to or smaller than the size of a nucleus. That is what allows them to reveal nuclear structure.

How students did: 63% of students got this right in June 2022.

2 **C**

Why high-energy electrons probe nucleons · Edexcel IAL January 2024 · Unit 4 · Q4

To resolve detail inside a nucleon, the electrons' de Broglie wavelength must be smaller than about 10^{-15} m. $\lambda = h/p$, so a very short wavelength needs a very large momentum, and therefore a very high energy.

How students did: 61% of students got this right in January 2024.

3 **C**

Why fast muons live longer · Edexcel IAL June 2025 · Unit 4 · Q4

Relativistic time dilation is only significant when a particle moves at a speed close to the speed of light. So the muons' increased lifetime shows $v \approx c$. Nothing with mass can travel at or above c.

4 **B**

Why electrons can probe nuclei: the odd one out · Edexcel IAL October 2021 · Unit 4 · Q8

High energies give electrons short de Broglie wavelengths, comparable to nuclear diameters, so they diffract from nuclei (A, C and D all help explain this). That electrons can be part of an atom is true but irrelevant to using them as probes.

How students did: 59% of students got this right in October 2021.

5 **D**

Relativistic effects on a fast muon · Edexcel IAL June 2022 · Unit 4 · Q7

At speeds close to c, relativistic effects mean a moving muon's lifetime, measured by us, is longer (time dilation), and its mass is larger than its rest mass.

How students did: 50% of students got this right in June 2022.

End of mark scheme. Answers from Pearson's published mark schemes; explanations written for this pack. Pearson Edexcel material is © Pearson Education Ltd. More free packs and 1-to-1 tuition: **www.getbetteratphysics.co.uk**

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