GET BETTER AT PHYSICS · MARK SCHEME

Particle Equations & Conservation Laws: tiered multiple choice

Edexcel IAL Physics · Unit 4 (WPH14) · Specification points 116, 123–124 · 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
D	C	D	D	D

Easy

Questions 1–5

1 **D**

Conclusions from particle tracks · Edexcel IAL October 2023 · Unit 4 · Q6

The two tracks curve in opposite directions in the same magnetic field, so X and Y must have opposite charges. Without knowing the field direction, you cannot tell which one is positive, or the direction of the field.

How students did: 86% of students got this right in October 2023.

2 **C**

Equation for neutron decay · Edexcel IAL January 2020 · Unit 4 · Q1

In β^- decay a neutron becomes a proton, an electron and an electron antineutrino: $n \rightarrow p + e^- + \bar{\nu}_e$. Charge: $0 = +1 - 1 + 0$. Lepton number: $0 = 0 + 1 - 1$.

How students did: 73% of students got this right in January 2020.

3 **D**

Products of proton–antiproton annihilation · Edexcel IAL June 2022 · Unit 4 · Q2

Before: charge 0 and baryon number 0 $(+1 - 1)$. $\pi^+ + \pi^-$ has charge 0 and baryon number 0 (pions are mesons), so it is possible. The other options fail charge, baryon number or lepton number.

How students did: 64% of students got this right in June 2022.

4 **D**

Which conservation law is broken · Edexcel IAL October 2020 · Unit 4 · Q2

$n \rightarrow p + e^- + \nu_e$. Lepton number: left side 0; right side $0 + 1 + 1 = 2$, so lepton number is not conserved. Charge $(0 = +1 - 1)$ and baryon number $(1 = 1)$ are fine. The correct particle is an antineutrino, $\bar{\nu}_e$.

How students did: 57% of students got this right in October 2020.

5 **D**

Which pion decay conserves everything · Edexcel IAL January 2024 · Unit 4 · Q6

Check charge and lepton number. $\pi^+ \rightarrow e^+ + \nu_e$: charge $+1 = +1 + 0$; lepton number $0 = -1 + 1$. Both are conserved. A fails lepton number, and B and C fail charge or lepton number.

How students did: 56% of students got this right in January 2024.

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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