FREE REVISION PACK

Antiparticles, Pair Production & Annihilation

Pearson Edexcel International Advanced Level Physics · Unit 4 (WPH14) · Specification points 122

Easy | Medium | Multiple choice · past-paper questions

5	5	≈ 10 min
QUESTIONS	TOTAL MARKS	SUGGESTED TIME*

Contents

Q	LEVEL	FOCUS	SOURCE	MARKS
1	Easy	Maximum mass from pair production	Edexcel IAL January 2020 · Unit 4 · Q6	1 mark
2	Easy	Mass and charge of an anti-proton	Edexcel IAL October 2022 · Unit 4 · Q1	1 mark
3	Easy	Charge and mass of an antiproton	Edexcel IAL January 2022 · Unit 4 · Q2	1 mark
4	Easy	Comparing an electron and a positron	Edexcel IAL January 2025 · Unit 4 · Q4	1 mark
5	Medium	Maximum mass of a pair created by annihilation	Edexcel IAL October 2024 · Unit 4 · Q10	1 mark

Key ideas to have ready

- An antiparticle has the same mass but opposite charge and opposite quantum numbers.
- Pair production: a photon's energy creates a particle–antiparticle pair (shared equally).
- Annihilation: particle + antiparticle → energy (photons or a new pair).
- Mass is never negative.

How to use this pack

1. The questions are grouped into levels (Easy and Medium). 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 1–4

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

Edexcel IAL January 2020 · Unit 4 · Q6

1 A gamma photon of energy 18 MeV produces a particle and its antiparticle.

Which of the following will give the maximum possible mass of the particle in kg?

☒ **A** $\frac{9 \times 1.6 \times 10^{-19}}{3 \times 10^{8}}$

☒ **B** $\frac{9 \times 10^{6} \times 1.6 \times 10^{-19}}{3 \times 10^{8}}$

☒ **C** $\frac{9 \times 1.6 \times 10^{-19}}{(3 \times 10^{8})^{2}}$

☒ **D** $\frac{9 \times 10^{6} \times 1.6 \times 10^{-19}}{(3 \times 10^{8})^{2}}$

Edexcel IAL October 2022 · Unit 4 · Q1

2 Which row of the table describes the mass and charge of an anti-proton?

	Mass / kg	Charge / C
☒ **A**	1.67×10^{-27}	1.6×10^{-19}
☒ **B**	1.67×10^{-27}	-1.6×10^{-19}
☒ **C**	-1.67×10^{-27}	1.6×10^{-19}
☒ **D**	-1.67×10^{-27}	-1.6×10^{-19}

Edexcel IAL January 2022 · Unit 4 · Q2

3 Which row in the table gives the charge and mass of an antiproton?

	Charge / C	Mass / kg
☒ **A**	1.6×10^{-19}	-9.11×10^{-31}
☒ **B**	-1.6×10^{-19}	9.11×10^{-31}
☒ **C**	1.6×10^{-19}	-1.67×10^{-27}
☒ **D**	-1.6×10^{-19}	1.67×10^{-27}

Edexcel IAL January 2025 · Unit 4 · Q4

4 The positron is the antiparticle of the electron.

Which row of the table gives a similarity and a difference between a positron and an electron?

	Similarity	Difference
☒ **A**	same lepton number	different baryon number
☒ **B**	same lepton number	different charge
☒ **C**	same mass	different baryon number
☒ **D**	same mass	different lepton number

Medium Two or three steps. Roughly a third to a half of students get these right. **Question 5**

Edexcel IAL October 2024 · Unit 4 · Q10

5 A proton and an anti-proton travel in opposite directions towards each other.

Each particle has energy of 450 GeV.

When the particles collide, they annihilate and create a particle-antiparticle pair.

Which of the following expressions gives the maximum mass, in kg, of the antiparticle produced?

☒ **A** $\frac{450 \times 10^{6} \times 1.6 \times 10^{-19}}{2 \times (3.00 \times 10^{8})^{2}}$

☒ **B** $\frac{450 \times 10^{6} \times 1.6 \times 10^{-19}}{(3.00 \times 10^{8})^{2}}$

☒ **C** $\frac{450 \times 10^{9} \times 1.6 \times 10^{-19}}{(3.00 \times 10^{8})^{2}}$

☒ **D** $\frac{2 \times 450 \times 10^{9} \times 1.6 \times 10^{-19}}{(3.00 \times 10^{8})^{2}}$

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