FREE REVISION PACK

Accelerators & Thermionic Emission

Pearson Edexcel International Advanced Level Physics · Unit 4 (WPH14) · Specification points 113–115

Easy | Hard | Multiple choice · past-paper questions

5	5	≈ 10 min
QUESTIONS	TOTAL MARKS	SUGGESTED TIME*

Contents

Q	LEVEL	FOCUS	SOURCE	MARKS
1	Easy	Electrons released from a heated filament	Edexcel IAL January 2024 · Unit 4 · Q2	1 mark
2	Easy	How an electron gun releases electrons	Edexcel IAL October 2024 · Unit 4 · Q1	1 mark
3	Easy	Incorrect statement about a cyclotron	Edexcel IAL October 2024 · Unit 4 · Q8	1 mark
4	Easy	True statement about a cyclotron	Edexcel IAL January 2023 · Unit 4 · Q7	1 mark
5	Hard	Fields in a cyclotron	Edexcel IAL June 2024 · Unit 4 · Q5	1 mark

Key ideas to have ready

- Thermionic emission: a heated filament releases electrons.
- Linac: drift tubes get longer because the particles speed up while the a.c. frequency is constant.
- Cyclotron: the electric field between the dees speeds particles up; the magnetic field makes them move in circles.
- Inside the dees there is no electric field; the radius grows as the speed grows.

How to use this pack

1. The questions are grouped into levels (Easy and Hard). 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 2024 · Unit 4 · Q2

1 What is the process by which electrons are released from a heated filament?

- ☒ **A** excitation
- ☒ **B** ionisation
- ☒ **C** photoelectric emission
- ☒ **D** thermionic emission

Edexcel IAL October 2024 · Unit 4 · Q1

2 An electron gun produces a beam of electrons in a vacuum tube. The electrons are released from a metal filament using a current.

Which of the following causes electrons to be released from the filament?

- ☒ **A** beta decay
- ☒ **B** excitation
- ☒ **C** photoelectric effect
- ☒ **D** thermionic emission

Edexcel IAL October 2024 · Unit 4 · Q8

3 Cyclotrons accelerate charged particles to high speeds. Cyclotrons use electric fields and magnetic fields.

Which of the following statements is **not** correct?

- ☒ **A** The magnetic field is at right angles to the velocity of the particles.
- ☒ **B** The magnetic fields in the dees keep the particles following circular paths.
- ☒ **C** The particles are accelerated by electric fields between the dees.
- ☒ **D** The particles are accelerated by electric fields inside the dees.

Edexcel IAL January 2023 · Unit 4 · Q7

4 Which of the following statements is true for a cyclotron?

- ☒ **A** A cyclotron can be used to accelerate neutrons.
- ☒ **B** A cyclotron uses a magnetic field to increase the speed of particles.
- ☒ **C** A cyclotron uses an alternating potential difference at a constant frequency.
- ☒ **D** A cyclotron uses an electric field to keep particles moving in a circular path.

Hard Several steps, often with a trap built in. Fewer than 3 in 10 students get these right. **Question 5**

Edexcel IAL June 2024 · Unit 4 · Q5

5 Cyclotrons use electric fields and magnetic fields to give particles very high energy.

Which of the following statements is true for charged particles in cyclotrons?

☒ **A** The particles are accelerated by electric fields and magnetic fields.

☒ **B** The particles follow circular paths of constant radius.

☒ **C** The electric field changes direction when the particles are in the gap between the dees.

☒ **D** The magnetic field changes direction when the particles are in the gap between the dees.

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