

Revision Sheet

Pearson Edexcel · International A-Level · Physics · Unit 4 Further Mechanics,
Fields and Particles

12 vocabulary items · 26 marks of exam questions (4 questions)

Part 1 · Vocabulary review (12 items). The terms this unit is examined on most. Mark it yourself from the answer key.

Section A · English dictation

Listen to each word and write it in English. The teacher reads the numbered answer key aloud.

1.

Dictation item 1.

[1]
2.

Dictation item 2.

[1]
3.

Dictation item 3.

[1]
4.

Dictation item 4.

[1]
5.

Dictation item 5.

[1]
6.

Dictation item 6.

[1]
7.

Dictation item 7.

[1]
8.

Dictation item 8.

[1]
9.

Dictation item 9.

[1]
10.

Dictation item 10.

[1]
11.

Dictation item 11.

[1]
12.

Dictation item 12.

[1]

Part 2 · Exam questions (26 marks, 4 questions) begins on the next page. They are ordered easy to difficult and none of them has been set before.

Questions 3 and 4 refer to the information below.

A current-carrying wire is placed between two bar magnets, as shown.



The current in the wire is into the page.

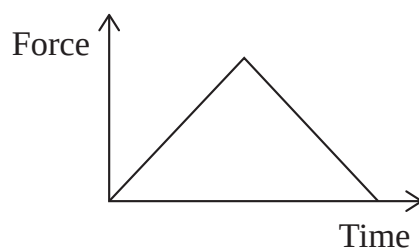
13 Which diagram shows the direction of the force on the wire due to the magnetic field?

- ☐ **A**
- ☐ **B**
- ☐ **C**
- ☐ **D**

(Total for Question 13 = 1 mark)

14 A ball collides with a wall and moves off in the opposite direction. The wall exerts a force on the ball during the collision.

The force-time graph for the collision is shown.



Which of the following is given by the area under the graph?

- ☐ **A** acceleration of the ball
- ☐ **B** average force acting on the ball
- ☐ **C** change in momentum of the ball
- ☐ **D** distance travelled by the ball

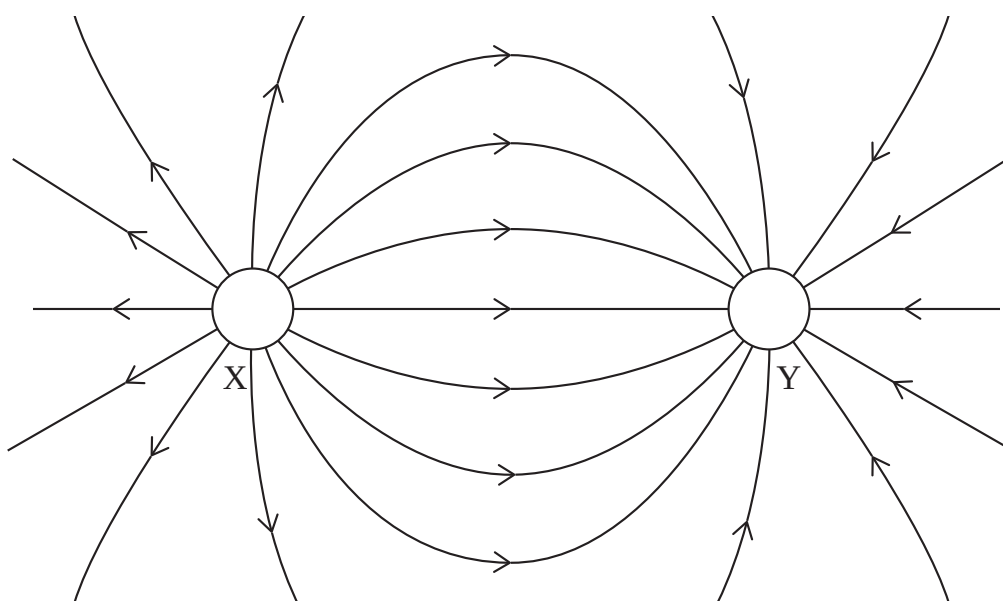
(Total for Question 14 = 1 mark)

15 Scientists are developing safe methods for removing old satellites from orbit.

Some scientists plan to use electrostatic forces. A spacecraft will fire a beam of electrons at a satellite. This will give the satellite a negative charge and the spacecraft a positive charge.

There will be an electrostatic force of attraction between the satellite and the spacecraft. The spacecraft will then move away, taking the satellite with it.

- (a) The diagram shows the electric field around the spacecraft X and the satellite Y when they have equal and opposite charge. You may assume that the spacecraft and the satellite are both spherical and have the same diameter.



- (i) Add dashed lines to the electric field diagram to show equipotentials at intervals of equal potential difference.

(3)

- (ii) Label the equipotential that represents 0 V.

(1)

- (b) After some time, the charge on the spacecraft will be $+1.5 \times 10^{-6} \text{ C}$ and the charge on the satellite will be $-1.5 \times 10^{-6} \text{ C}$.
- (i) Calculate the minimum energy, in joules, required for an electron leaving the surface of the spacecraft to reach the surface of the satellite.

Assume that the charge on each object does **not** affect the potential at the surface of the other object.

radius of satellite = 2.5 m
radius of spacecraft = 2.5 m

(3)

Minimum energy = ... J

(ii) The spacecraft moves to a new position, taking the satellite with it.

The distance between the satellite and the spacecraft remains constant, so the electrostatic force is constant.

The scientists estimate that the satellite could be moved a distance of 300 km in about 60 days.

Deduce whether this estimate is correct.

Assume gravitational forces are negligible and the satellite is initially at rest.

distance between centre of satellite and centre of spacecraft = 20 m

mass of satellite = 2500 kg

(4)

(c) In reality, the magnitude of the positive charge on the spacecraft may be greater than the magnitude of the negative charge on the satellite.

Suggest why.

(1)

(Total for Question 15 = 12 marks)

16 Scientists at CERN are planning an upgrade to the Large Hadron Collider called the Large Hadron Electron Collider (LHeC).

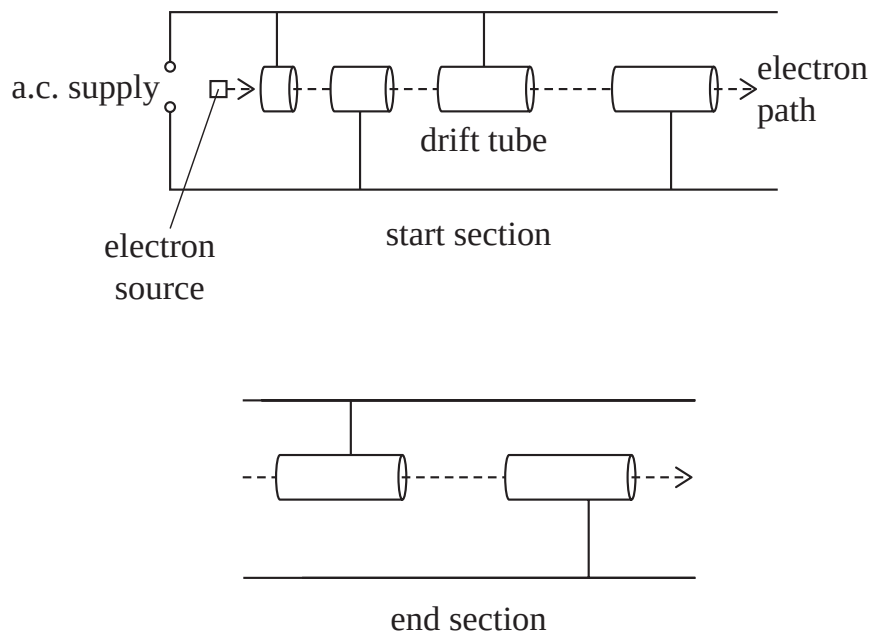
The scientists plan to use a linear accelerator (linac) to produce high energy electrons. Collisions between these electrons and high energy protons will allow the structure of protons to be investigated.

(a) The high energy electrons produced will have energy 60 GeV.

Show that these electrons will be travelling at relativistic speeds.

(3)

*(b) The diagram shows the start section of a linac and the end section of a linac.



Explain how a linac produces high energy electrons.

You should refer to the a.c. supply and to the length of the drift tubes in each section.

(6)

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(c) Explain why high energies are required to investigate the structure of protons.

(3)

(Total for Question 16 = 12 marks)