

YEAR 2 | MODULE 6 | PACK 05

Electric fields chapter test

Official past-paper questions

2017-2023 | OCR A H556 | Mixed 6.2.1-6.2.4; Year 1 mechanics and circuits

30 marks | 5 question entries

Suggested time: 45 minutes

Use this after the three core Electric Fields packs. Every source question in this test is withheld from the Electric Fields practice packs and the earlier chapters in this collection.

Conditions: 45 minutes, calculator and the official formula booklet; no notes or mark scheme. Stop at the time limit and record your first-attempt score. The test uses Electric Fields with Year 1 mechanics and circuits. Magnetic-field and strong-nuclear-force explanations are omitted.

This test samples field patterns, force, potential, energy and charged-particle motion. Use Pack 03 to check parallel-plate capacitance and permittivity as well.

A chapter-test percentage is a progress measure, not an OCR grade prediction. Full-paper performance remains a separate check.

Sources: the 2024 and 2025 exams are not used in these topic packs. These files contain official examination questions only; no sample, specimen or practice papers.

Name: _____

First attempt: _____ Score: _____ / 30

[Official data, formulae and relationships booklet](#)

Question index

EF identifiers are stable across the question packs and mark schemes; Q numbers refer to this pack. All MCQs appear first.

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Q01 | EF19

1 mark

June 2023 | H556/02 | Q9

- 9 The centres of a positron and a helium nucleus are separated by 2 mm.

What is the electrostatic force between them?

- A $1.15 \times 10^{-28} \text{ N}$
B $2.30 \times 10^{-25} \text{ N}$
C $5.75 \times 10^{-23} \text{ N}$
D $1.15 \times 10^{-22} \text{ N}$

Your answer

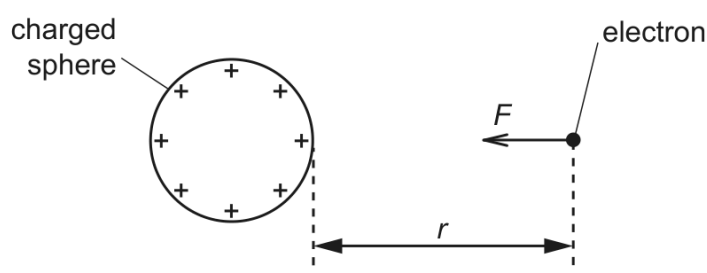
[1]

Q02 | EF20

1 mark

June 2018 | H556/02 | Q13

- 13 An electron is released at a distance r from the surface of a positively charged sphere. It is attracted towards the centre of the sphere and moves until it touches the surface.



Which of the following statements is/are correct?

- 1 The area under the F against r graph is equal to work done on the electron.
- 2 The electric field strength E at distance r is equal to $\frac{F}{1.6 \times 10^{-19}}$.
- 3 The work done on the electron is equal to $F \times r$.

- A Only 1
B Only 1 and 2
C Only 1 and 3
D 1, 2 and 3

Your answer

[1]

Q03 | EF21

8 marks

June 2017 | H556/02 | Q20

- 20 (a) Fig. 20.1 shows a positively charged metal sphere and a negatively charged metal plate.

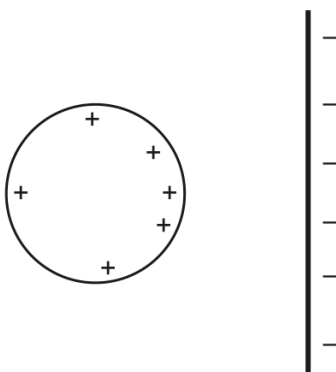


Fig. 20.1

On Fig. 20.1, draw a minimum of **five** electric field lines to show the field pattern between the sphere and the plate. [2]

- (b) Define *electric potential* at a point in space.

.....
..... [1]

- (c) A metal sphere is given a positive charge by connecting its surface briefly to the positive terminal of a power supply. The electric potential at the surface of the sphere is + 5.0 kV. The sphere has radius 1.5 cm.

- (i) Show that the charge Q on the surface of the sphere is $8.3 \times 10^{-9} \text{ C}$.

[2]

Q03 | EF21 - continued

8 marks

June 2017 | H556/02 | Q20

- (ii) Fig. 20.2 shows the charged sphere from (i) suspended from a nylon thread and placed between two oppositely charged vertical plates.

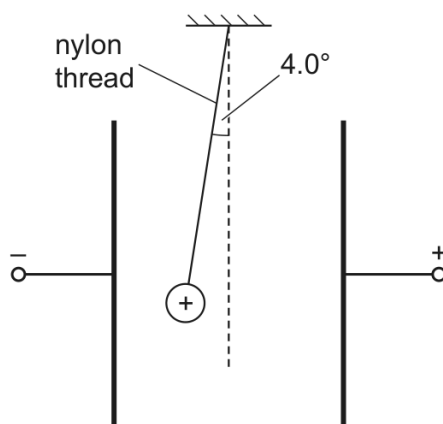


Fig. 20.2 (not to scale)

The weight of the sphere is $1.7 \times 10^{-2} \text{ N}$. The string makes an angle of 4.0° with the vertical.

1. Show that the electric force on the charged sphere is $1.2 \times 10^{-3} \text{ N}$.

[1]

2. Calculate the uniform electric field strength E between the parallel plates.

$$E = \dots\dots\dots \text{ NC}^{-1} \text{ [2]}$$

Q04 | EF22

8 marks

November 2021 | H556/02 | Q24(a)-(b)

24 (a) Fig. 24 shows two horizontal metal plates in a vacuum.

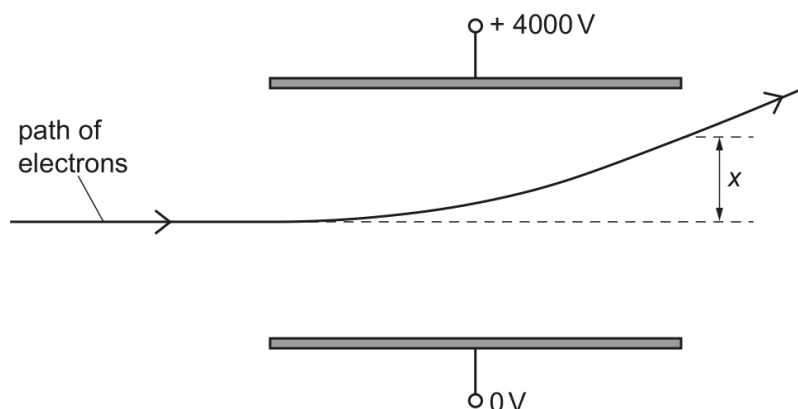


Fig. 24

The diagram is **not** drawn to scale.

Electrons travelling horizontally enter the space between the charged plates and are deflected vertically.

The potential difference between the plates is 4000 V.

The distance between the plates is 0.08 m.

The initial speed of the electrons is $6.0 \times 10^7 \text{ m s}^{-1}$.

The vertical deflection of the electrons at the far end of the plates is x .

(i) Show that the vertical acceleration a of an electron between the plates is $8.8 \times 10^{15} \text{ m s}^{-2}$.

[3]

(ii) The length of each plate is 0.12 m.

Show that the time t taken by the electron to travel this length is $2.0 \times 10^{-9} \text{ s}$.

[1]

Only (a)-(b) are assigned. The original electron diagram and linked kinematics are retained. Positrons have the same mass and opposite charge to electrons; the magnetic velocity-selector question in (c) is omitted.

Q04 | EF22 - continued

8 marks

November 2021 | H556/02 | Q24(a)-(b)

- (iii) Calculate the vertical deflection x of the electron.

$x = \dots\dots\dots$ m [2]

- (b) The arrangement shown in **Fig. 24** is now used to investigate positrons emitted from a radioactive source.

The speed of the positrons is also $6.0 \times 10^7 \text{ ms}^{-1}$.

The initial path of the positrons is the same as that of the electrons in **Fig. 24**.

On **Fig. 24**, sketch the path of the positrons between the plates. [2]

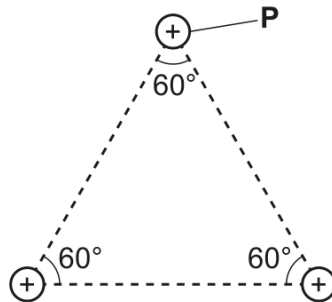
Only (a)-(b) are assigned. The original electron diagram and linked kinematics are retained. Positrons have the same mass and opposite charge to electrons; the magnetic velocity-selector question in (c) is omitted.

Q05 | EF23

12 marks

November 2020 | H556/02 | Q23(a)(i)-(ii), (b)

- 23 (a)** The diagram below shows the arrangement of the 3 protons inside the nucleus of lithium-6 (${}^6_3\text{Li}$).



The separation between each proton is about $1.0 \times 10^{-15} \text{ m}$.

- (i)** Calculate the magnitude of the repulsive electric force F experienced by the proton **P**.

$F = \dots\dots\dots \text{ N}$ [4]

- (ii)** On the diagram above, draw an arrow to show the direction of the electric force F experienced by **P**. [1]

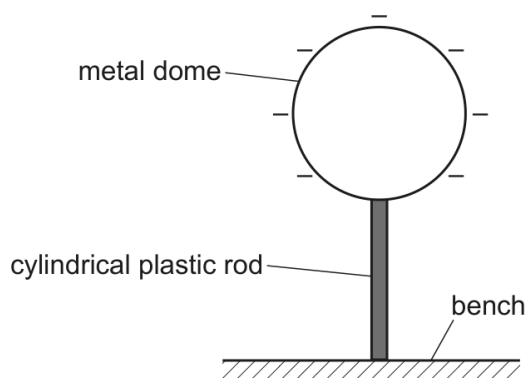
Only (a)(i)-(ii) and (b) are assigned. The strong-nuclear-force explanation in (a)(iii) is omitted. Use the supplied proton arrangement and some data with electric fields and Year 1 current/resistivity.

Q05 | EF23 - continued

12 marks

November 2020 | H556/02 | Q23(a)(i)-(ii), (b)

- (b) A spherical metal dome shown below is charged to a potential of -12 kV .



The dome is supported by a cylindrical plastic rod. The radius of the dome is 0.19 m .

- (i) Show that the magnitude of the total charge Q on the dome is $2.5 \times 10^{-7}\text{ C}$.

[2]

- (ii) The dome discharges slowly through the plastic rod.
It takes 78 hours for the dome to completely discharge.

- 1 Show that the mean current I in the plastic rod is about $9 \times 10^{-13}\text{ A}$.

[2]

- 2 The average potential difference across the plastic rod during discharge is 6000 V .
The rod has cross-sectional area $1.1 \times 10^{-4}\text{ m}^2$ and length 0.38 m .

Calculate the resistivity ρ of the plastic.

$\rho = \dots\dots\dots \Omega\text{ m}$ [3]

Only (a)(i)-(ii) and (b) are assigned. The strong-nuclear-force explanation in (a)(iii) is omitted. Use the supplied proton arrangement and dome data with electric fields and Year 1 current/resistivity.