

YEAR 2 | MODULE 6 | PACK 02

Uniform fields and charged-particle motion

Official past-paper questions

2017-2023 | OCR A H556 | 6.2.1(d); 6.2.3(a), (c); Year 1 mechanics and current

23 marks | 3 question entries

One practice session

Use: attempt the session after learning its content. Try without notes; record any help used. Mark the session, identify the reason for lost marks, then revisit those questions after a few days.

Format: all MCQs appear first with their complete answer boxes. Written extracts retain the original paper's answer space. Only the subparts named in the source reference are assigned.

Use electric-field forces with Year 1 mechanics. All diagrams, numerical data, and investigation answer space are retained.

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: _____ / 23

[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.

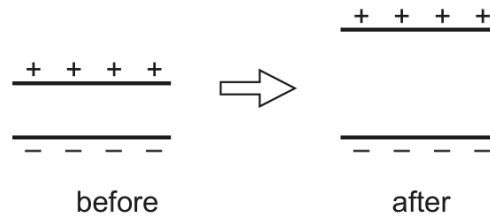
Question / source	Marks	Page
Q01 EF08	1	3
June 2017 H556/02 Q9		
Q02 EF09	10	4
June 2019 H556/02 Q22(b)-(c)		
Q03 EF10	12	7
November 2020 H556/03 Q1		

Q01 | EF08

1 mark

June 2017 | H556/02 | Q9

- 9 Two isolated parallel capacitor plates have an equal and opposite charge. The separation between the plates is doubled. The charge on each plate remains the same but the potential difference between the plates doubles.



Which statement is correct?

- A The capacitance of the capacitor doubles.
- B The energy stored by the capacitor is halved.
- C The permittivity of free space doubles.
- D The electric field strength between the plates remains the same.

Your answer

[1]

This MCQ also appears in the Capacitance electric-field links pack.

Q02 | EF09

10 marks

June 2019 | H556/02 | Q22(b)-(c)

- (b) Fig. 22.3 shows a negatively charged oil drop between two oppositely charged horizontal plates in a vacuum.

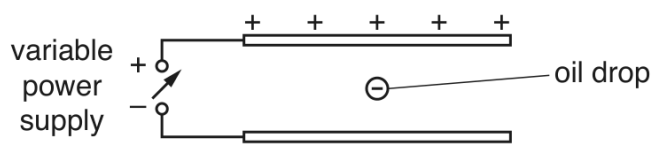


Fig. 22.3

The plates are fixed and connected to a variable power supply. The weight of the oil drop is $1.8 \times 10^{-14} \text{ N}$.

- (i) The power supply is adjusted so that the potential difference between the plates is 200 V when the oil drop becomes **stationary**.

State the magnitude of the vertical electric force F_E acting on the charged oil drop.

$$F_E = \dots\dots\dots \text{ N [1]}$$

- (ii) The potential difference between the plates is now increased to 600 V. The oil drop accelerates upwards.

Calculate the acceleration a of the oil drop.

$$a = \dots\dots\dots \text{ ms}^{-2} [3]$$

Only (b)-(c) are assigned. Each part supplies its own diagram and data. The oil-drop calculations do not need the omitted capacitor graph in (a); the charged-foil investigation keeps its original additional answer space.

Q02 | EF09 - continued

10 marks

June 2019 | H556/02 | Q22(b)-(c)

- (c)* Fig. 22.4 shows an arrangement used by a student to investigate the forces experienced by a small length of charged gold foil placed in a uniform electric field.

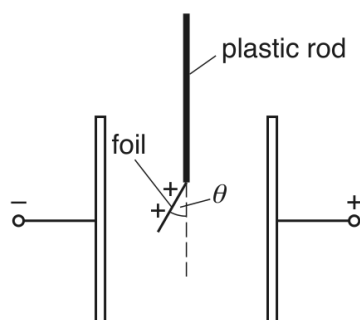


Fig. 22.4

The two vertical metal plates are connected to a high-voltage supply.

The foil is given a positive charge by briefly touching it to the positive plate.

The angle θ made with the vertical by the foil in the electric field is given by the expression

$$\tan \theta = \frac{qE}{W}$$

where q is the charge on the foil, E is the electric field strength between the plates and W is the weight of the foil.

The angle θ can be determined by taking photographs with the camera of a mobile phone.

Describe how the student can safely conduct an experiment to investigate the relationship between θ and E .

Identify any variables that must be controlled.

[6]

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Only (b)-(c) are assigned. Each part supplies its own diagram and data. The oil-drop calculations do not need the omitted capacitor graph in (a); the charged-foil investigation keeps its original additional answer space.

10 marks

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This image shows a full page of white paper with horizontal dashed lines, typical of primary school writing paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

6

Q03 | EF10

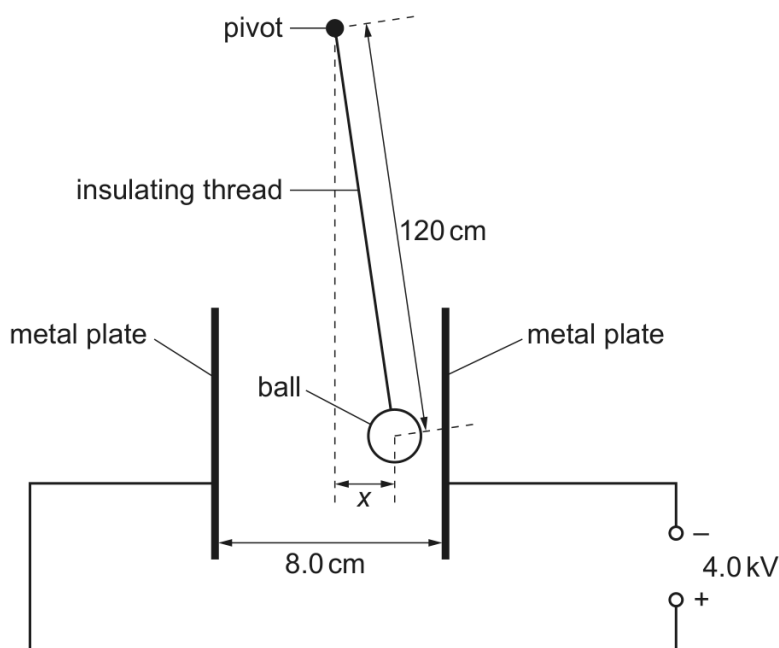
12 marks

November 2020 | H556/03 | Q1

- 1 A ball coated with conducting paint has weight 0.030 N and radius 1.0 cm . The ball is suspended from an insulating thread. The distance between the pivot and the centre of the ball is 120 cm .

The ball is placed between two vertical metal plates. The separation between the plates is 8.0 cm . The plates are connected to a 4.0 kV power supply.

- (a) The ball receives a positive charge of 9.0 nC when it is made to touch the positive plate. It then repels from the positive plate and hangs in equilibrium at a displacement x from the vertical, as shown below. The diagram is **not** drawn to scale.



- (i) Show that the electric force acting on the charged ball is $4.5 \times 10^{-4}\text{ N}$.

[2]

- (ii) Draw, on the diagram above, arrows which represent the **three** forces acting on the ball. Label each arrow with the name of the force it represents. [2]

The complete question is assigned. The original diagram, force balance, moments, charge transfer and current context are retained. The ball oscillations do not require the simple-harmonic-motion equations.

Q03 | EF10 - continued

12 marks

November 2020 | H556/03 | Q1

(iii) By taking moments about the pivot, or otherwise, show that $x = 1.8$ cm.

[2]

(b) The ball is still positively charged.

The plates are now moved slowly towards each other whilst still connected to the 4.0 kV power supply. The plates are stopped when the separation is 5.0 cm.

Explain the effect that this has on the deflection of the ball and explain why the ball eventually starts to oscillate between the plates.

[4]

The complete question is assigned. The original diagram, force balance, moments, charge transfer and current context are retained. The ball oscillations do not require the simple-harmonic-motion equations.

Q03 | EF10 - continued

12 marks

November 2020 | H556/03 | Q1

- (c) When the ball oscillates between the plates, the current in the external circuit is $3.2 \times 10^{-8} \text{ A}$.

A charge of 9.0 nC moves across the gap between the plates each time the ball makes one complete oscillation.

Calculate the frequency f of the oscillations of the ball.

$f = \dots\dots\dots \text{ Hz [2]}$

The complete question is assigned. The original diagram, force balance, moments, charge transfer and current context are retained. The ball oscillations do not require the simple-harmonic-motion equations.