

YEAR 2 | MODULE 6 | PACK 01

Point charges, force and potential energy

Official past-paper questions

2017-2023 | OCR A H556 | 6.2.1(a)-(b), (d); 6.2.2(a)-(b); 6.2.4(b)-(e)

15 marks | 7 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.

A short session on spherical-charge models, field strength, potential and energy. Review the required isolated-sphere capacitance derivation separately: these selected exams test its application rather than directly asking for that derivation.

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: _____ / 15

[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.

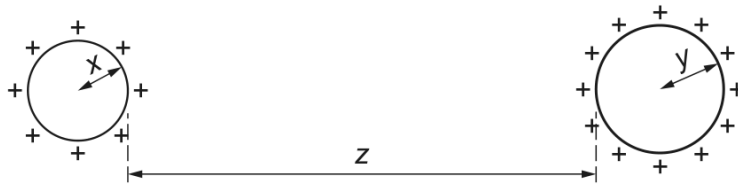
Question / source	Marks	Page
Q01 EF01	1	3
June 2019 H556/02 Q2		
Q02 EF02	1	3
June 2019 H556/02 Q8		
Q03 EF03	1	4
November 2020 H556/02 Q13		
Q04 EF04	1	5
November 2021 H556/02 Q4		
Q05 EF05	1	5
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Q06 EF06	4	6
June 2018 H556/02 Q23(b)(i)-(ii)		
Q07 EF07	6	7
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Q01 | EF01

1 mark

June 2019 | H556/02 | Q2

- 2 The diagram below shows two uniformly charged spheres separated by a large distance z .



The radius of the small sphere is x and the radius of the large sphere is y .

Which is the correct distance to use when determining the electric force between the charged spheres?

- A z
- B $x + z$
- C $y + z$
- D $x + y + z$

Your answer

[1]

Q02 | EF02

1 mark

June 2019 | H556/02 | Q8

- 8 The electric field strength at a distance of $2.0 \times 10^{-8} \text{ m}$ from a nucleus is $3.3 \times 10^8 \text{ NC}^{-1}$.

What is the charge on the nucleus?

- A $1.6 \times 10^{-19} \text{ C}$
- B $1.5 \times 10^{-17} \text{ C}$
- C $7.3 \times 10^{-10} \text{ C}$
- D $3.8 \times 10^{-9} \text{ C}$

Your answer

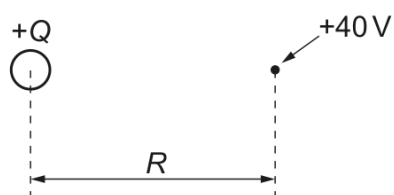
[1]

Q03 | EF03

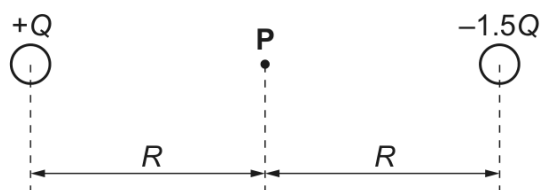
1 mark

November 2020 | H556/02 | Q13

- 13 The electric potential at a distance R from the centre of a charge $+Q$ is $+40\text{ V}$.



What is the potential at the point **P** for the arrangement of the charges $+Q$ and $-1.5Q$ as shown below?



- A -20 V
- B -60 V
- C $+80\text{ V}$
- D $+100\text{ V}$

Your answer

[1]

Q04 | EF04

1 mark

November 2021 | H556/02 | Q4

- 4 The diagram below shows two oppositely charged spheres.



The magnitude of the charge on each sphere is the same.

The point **P** is on the line joining the centres of the spheres and is the same distance from the centre of each sphere.

Which statement is correct?

- A A negatively charged particle at **P** will move to the right.
- B The direction of the electric field at **P** is to the left.
- C The electric potential at **P** is zero.
- D The magnitude of the electric field strength at **P** is zero.

Your answer

[1]

Q05 | EF05

1 mark

June 2018 | H556/02 | Q8

- 8 An isolated metal sphere is charged using a power supply.

Which single quantity can be used to determine the capacitance of the sphere?

- A The diameter of the sphere.
- B The charge on the sphere.
- C The resistance of the metal.
- D The e.m.f. of the power supply.

Your answer

[1]

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

Q06 | EF06

4 marks

June 2018 | H556/02 | Q23(b)(i)-(ii)

- (b) A proton with kinetic energy 0.52 MeV is travelling directly towards a stationary nucleus of cobalt-59 ($^{59}_{27}\text{Co}$) in a head-on collision.

- (i) Explain what happens to the electric potential energy of the proton-nucleus system.

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

- (ii) Calculate the **minimum** distance R between the proton and cobalt nucleus.

$R = \dots\dots\dots \text{ m}$ [3]

Only (b)(i)-(ii) are assigned. The proton energy and cobalt nuclear notation are given in this extract; the Rutherford-scattering explanation in (a) is omitted.

Q07 | EF07

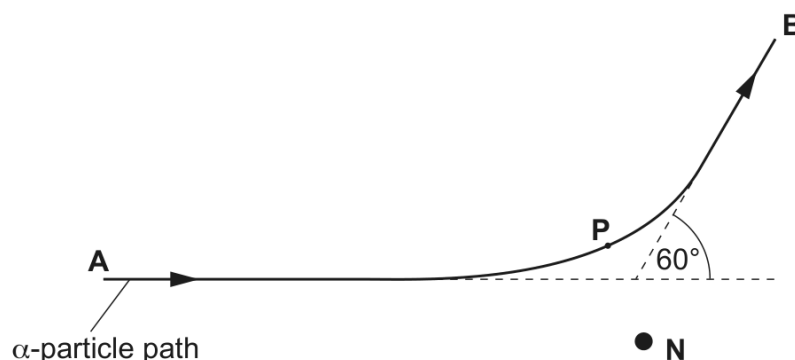
6 marks

November 2020 | H556/03 | Q6(a)-(b)

- 6 A beam of α -particles is incident on a thin gold foil. Most α -particles pass straight through the foil. A few are deflected by gold nuclei.

The diagram shows the path of one α -particle which passes close to a gold nucleus **N** in the foil. The α -particle is deflected through an angle of 60° as it travels from **A** to **B**.

P marks its position of closest approach to the gold nucleus.



- (a) Another α -particle in the beam is deflected by the same gold nucleus **N** through an angle of 30° .

Sketch its path onto the diagram above.

[2]

- (b) The distance between **P** and **N** is $6.8 \times 10^{-14} \text{ m}$.

Calculate the magnitude of the electrostatic force F between the α -particle (${}^4_2\text{He}$) and the gold nucleus (${}^{197}_{79}\text{Au}$) when the α -particle is at **P**.

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

Only (a)-(b) are assigned. The original scattering diagram, distance and nuclear notation are retained. The momentum calculations in (c)-(d) are omitted.