FREE REVISION PACK

Electric Potential & Equipotentials

AQA A-level Physics · 7408 · Specification 3.7.3.3

Easy | Medium | Multiple choice · past-paper questions

5	5	≈ 10 min
QUESTIONS	TOTAL MARKS	SUGGESTED TIME*

Contents

Q	LEVEL	FOCUS	SOURCE	MARKS
1	Easy	Potential difference from work done	AQA June 2019 · A-level Paper 2 · Q15	1 mark
2	Easy	Potential of a charged sphere from E and r	AQA June 2018 · A-level Paper 2 · Q21	1 mark
3	Easy	Finding the fourth charge from the potential	AQA June 2018 · A-level Paper 2 · Q22	1 mark
4	Medium	Field and potential at three times the radius	AQA November 2021 · A-level Paper 2 · Q18	1 mark
5	Medium	Change in potential energy in a uniform field	AQA June 2022 · A-level Paper 2 · Q16	1 mark

Key ideas to have ready

- Electric potential $V = Q / (4\pi\varepsilon_0 r)$: the work done per unit positive charge to bring it from infinity. Potential is a scalar, so add the potentials of several charges.
- Work done moving a charge = $Q\Delta V$. No work is done moving along an equipotential, or at right angles to a uniform field.
- For a charged sphere: $E = Q / (4\pi\varepsilon_0 r^2)$ and $V = Q / (4\pi\varepsilon_0 r)$, so $V = Er$ at the surface. $E \propto 1/r^2$ while $V \propto 1/r$.
- $E = -\Delta V / \Delta r$: in a uniform field, the potential changes only along the field direction.

How to use this pack

1. The questions are grouped into levels (Easy and Medium). 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 AQA'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 1–3

Only **one** answer per question is allowed. For each question, completely fill in the circle alongside the appropriate answer.

AQA June 2019 · A-level Paper 2 · Q15

1 $1.5\ \text{mJ}$ of work is done when a charge of $30\ \mu\text{C}$ is moved between two points, **M** and **N**, in an electric field.

What is the potential difference between **M** and **N**?

[1 mark]

A $20\ \text{mV}$ ⬭

B $20\ \text{V}$ ⬭

C $45\ \text{V}$ ⬭

D $50\ \text{V}$ ⬭

AQA June 2018 · A-level Paper 2 · Q21

2 A charged spherical conductor has a radius r. An electric field of strength E exists at the surface due to the charge.

What is the potential of the spherical conductor?

[1 mark]

A r^2E ⬭

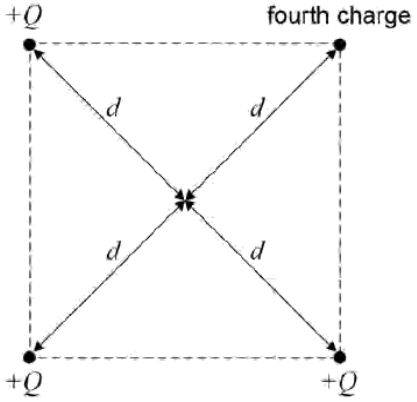
B rE^2 ⬭

C $\frac{E}{r}$ ⬭

D rE ⬭

AQA June 2018 · A-level Paper 2 · Q22

3 Four positive charges are fixed at the corners of a square as shown.



The total potential at the centre of the square, a distance d from each charge, is $\frac{5Q}{4\pi\varepsilon_o d}$.
Three of the charges have a charge of $+Q$.

What is the magnitude of the fourth charge?

[1 mark]

A $-\frac{7Q}{4}$ ○

B Q ○

C $\sqrt{2}Q$ ○

D $2Q$ ○

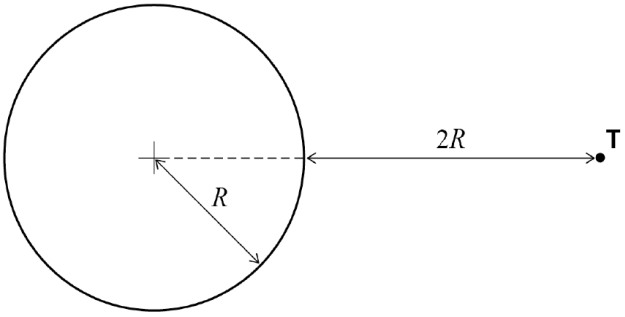
Medium

Two or three steps. Roughly a third to a half of students get these right.

Questions 4–5

AQA November 2021 · A-level Paper 2 · Q18

4 An isolated spherical conductor is charged.
The conductor has a radius R and an electric potential V. The electric field strength at its surface is E.



Point **T** is a distance $2R$ from the surface.

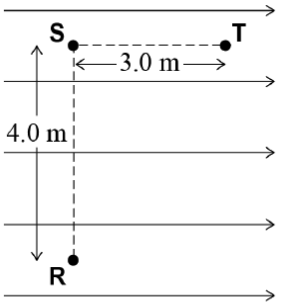
What are the electric field strength and electric potential at **T**?

[1 mark]

	Electric field strength	Electric potential	
A	$\frac{E}{2}$	$\frac{V}{4}$	○
B	$\frac{E}{3}$	$\frac{V}{9}$	○
C	$\frac{E}{4}$	$\frac{V}{2}$	○
D	$\frac{E}{9}$	$\frac{V}{3}$	○

AQA June 2022 · A-level Paper 2 · Q16

5 The diagram shows a uniform electric field of strength $15\ \text{V m}^{-1}$.
The length **RS** is perpendicular to the field and the line **ST** is parallel to the field.



What is the total change in electrical potential energy for a charge of $3.0\ \mu\text{C}$ moving from **R** to **T**?

[1 mark]

A $135\ \mu\text{J}$ ⬭

B $180\ \mu\text{J}$ ⬭

C $225\ \mu\text{J}$ ⬭

D $315\ \mu\text{J}$ ⬭

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