

Practice Question Set For A-Level
Subject : Physics
Paper-1 Topic : 7_ Electric Field 2

Student: _____

Max. Marks : 9 Marks

Time : 9 Minutes

Q1.

Over one hundred years ago, Rutherford supervised a series of experiments using a source of alpha particles and thin gold foil.

The initial kinetic energy of an alpha $\left(\begin{smallmatrix} 4 \\ 2 \end{smallmatrix} \alpha\right)$ particle is 7.3×10^{-13} J.

(i) In a textbook, it states that an alpha particle with this energy would be brought to rest when it reached a distance of 5.0×10^{-14} m from the centre of the gold nucleus $\left(\begin{smallmatrix} 197 \\ 79 \end{smallmatrix} \text{Au}\right)$.

Deduce whether this statement is correct.

(4)

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(ii) Determine the initial momentum of the alpha particle.

(3)

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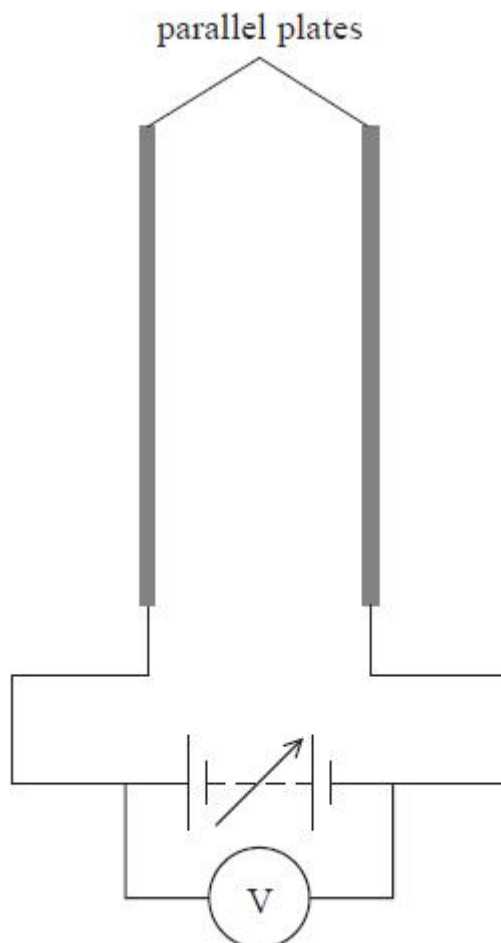
Initial momentum =

(Total for question = 4 marks)

Q2.

A teacher demonstrates the electric field produced between two parallel metal plates. The plates are connected to a variable power supply, as shown. The power supply has a very large internal resistance and includes a

voltmeter that indicates its output.



The power supply output is increased until sparks are heard and are seen in the gap between the plates. Sparks form in air when the electric field strength exceeds $3.0 \times 10^6 \text{ V m}^{-1}$ and the air becomes conducting for a short time.

(i) Calculate the minimum potential difference across the plates for sparks to be created.

distance between parallel plates = 2.0 mm

(2)

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Minimum potential difference =

(ii) Explain why the voltmeter reading decreases significantly whenever sparks are produced.

(3)

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(Total for question = 5 marks)