

- 7 Two parallel, vertical metal plates in a vacuum are connected to a power supply and a switch, as shown in Fig. 7.1.

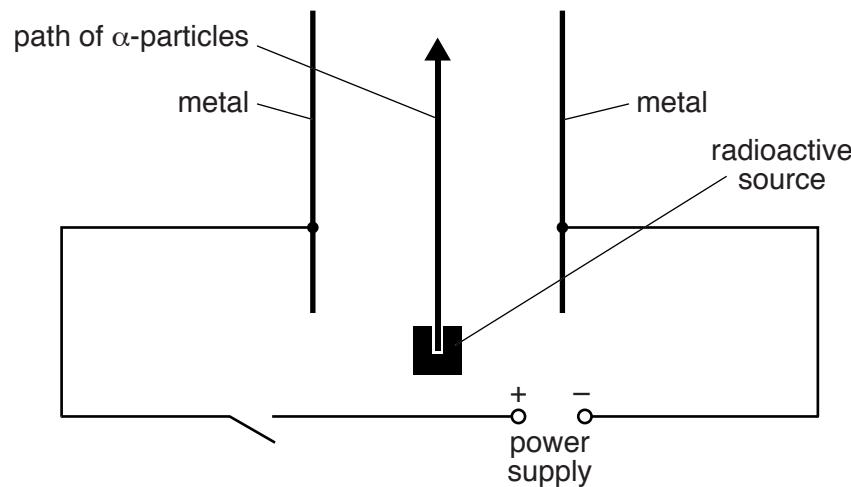


Fig. 7.1

A radioactive source emitting  $\alpha$ -particles is placed below the plates. The path of the  $\alpha$ -particles is shown on Fig. 7.1. The switch is closed producing a potential difference (p.d.) across the plates. This gives rise to a uniform electric field between the plates.

The separation of the plates is 12 mm.

- (a) (i) On Fig. 7.1, draw the path of the  $\alpha$ -particles. [1]

- (ii) Explain why the metal plates are placed in a vacuum. [1]

.....  
.....

- (iii) Calculate the p.d. required to produce an electric field of  $140 \text{ MV m}^{-1}$ .

$$\text{p.d.} = \dots \text{ MV} [2]$$

- (b) The  $\alpha$ -particle source is replaced by a  $\beta$ -particle source. By reference to the properties of  $\alpha$ -radiation and  $\beta$ -radiation, suggest three possible differences in the deflection observed with  $\beta$ -particles.

1. ....

2. ....

3. ....

[3]

- (c) Complete Fig. 7.2 to show the changes in the proton number  $Z$  and the nucleon number  $A$  of different radioactive nuclei when either an  $\alpha$ -particle or a  $\beta$ -particle is emitted.

emitted particle	change in $Z$	change in $A$
$\alpha$ -particle		
$\beta$ -particle		

**Fig. 7.2**

[1]

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