

- 4 (a) Define *electric potential* at a point.

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[2]

- (b) A charged particle is accelerated from rest in a vacuum through a potential difference V . Show that the final speed v of the particle is given by the expression

$$v = \sqrt{\left(\frac{2Vq}{m}\right)}$$

where $\frac{q}{m}$ is the ratio of the charge to the mass (the specific charge) of the particle.

[2]

- (c) A particle with specific charge $+9.58 \times 10^7 \text{ C kg}^{-1}$ is moving in a vacuum towards a fixed metal sphere, as illustrated in Fig. 4.1.



Fig. 4.1

The initial speed of the particle is $2.5 \times 10^5 \text{ ms}^{-1}$ when it is a long distance from the sphere.

The sphere is positively charged and has a potential of $+470 \text{ V}$.

Use the expression in (b) to determine whether the particle will reach the surface of the sphere.

[3]