



A Level Physics A

H556/02 Exploring physics

Question Set 7

- 1 (a) Fig. 20.1 shows a positively charged metal sphere and a negatively charged metal plate.

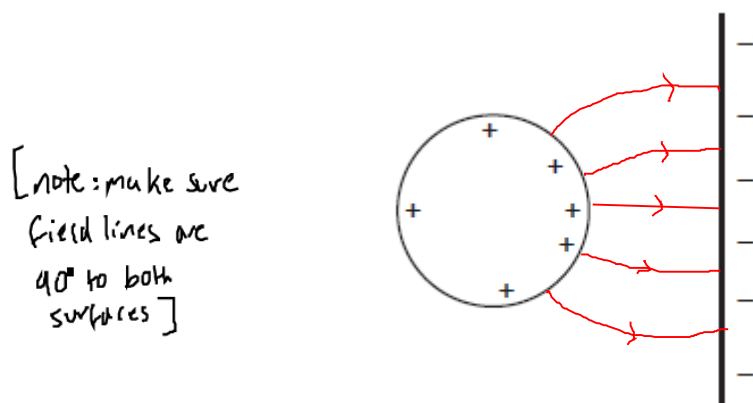


Fig. 20.1

On Fig. 20.1, draw a minimum of **five** electric field lines to show the field pattern between the sphere and the plate. [2]

- (b) Define *electric potential* at a point in space.

– Work done per unit charge in bringing a positive charge from infinity to that point. [1]

- (c) A metal sphere is given a positive charge by connecting its surface briefly to the positive terminal of a power supply. The electric potential at the surface of the sphere is + 5.0 kV. The sphere has radius 1.5 cm.

- (i) Show that the charge Q on the surface of the sphere is 8.3×10^{-9} C.

$$C = \frac{Q}{V} = 4\pi \epsilon_0 R \rightarrow Q = 4\pi \epsilon_0 R V \quad [2]$$

$$= 4\pi \times 8.85 \times 10^{-12} \times 1.5 \times 10^{-2} \times 5000$$

$$= 8.34 \times 10^{-9} \text{ C} \approx 8.3 \times 10^{-9} \text{ C}$$

- (ii) Fig. 20.2 shows the charged sphere from (i) suspended from a nylon thread and placed between two oppositely charged vertical plates.

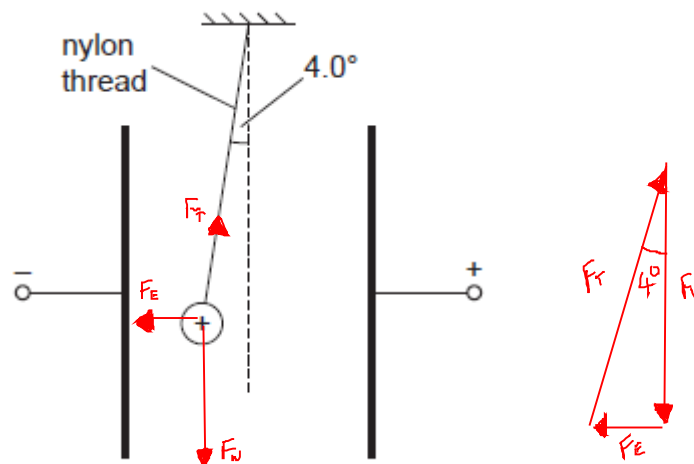


Fig. 20.2 (not to scale)

The weight of the sphere is $1.7 \times 10^{-2} \text{ N}$. The string makes an angle of 4.0° with the vertical.

1. Show that the electric force on the charged sphere is $1.2 \times 10^{-3} \text{ N}$.

$$\tan(4) = \frac{F_E}{F_w} \rightarrow F_E = 1.7 \times 10^{-2} \times \tan(4) = 1.2 \times 10^{-3} \text{ N} \quad [1]$$

2. Calculate the uniform electric field strength E between the parallel plates.

$$E = \frac{F}{Q} = \frac{1.184 \times 10^{-3}}{8.34 \times 10^{-9}} = 1.4 \times 10^5 \quad E = \dots\dots\dots 1.4 \times 10^5 \dots\dots\dots \text{NC}^{-1} \quad [2]$$

Total Marks for Question Set 7: 8

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