

A Level Physics A

H556/02 Exploring physics

Question Set 29

1 (a) Fig. 22.1 shows two horizontal metal plates in a vacuum.

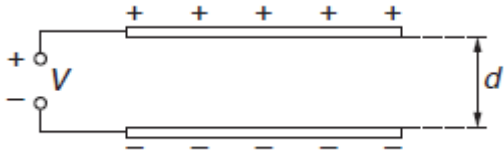


Fig. 22.1

The plates are connected to a power supply. The potential difference V between the plates is constant. The magnitude of the charge on each plate is Q . The separation between the plates is d .

Fig. 22.2 shows the variation with d of the charge Q on the positive plate.

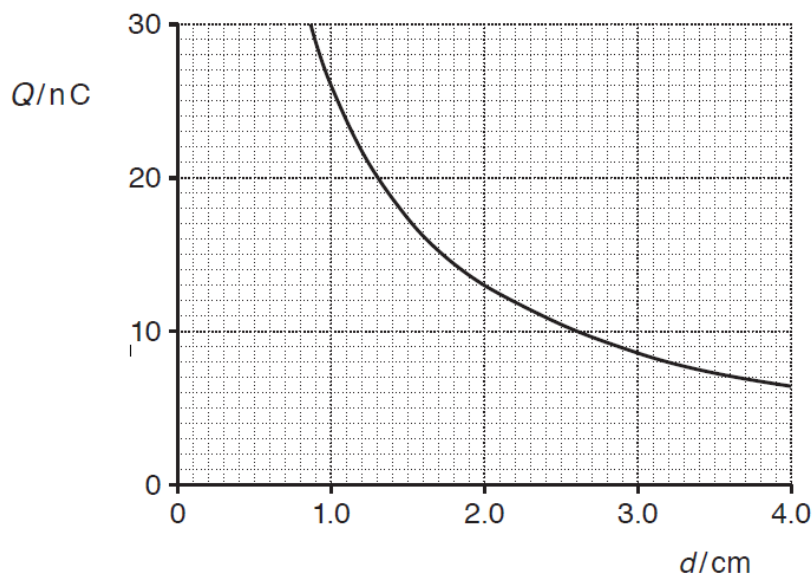


Fig. 22.2

(i) Use Fig. 22.2 to propose and carry out a test to show that Q is inversely proportional to d .

Test proposed:

.....

.....

Working:

[2]

(ii) Use capacitor equations to show that Q is inversely proportional to d .

[2]

(b) Fig. 22.3 shows a negatively charged oil drop between two oppositely charged horizontal

plates in a vacuum.

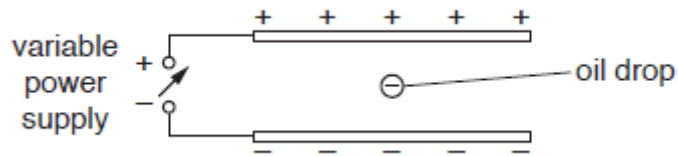


Fig. 22.3

The plates are fixed and connected to a variable power supply. The weight of the oil drop is 1.8×10^{-14} N.

- (i) The power supply is adjusted so that the potential difference between the plates is 200 V when the oil drop becomes **stationary**.

State the magnitude of the vertical electric force F_E acting on the charged oil drop.

$$F_E = \dots\dots\dots \text{ N [1]}$$

- (ii) The potential difference between the plates is now increased to 600 V. The oil drop accelerates upwards.

Calculate the acceleration a of the oil drop.

$$a = \dots\dots\dots \text{ m s}^{-2} \text{ [3]}$$

(c)* Fig. 22.4 shows an arrangement used by a student to investigate the forces experienced by a

small length of charged gold foil placed in a uniform electric field.

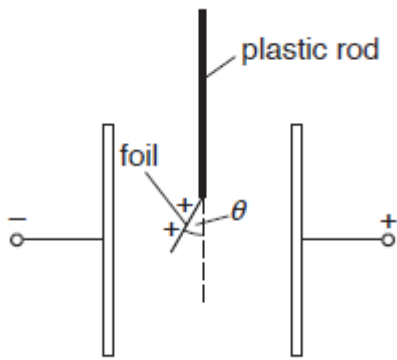


Fig. 22.4

The two vertical metal plates are connected to a high-voltage supply.

The foil is given a positive charge by briefly touching it to the positive plate.

The angle θ made with the vertical by the foil in the electric field is given by the expression

$$\tan \theta = \frac{qE}{W}$$

where q is the charge on the foil, E is the electric field strength between the plates and W is the weight of the foil.

The angle θ can be determined by taking photographs with the camera of a mobile phone.

Describe how the student can safely conduct an experiment to investigate the relationship between θ and E .

Identify any variables that must be controlled.

[6]

Total Marks for Question Set 29: 14

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