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

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Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Q1.

Some mobile phones have a capacitor touch screen made up of a sheet of glass with a thin metallic coating. The screen is charged and when it is touched some of the charge is transferred to the user. This causes a drop in electrical potential at the point where the screen is touched.

A capacitor is charged by connecting it across a battery and then discharged through a resistor. In the case of the touch screen the user provides a discharge resistance of about 900 Ω.

Explain how the capacitor discharges.

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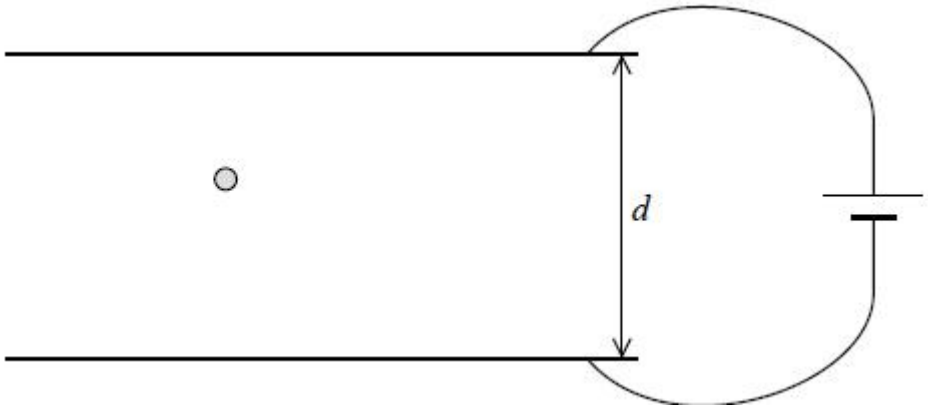
(Total for question = 3 marks)

Q2.

In an experiment to determine the charge on an electron, negatively charged oil drops are allowed to fall between two parallel metal plates separated by a distance *d*.

A potential difference (p.d.) is applied across the plates. The diagram shows one oil drop between the plates.



When the p.d. is 0 V the oil drop accelerates to terminal velocity. The p.d. is increased. It is observed that at a

particular p.d. *V* the oil drop stops falling and remains stationary between the plates.

(a) The oil drop has a mass *m*. Show that the charge *q* on the oil drop is given by

$$q = \frac{mgd}{V}$$

(2)

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(b) Explain what would happen to the oil drop if the p.d. is increased further.

(2)

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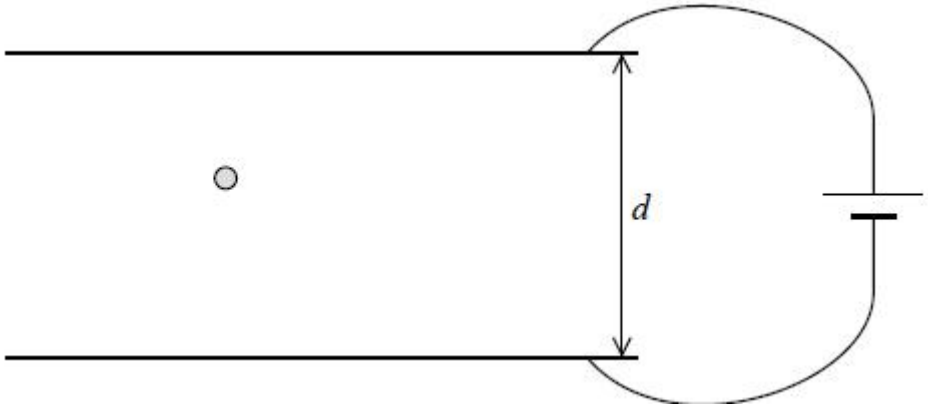
(Total for question = 4 marks)

Q3.

In an experiment to determine the charge on an electron, negatively charged oil drops are allowed to fall between two parallel metal plates separated by a distance *d*.

A potential difference (p.d.) is applied across the plates. The diagram shows one oil drop between the plates.



When the p.d. is 0 V the oil drop accelerates to terminal velocity. The p.d. is increased. It is observed that at a particular p.d. *V* the oil drop stops falling and remains stationary between the plates.

* Explain the motion of the oil drop in terms of the forces acting on it as the p.d. is increased from 0 to *V*.

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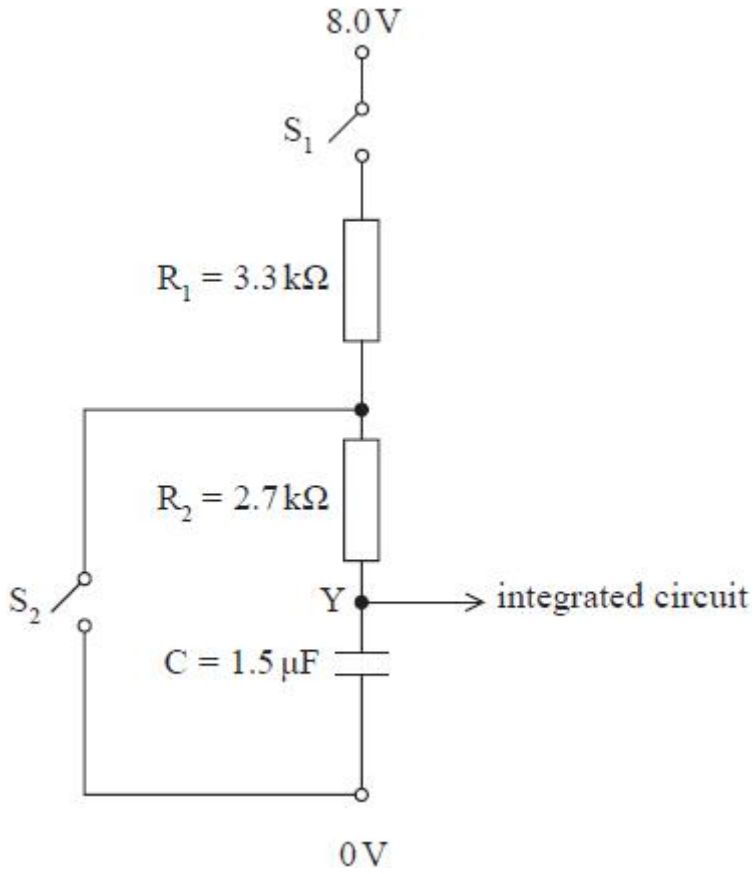
(Total for question = 6 marks)

Q4.

The properties of capacitors make them useful in timing circuits.

The following circuit is used to provide an input Y to an integrated circuit.



When the potential at Y is 8.0 V, the switch S_2 is closed.

(i) Calculate the time taken for the potential at Y to decrease to 2.0 V.

(3)

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Time taken = ...

(ii) Calculate the energy stored on the capacitor when the potential at Y is 2.0 V.

(2)

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Energy stored = ...

(Total for question = 5 marks)