4 **(a)** Define electric field strength.

In your answer, include the equation and unit.

………………………………………………………………………………………………..……

………………………………………………………………………………………………..……

………………………………………………………………………………………………..……

equation for electric field strength is ……………………

S.I. unit of electric field strength = ……………….. [2]

(b) In an experimental setup to determine the force exerted by an electric field, a small negatively charged sphere is suspended from a fine glass spring between parallel horizontal metal plates, as shown in Fig. 4.1.
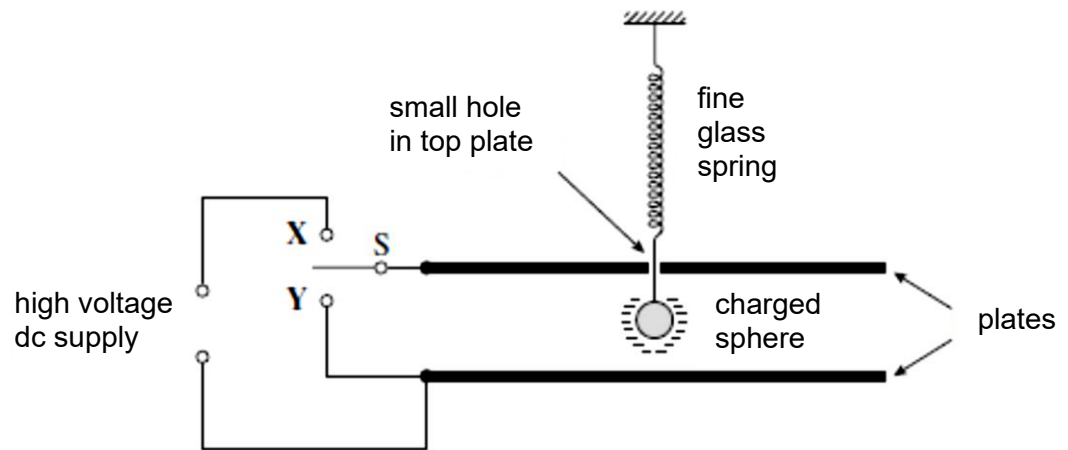

Fig. 4.1

Initially the plates are uncharged. When switch S is set to position X, a high voltage dc supply is connected across the plates. This causes the sphere to move vertically upwards so that eventually it comes to rest 18 mm higher than its original position.

(i) State the direction of the electric field between the plates.

……..………………………………………………………………………………….... [1]

(ii) The spring constant of the glass spring is 0.24 N m^{-1}.

Calculate the force exerted on the sphere by the electric field.

force = …………….…………… N [2]

(iii) The potential difference applied across the plates is 5.0 kV. If the charge on the sphere is -4.1×10^{-8} C, determine the separation of the plates.

separation of the plates = ……………….. m   [3]

(b) Switch S is now moved from position X to Y.

State and explain the effect of this on the electric field between the plates.

………………………………………………………………………………………………..………

………………………………………………………………………………………………..………

………………………………………………………………………………………………..………

………………………………………………………………………………………………..………

………………………………………………………………………………………………….....   [2]