3 **(a)** Gravitational fields, electric fields and magnetic fields are examples of fields of force.

State the direction of the force acting on the body with respect to the field it is in for each of the following scenarios.

(i) The Moon in the gravitational field of the Earth.

..... [1]

(ii) An electron released from rest in the electric field of a positive point charge.

..... [1]

(iii) An electron moving at an angle to a uniform magnetic field.

..... [1]

(b) An isolated point charge S in a vacuum produces electric potential V at distance r from S. Fig. 3.1 shows the variation with r of V.

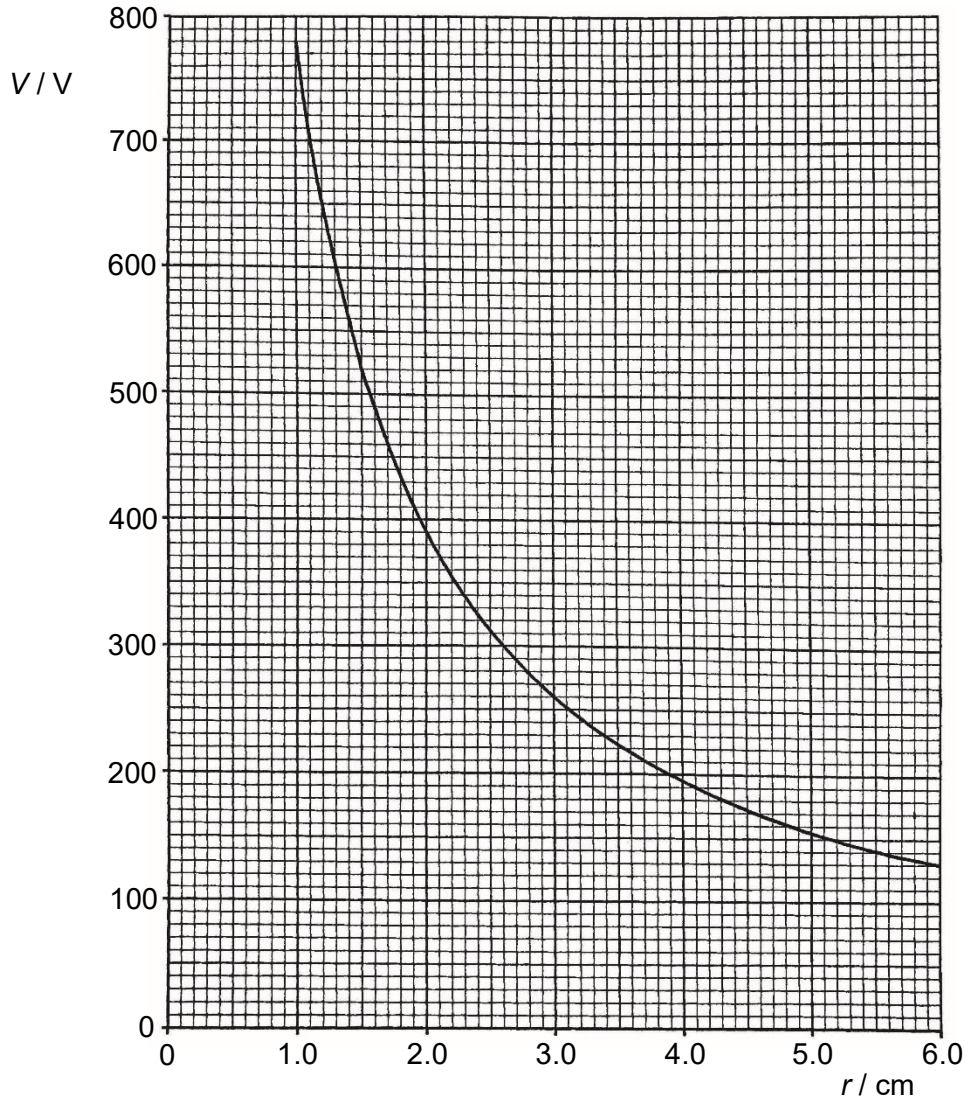

Fig. 3.1

(i) Show that the charge of S is 8.7×10^{-10} C.

[1]

(ii) An electron is projected radially from $r = 2.0$ cm with a speed of 8.4×10^{6} m s^{-1} away from S.

Using Fig. 3.1, determine the maximum distance of the electron from S.

maximum distance = ... cm [2]

(iii) A negative point charge T is now placed at a fixed distance $r = 6.0$ cm from S. The charge of T is -8.7×10^{-10} C.

1. Sketch on Fig. 3.3, the variation with distance *r* from S of the electric force *F* on an electron when it is between S and T.

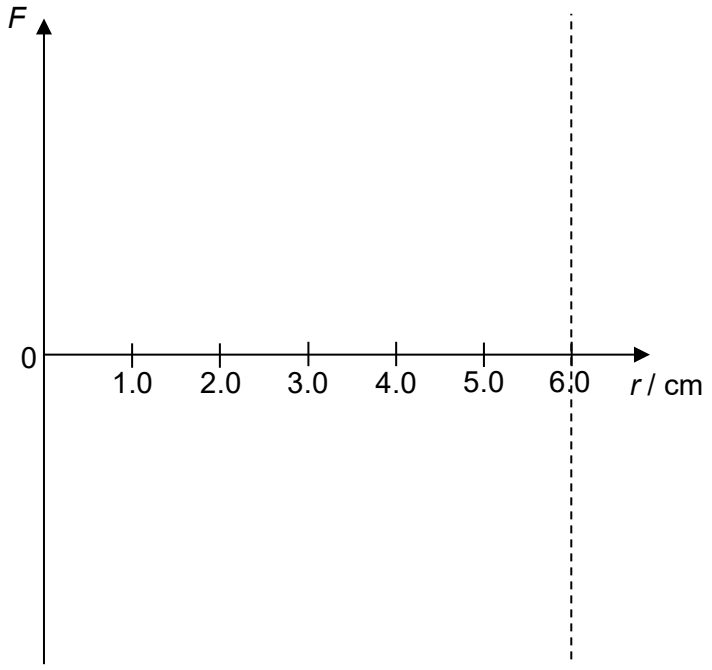

Fig. 3.3

[2]

2. If the electron in **(b)(ii)** is again projected from $r = 2.0$ cm with the same speed towards T, explain how the maximum distance of the electron from S will change.

.....

.....

..... [2]