

- 4 A charged point mass is situated in a vacuum. A proton travels directly towards the mass, as illustrated in Fig. 4.1.

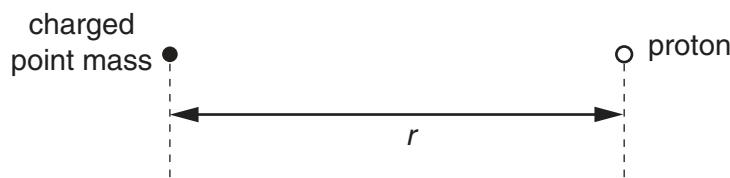


Fig. 4.1

When the separation of the mass and the proton is r , the electric potential energy of the system is U_P .

The variation with r of the potential energy U_P is shown in Fig. 4.2.

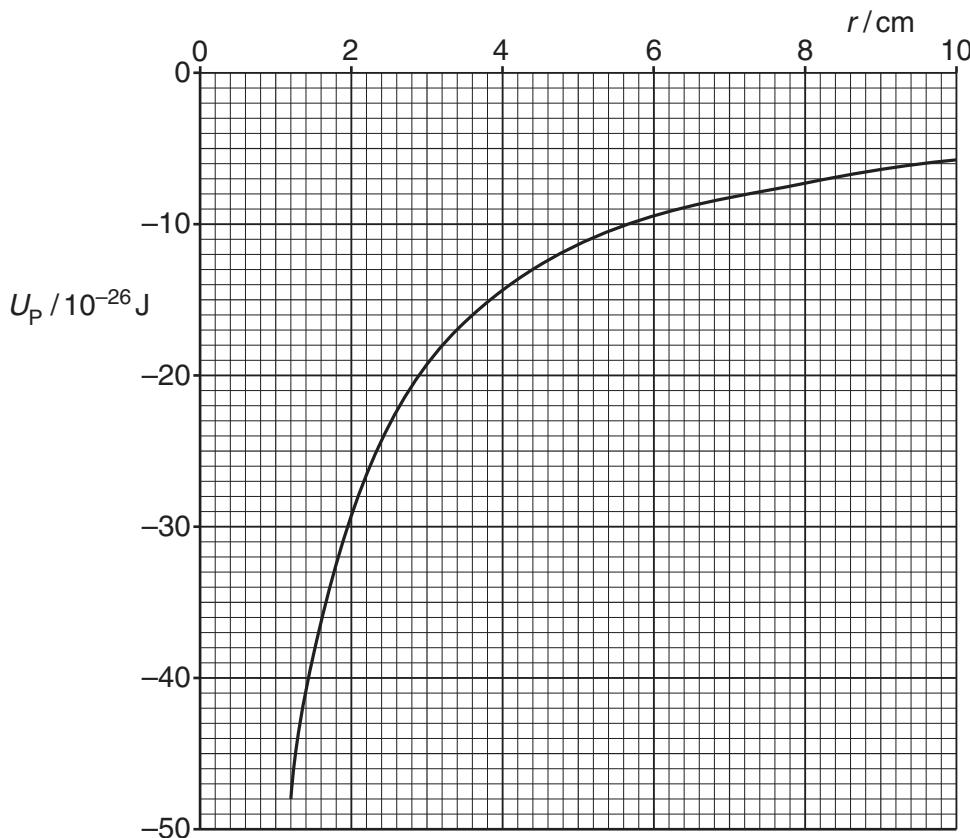


Fig. 4.2

- (a) (i) Use Fig. 4.2 to state and explain whether the mass is charged positively or negatively.

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

- (ii) The gradient at a point on the graph of Fig. 4.2 is G .
Show that the electric field strength E at this point due to the charged point mass is given by the expression

$$Eq = G$$

where q is the charge at this point.

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

- (b) Use the expression in (a)(ii) and Fig. 4.2 to determine the electric field strength at a distance of 4.0cm from the charged point mass.

field strength = Vm^{-1} [4]