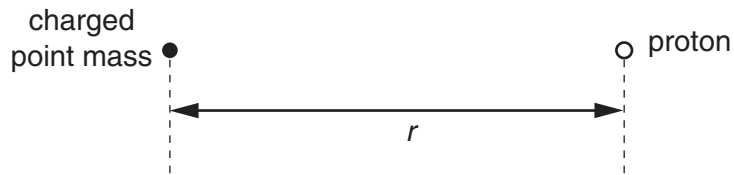


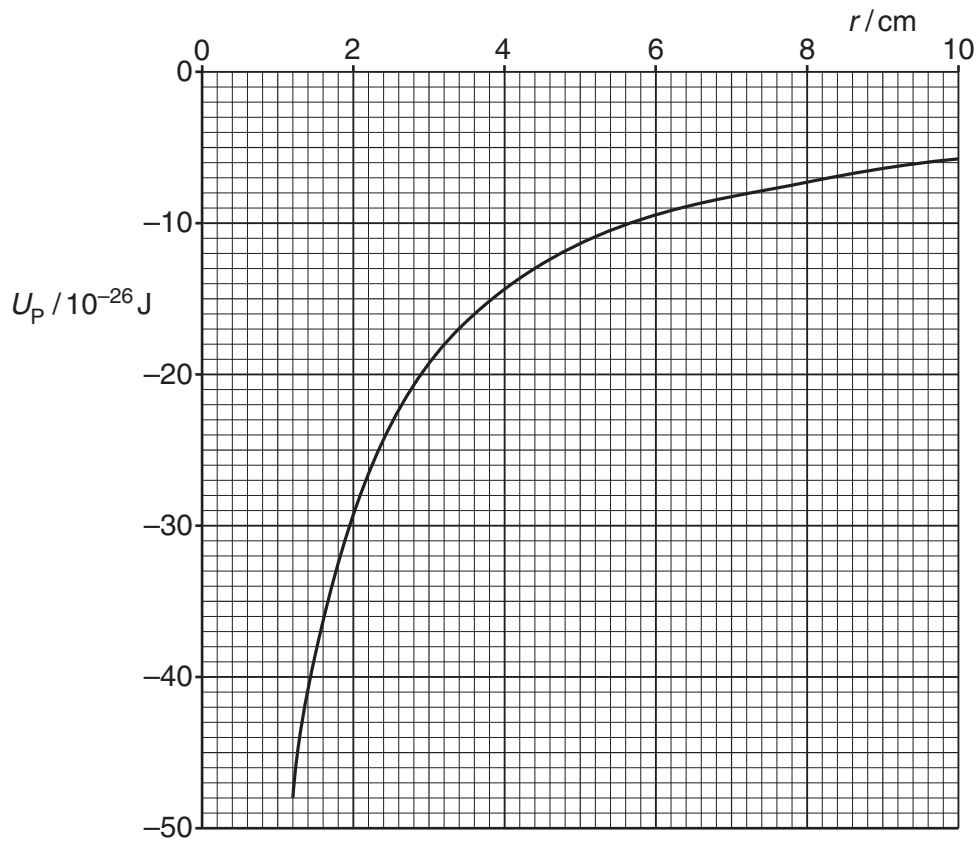
- 4 A charged point mass is situated in a vacuum. A proton travels directly towards the mass, as illustrated in Fig. 4.1.



**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 4.0 cm from the charged point mass.

field strength = .....  $\text{V m}^{-1}$  [4]