7 Two small spherical charged particles P and Q may be assumed to be point charges located at their centres. The particles are in vacuum.

Particle P is fixed in position. Particle Q is moved along the line joining the two charges, as shown in Fig. 7.1.

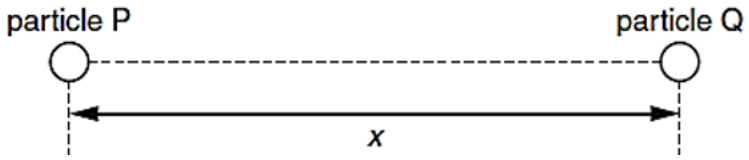

Fig. 7.1

The variation with separation x of the electric potential energy Ep of particle Q is shown in Fig. 7.2.

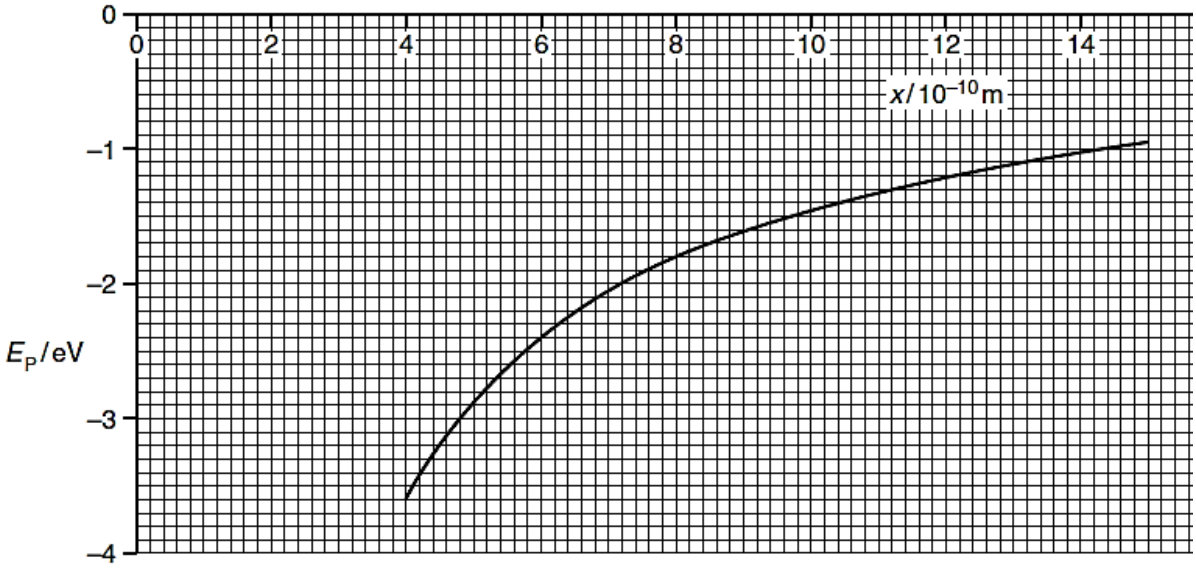

Fig. 7.2

(a) Deduce that the force on particle Q is proportional to the gradient of the curve of Fig. 7.2.

……

……

……

……

…… [2]

(b) By reference to Fig. 7.2, state and explain

(i) whether the two charges have the same, or opposite sign,

.....

.....

..... [2]

(ii) the effect, if any, on the shape of the graph of doubling the charge on particle P.

.....

.....

..... [2]

(c) Using Fig. 7.2, determine the separation of the particles at the point where particle Q has electric potential energy equal to -5.1 eV.

separation = …….. m [2]