3

(a)

Define electric potential.

.....

.....

.....

[1]

(b)

Two small positively charged metal spheres A and B are situated in a vacuum. The ratio of charge on sphere A to charge on sphere B is 3:1.

On Fig. 3.1, sketch the electric field lines due to these two charges.

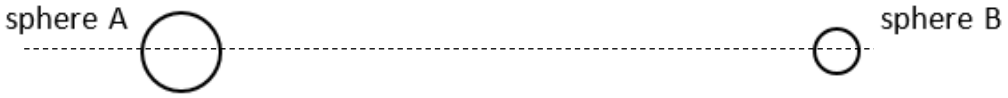

Fig. 3.1

[3]

(c)

Fig. 3.2 shows four charged particles, each having a charge Q of -2.0 nC placed at four corners of a square of sides 10 cm. Point O is the centre of the square formed by the four charged particles. Point A lies 5.0 cm to the right of O. An electron P travels from infinity with a velocity v.

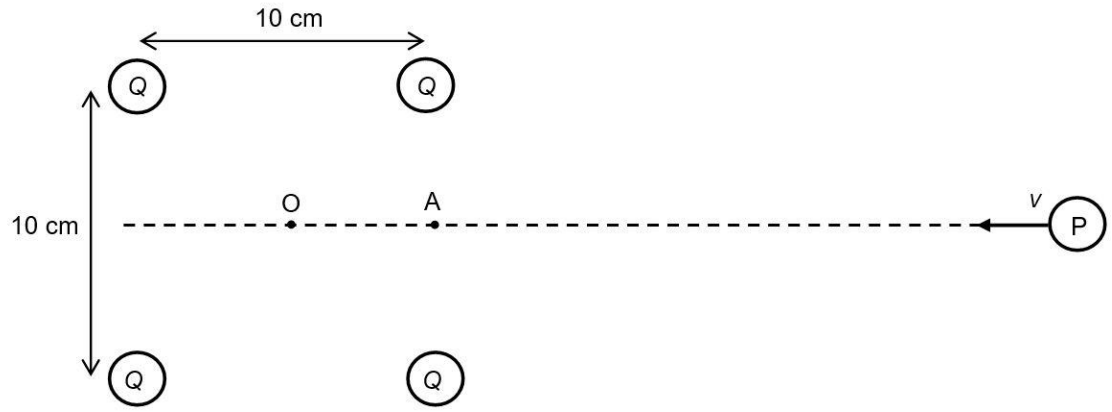

Fig. 3.2

(i)

Calculate the electric potential at A due to the four charged particles.

electric potential at A =……..V

[2]

(ii)

Hence calculate the minimum value of the velocity v that the electron P must possess at infinity in order to reach A. Explain your working.

minimum value of v = ... m s^{-1}

[3]

[Total: 9]