5 **(a)** State Coulomb's law.

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.....

..... [1]

(b) Two charged metal spheres A and B are situated in a vacuum, as illustrated in Fig. 5.1.

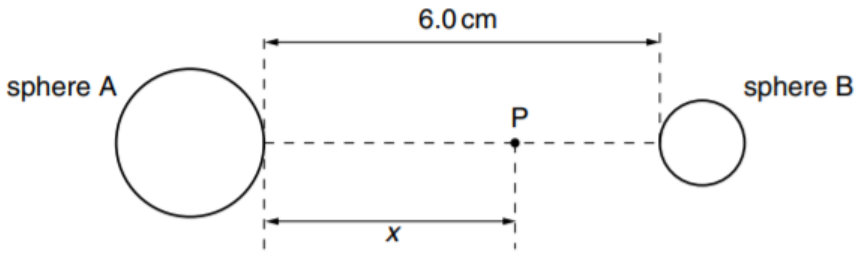

Fig. 5.1

The shortest distance between the surfaces of the spheres is 6.0 cm.

A movable point P lies along the line joining the centres of the two spheres, a distance x from the surface of sphere A.

The variation with distance x of the electric field E at point P is shown in Fig. 5.2.

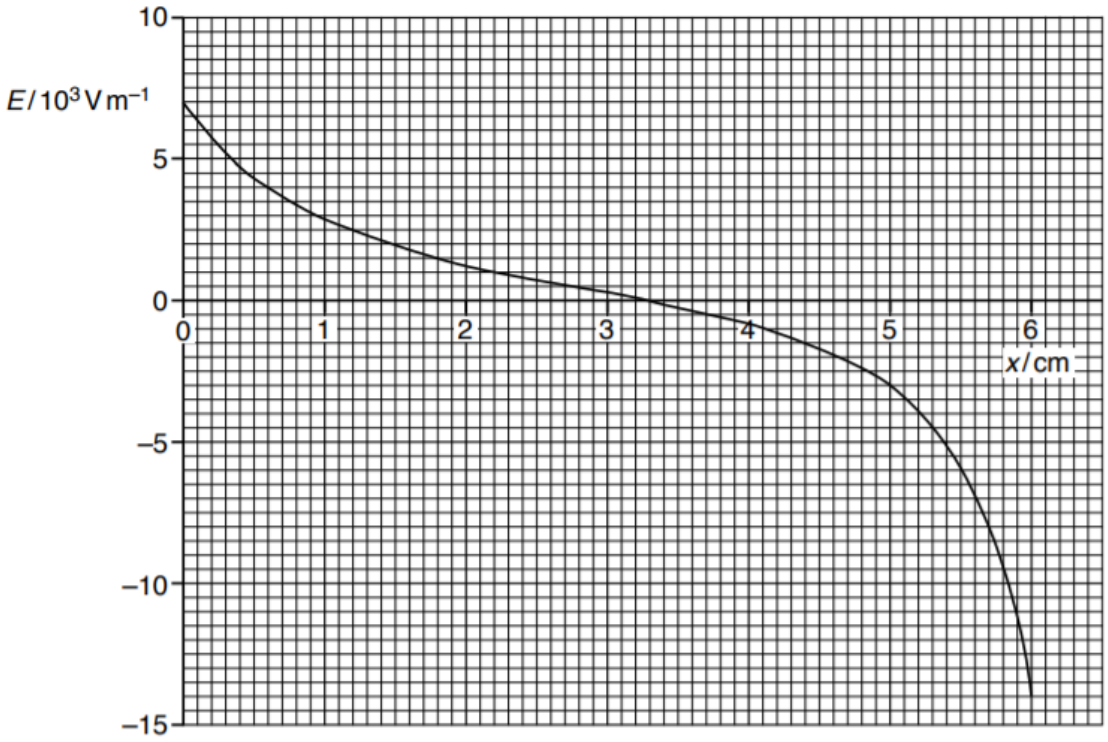

Fig. 5.2

(i) Use Fig. 5.2 to explain whether the two spheres have charges of the same, or opposite sign.

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……

……

…… [2]

(ii) A proton is at rest at point P where x = 5.0 cm.

1. Use data from Fig. 5.2 to determine the magnitude of the acceleration of the proton.

acceleration = …… m s^{-2} [3]

2. Use data from Fig. 5.2 to estimate the speed of the proton at x = 3.3 cm.

maximum speed = …… m s^{-1} [3]

[Total: 9]