6 (a) (i) Explain what is meant by a *field of force*.

.....

.....

..... [2]

(ii) A force due to a field is acting on a charged particle.

Explain why this force may **not** be due to the presence of an electric field.

.....

.....

.....

.....

..... [4]

(b) Two charged solid metal spheres A and B are situated in a vacuum. Their centres are separated by a distance of 30.0 cm, as illustrated in Fig. 6.1. The diagram is not to scale.

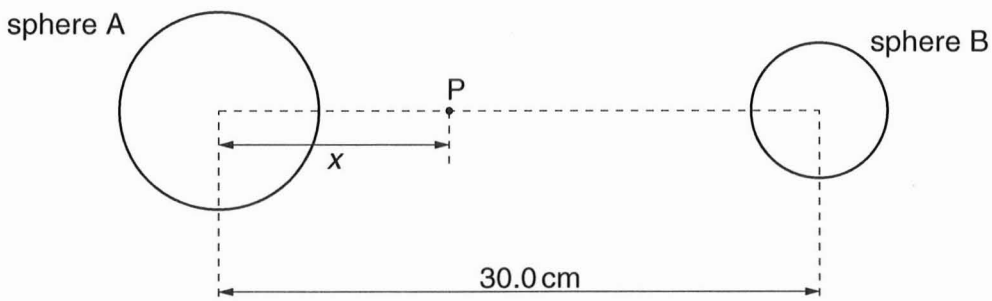

Fig. 6.1

Point P is a point on the line joining the centres of the two spheres. Point P is a distance x from the centre of sphere A.

The variation with distance x of the electric field strength E at point P is shown in Fig. 6.2.

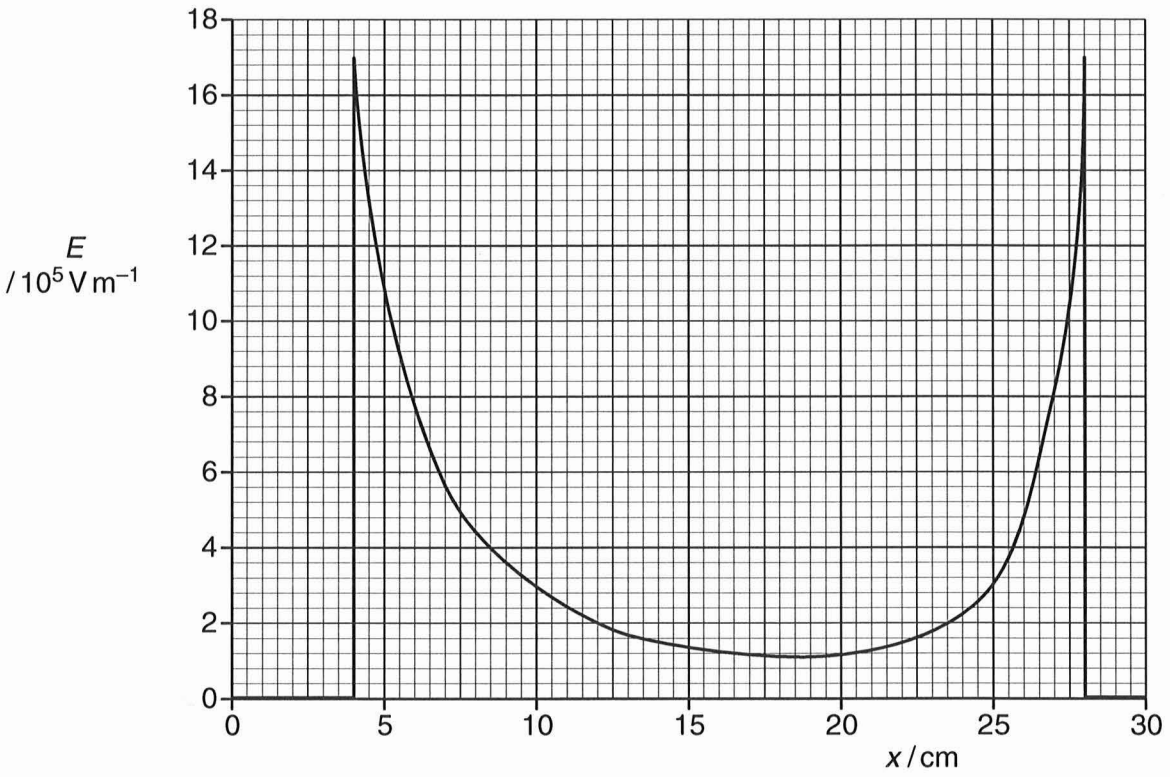

Fig. 6.2

(i) Suggest why the electric field strength is zero for two regions of x.

.....

..... [1]

(ii) Use Fig. 6.2 to

1. determine the radius of each sphere,

radius of sphere A = ... cm

radius of sphere B = ... cm
[1]

2. state and explain whether the spheres have charges of the same, or opposite, sign.

.....

.....

..... [2]

(iii) A lithium-7 ($^{7}_{3}$Li) nucleus moves along the line joining the centres of the two spheres.

1. Estimate the energy gained by this nucleus as it moves from point P where $x = 16.0\,\text{cm}$ to the point P where $x = 21.0\,\text{cm}$.

energy = ... J [5]

2. Calculate the acceleration of the nucleus at point P where $x = 25.0\,\text{cm}$.

acceleration = ... m s^{-2} [2]

3. The nucleus is at rest at point P where $x = 4.0\,\text{cm}$.

Describe qualitatively the variation with x of the acceleration of the nucleus for $x = 4.0\,\text{cm}$ to $x = 28.0\,\text{cm}$.

.....

.....

.....

.....

..... [3]