

- 3 (a) Fig. 3.1 shows the path of a moving object as it enters and travels through a uniform field of force.

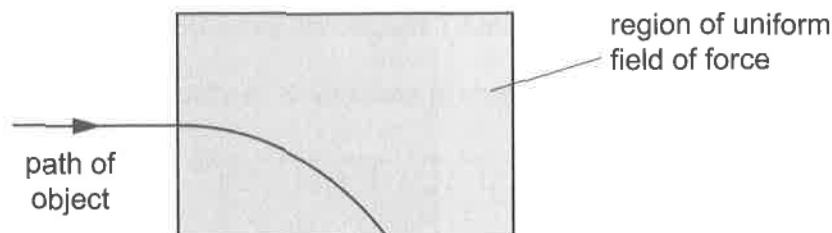


Fig. 3.1

Before the object enters this field, its direction of motion is perpendicular to the direction of the field.

The object could be a mass in a gravitational field or a charged particle in an electric field. In both cases, the shape of the path is the same.

Explain why the shape of the path is the same in both cases.

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..... [2]

- (b) The variations with separation of the gravitational force F_G and of the electric force F_E between two protons are shown in Fig. 3.2.

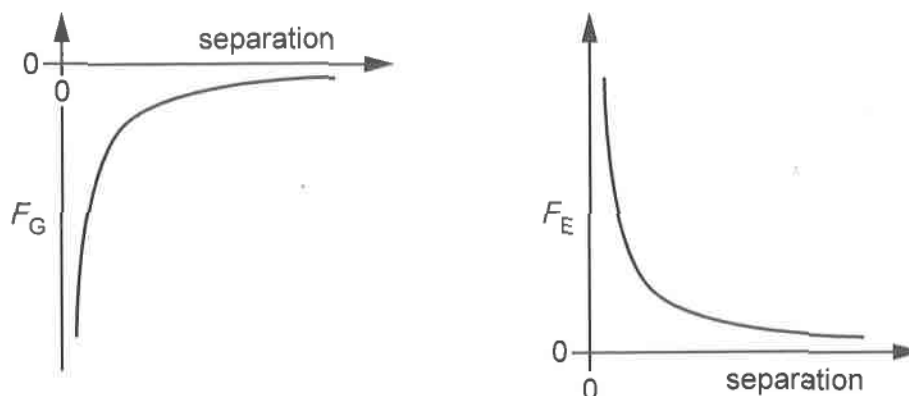


Fig. 3.2

- (i) Explain why the gravitational force and the electric force have opposite signs.

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..... [1]



- (ii) State and explain whether the axes on both graphs are drawn to the same scale.

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..... [2]

- (c) Two charged particles, P and R, are isolated in space and separated by a distance of 6.0 cm, as shown in Fig. 3.3.

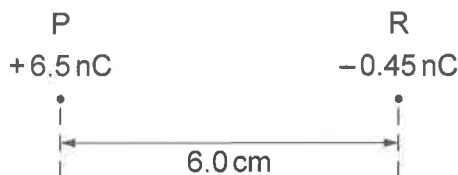


Fig. 3.3

Particle P has a charge of +6.5 nC and particle R has a charge of -0.45 nC.

- (i) Explain whether the electric field strength is zero at any point along a straight line between the two charges.

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..... [1]

- (ii) Explain whether the electric potential is zero at any point along a straight line between the two charges.

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..... [1]

- (iii) An electron is situated on a straight line that passes through P and R.

Determine the distance in cm from P along the line where there is no resultant force on the electron.

distance = cm [2]

[Total: 9]

[Turn over