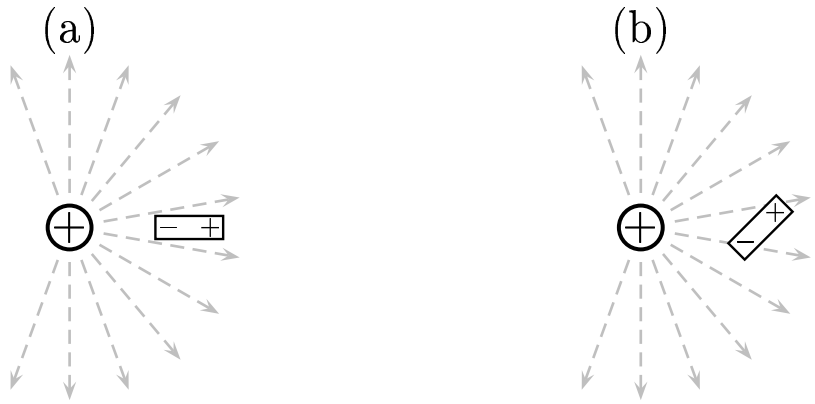
A dipole (electrically neutral) is placed in an external field.



For which situation(s) shown above is the net force on the dipole zero?

A) (a) only

B) (b) only

C) Both (a) and (b)

D) Neither (a) nor (b)

Basic Concepts: Field patterns of point charge and parallel plates of infinite extent.

The force on a charge in the electric field is given by

$$\vec{F} = q\vec{E}$$

$$\Delta\vec{E} = \frac{k\Delta q}{r^2}\hat{r}$$

$$\vec{E} = \sum \Delta\vec{E}_i \, .$$

Symmetry of the configuration will cause some component of the electric field to be zero.

Gauss' law states:

$$\Phi_S = \oint \vec{E} \cdot d\vec{A} = \frac{Q}{\epsilon_0}$$

Solutions: The electric dipole consists of two equal and opposite charges separated by a distance. The electric fields are nonuniform for situations both Figs. (a) and (b). The force will be largest where the field is the strongest. Consequently, there will be a net force in both (a) and (b).

Answer **D**.

23.04-08˙Dipole˙in˙a˙Radial˙Field 2004-3-24