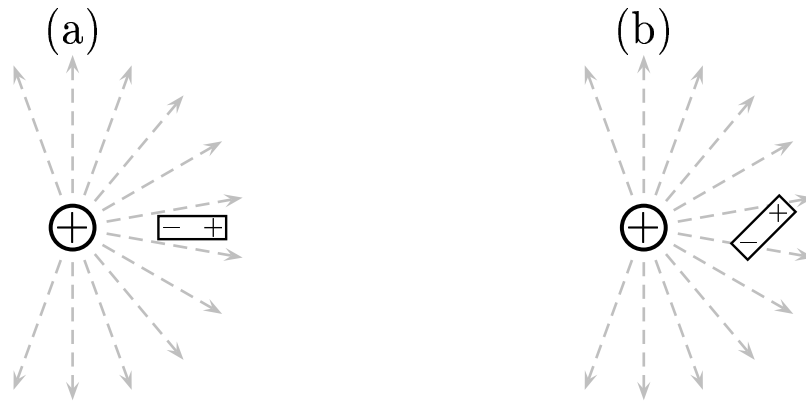


A dipole (electrically neutral) is placed in an external field.



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**.