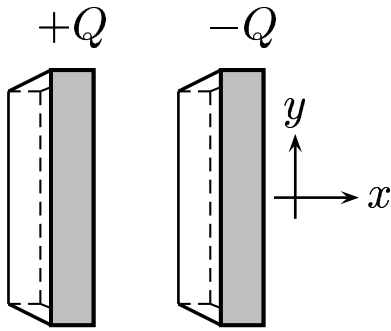


Consider an electrostatic situation. A parallel plate system has a plate charge  $+Q$  on the left-hand plate and a plate charge  $-Q$  on the right-hand plate. Each plate has an area  $A$ .



Determine the the force  $F$  the right-hand plate exerts on the left-hand plate.

A)  $\vec{F}_{left} = \frac{Q^2}{\epsilon_0 A}$ , to the right.

C)  $\vec{F}_{left} = \frac{Q^2}{2\epsilon_0 A}$ , to the right.

B)  $\vec{F}_{left} = \frac{Q^2}{\epsilon_0 A}$ , to the left.

D)  $\vec{F}_{left} = \frac{Q^2}{2\epsilon_0 A}$ , to the left.

The areal charge density is  $\sigma = \frac{Q}{A}$ , therefore

$$E_{gap} = \frac{\sigma}{\epsilon_0} = \frac{Q}{\epsilon_0 A}.$$

The electric field due to the right-hand plate alone contributes to one-half of the total field in the gap; *i.e.*,

$$E_{left} = \frac{\sigma}{2\epsilon_0} = \frac{Q}{2\epsilon_0 A} \Rightarrow \vec{F}_{left} = \frac{Q^2}{2\epsilon_0 A}, \quad \text{to the right.}$$

Answer **C**.