IMPORTANT QUESTION OF ELECTROSTATICS

Force between two identical charges placed at a distance r in vacuum is F. Now a slab of dielectric constant $K = 4$ is inserted between these two charges. The thickness of the slab is $r/2$. The force between the charges will now become

(a) $F/4$ (b) $F/2$ (c) $3F/5$ (d) $4F/9$

NEET/IIT/IB

$$F = \frac{1}{4\pi\varepsilon_0}\frac{q^2}{r^2}$$

Suppose force between the charges is same when charges are r' distance apart in dielectric

$$\therefore \quad F = \frac{1}{4\pi\varepsilon_0}\frac{q^2}{Kr^2} = \frac{1}{4\pi\varepsilon_0}\frac{q^2}{r'^2}$$

Thus distance r' of dielectric is equivalent to $\sqrt{K}r$ distance of air.

In the given situation, force between the charge would be

$$F' = \frac{1}{4\pi\varepsilon_0}\frac{q^2}{\left(\frac{r}{2}+\sqrt{4}\frac{r}{2}\right)^2} = \frac{4}{9}\times\frac{q^2}{4\pi\varepsilon_0 r^2} \quad \Rightarrow \quad F' = \frac{4}{9}F$$

CBSE/NEET/IIT PHYSICS XI,XII

DELHI'S BEST PHYSICS CLASSES

KUMAR PHYSICS CLASSES
E 281 BASEMENT M BLOCK MAIN ROAD GREATER KAILASH 2
NEW DELHI
9958461445,01141032244
www.kumarphysicsclasses.com
Physics
Tutor

NEET MCQ'S FROM KUMAR PHYSICS CLASSES
E 281 BASEMENT M BLOCK MAIN ROAD DELHI 110048
01141032244,9958461445