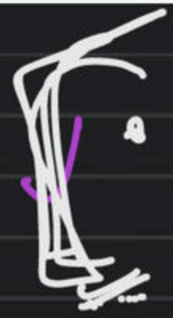
Electrostatics

Practice Course on Physics for BT (Biotechnology)

rahul aggrawal • Lesson 6 • July 28, 2021



• Calculate the electrostatic force between two α- particles separated by 3.2×10^{-15} m.

(a) 45 N (b) 50 N (c) 90 N (d) 100 N

• How far apart the two electron be, if the force b/w them equals the weight of an electron?

(a) 0.117 m (b) 5.1 m

(c) 2.2 m (d) 4.7 cm .

$$W = mg$$

$$= 9.1 \times 10^{-31} \times 10$$

$$= 9.1 \times 10^{-30} \text{ Newton}$$

$$F = K \frac{e^2}{r^2}$$

$$r^2 = \frac{Ke^2}{F}$$

$$r^2 = \frac{9 \times 10^9 \times (1.6 \times 10^{-19})^2}{9.1 \times 10^{-30}}$$

• What is the dimension formula for $\frac{1}{4\pi\varepsilon_0}$?

(a) $[ML T^{-3} A]$

(b) $[M L^3 T^{-4} A^{-2}]$ ✓

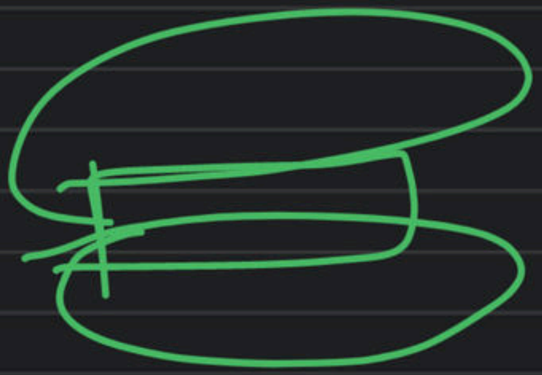
(c) $[M L^2 T^{-4} A^{-1}]$

(d) $[M^{-1} L^3 T^{-4} A^{-1}]$

- Electric field lines are continuous

True

False ✓



- Two charges, one $+5\mu C$ and other $-5\mu C$ are placed 1mm apart. Calculate the dipole moment.

(a) $2 \times 10^{-2} Cm$ (b) $5 \times 10^{-9} Cm$ ✓

(c) $3 \times 10^{-4} Cm$ (d) $7 \times 10^{-3} Cm$

- If an oil drop of weight 3.2×10^{-13} N is balanced in an electric field of 5×10^5 N/C, find the charge on the drop.

(a) 1.6×10^{-19} C (b) 6.4×10^{-19} C

(c) 3.2×10^{-19} C (d) 7.8×10^{-19} C

$$F = qE = mg, \quad q = \frac{mg}{E}$$ ✓

Question
from Radhika

16. *A man can swim in still water at a speed of* 3 km/h. *He wants to cross a river that flows at* 2 km/h *and reach the point directly opposite to his starting point. (a) In which direction should he try to swim (that is, find the angle his body makes with the river flow) ? (b) How much time will he take to cross the river if the river is* 500 m *wide ?*

• An electric dipole, when held at 30° with respect to a uniform electric field of 10^4 N/C, experiences a torque of 9×10^{-26} Nm. Calculate the moment of the dipole.

(a) 2.4×10^{-26} cm

(b) 2.5×10^{-27} cm

(d) 3.2×10^{-4} cm

(c) 1.8×10^{-29} cm

$p = \frac{\tau}{E \sin\theta}$

(e) 2.5×10^{-29} cm

$\tau = pE \sin\theta$ // !

- A charge q is placed at the centre of a cube. What is the electric flux through the cube?

(a) $\frac{q}{8\epsilon_0}$ (b) $\frac{q}{6\epsilon_0}$ (c) $\frac{q}{3\epsilon_0}$

(d) $\frac{q}{\epsilon_0}$

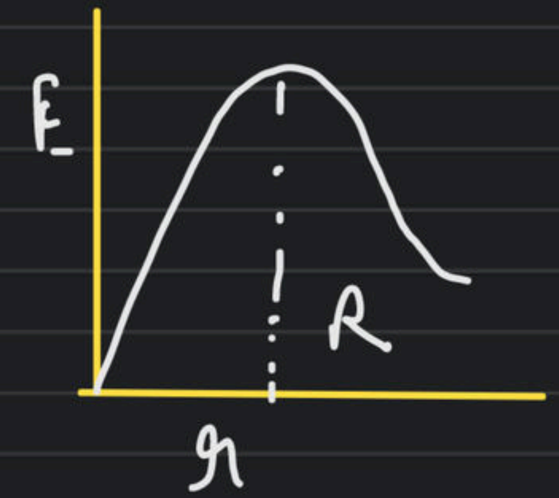
- A charge q is placed at the centre of a cube of side l. What is the electric flux passing through two opposite faces of the cube?

(a) $\frac{q}{\varepsilon_0}$ (b) $\frac{q}{6\varepsilon_0}$ (c) $\frac{q}{3\varepsilon_0}$ (d) $\frac{q}{2\varepsilon_0}$

• In a Uniformly charged sphere of charge Q and radius R, the electric field E is plotted as the f^n of distance from the centre.

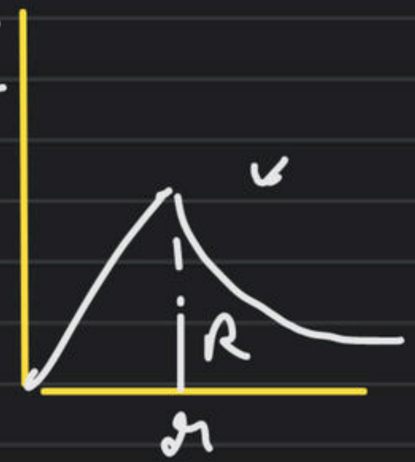
The graph which would correspond to the above will be —

a

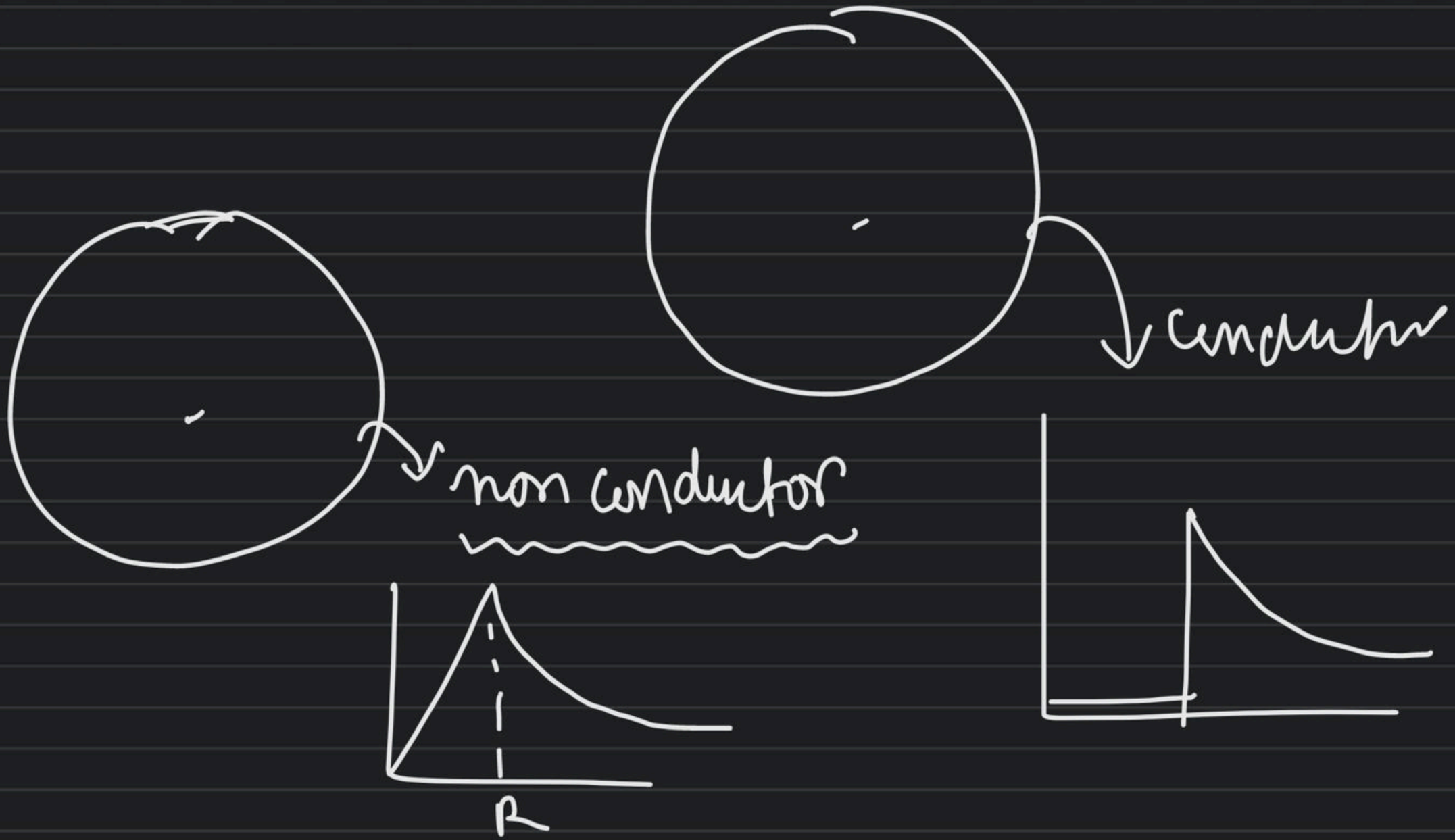


b

c



d


conductor
non conductor
R