Small identical droplets of distilled water (radius 0.1 mm) are found to have a charge of 0.002 esu each. If 64 of these coalesce to form a single drop, the potential of this drop is given by:

(A) 960 mV (B) $960 \mu \text{V}$ (C) 960 MV (D) 960 V

Solution

Charge on large single drop, $Q = 64 \times 0.002 \text{ esu} = 0.128 \text{ esu}$

Let R be the radius of large single drop. Then,

$$64 \times \frac{4}{3} \pi (0.1 \times 10^{-3})^3 = \frac{4}{3} \pi R^3$$

$$\therefore R = 4 \times 0.1 \times 10^{-3} m = 4 \times 10^{-4} m$$

Potential V = $\frac{1}{4\pi \in_0} \frac{Q}{R} = 9 \times 10^9 \times \frac{0.128 \times \frac{1}{3 \times 10^9}}{4 \times 10^{-4}}$ [::1Coul. = 3×10⁹ esu]

 $\therefore V = 960V$

Hence, (D)