QUES 02:-

A paisa coin is made up of Al-Mg alloy and weighs 0.75g. It has a square shape and its diagonal measures 17 mm. It is electrically neutral and contains equal amounts of positive and negative charges. Treating the paisa coins made up of only Al, find the magnitude of an equal number of positive and negative charges. What conclusion do you draw from this magnitude?

Sol. A 0.75 g paisa coin now is made with Al only.

So, the mass of a paisa coin = 0.75g

Atomic mass of Al $\cong$ 27 a.m.u

So, number of moles in 0.75 g = $\frac{0.75}{27}$ mole

Number of Al atoms in coin = N

= $\frac{0.75}{27} \times 6.022 \times 10^{23}$ atoms

Atomic number of Al = 13

$\therefore$ Number of electrons (negative charge) and protons (positive charge) = 13.

So, number of either proton or electron in a coin = $\frac{13 \times 0.75}{27} \times 6.022 \times 10^{23}$

Magnitude of charge on a proton or electron = 1.6 × 10⁻¹⁹ C

So, total charge (either positive or negative)

= $\frac{13 \times 75 \times 6.022 \times 10^{23} \times 1.6 \times 10^{-19} C}{27 \times 100}$

= 3.48 × 10⁴ C

Either positive or negative charge on a coin = 3.48 × 10⁴ C

It concludes that even a 0.75 g Al contains an enormous amount of positive and negative charges and equal in magnitude.