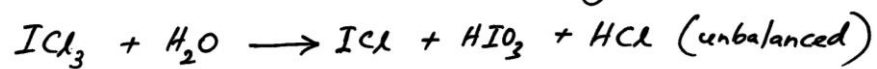


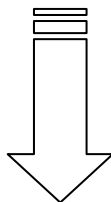
Q2.

Calculate the mass of iodic acid,  $\text{HIO}_3$ , that can form when 610g of iodine trichloride reacts with 110.8g of water.



What mass of the excess reactant remains?

ANSWER





$$n_{ICl_3} = \left(\frac{610}{233.3}\right) = 2.62 \text{ mol}$$

$$M_r(ICl_3) = 233.3 \text{ g mol}^{-1}$$

$$n_{H_2O} = \left(\frac{110.8}{18.015}\right) = 6.15 \text{ mol}$$

$$M_r(H_2O) = 18.015 \text{ g mol}^{-1}$$

$$M_r(HIO_3) = 175.9 \text{ g mol}^{-1}$$

$$\frac{n_{ICl_3}}{2} = \frac{2.62}{2} = 1.31 \leftarrow \text{smallest value}$$

$$\frac{n_{H_2O}}{3} = \frac{6.15}{3} = 2.05$$

$\therefore ICl_3 = \text{limiting reactant.}$

$$n_{HIO_3} = \frac{1}{2} \times n_{ICl_3}$$

$$= \left(\frac{1}{2} \times 2.62\right) \text{ mols} = 1.31 \text{ mols}$$

$$\therefore m_{HIO_3} = (1.31)(175.9 \text{ g mol}^{-1}) = 230.4 \text{ g (Ans)}$$

$$n_{H_2O} = \frac{3}{2} \times n_{ICl_3} = \left(\frac{3}{2} \times 2.62\right) = 3.93 \text{ mols.}$$

$$\therefore m_{H_2O} = (3.93 \times 18.015) \text{ g} = 70.8 \text{ g}$$

(reacted)

$$m_{H_2O} = (110.8 - 70.8) = 40.0 \text{ g (Ans)}$$

(unreacted)

\* The limiting reactant is the one whose  $\left(\frac{n(\text{moles})}{\text{Stoichiometric coefficient}}\right)$  has the smallest value.