Example(5): Calculate the volume of O_2 required for complete combustion of $16\ L$ of butane (C_4H_{10}) at constant temperature and pressure.

Solution: **:**

$$2C_4H_{10}(g) + 13O_2(g) \longrightarrow 8CO_2(g) + 10H_2O(l)$$

2 mol 13 mol

2 volumes 13 volumes

Volume of O_2= $16\ L$ of butane $\times \frac{13 \text{ volumes of oxygen}}{2 \text{ volume of butane}} = \mathbf{104\ L\ of\ oxygen}$

Check: Mole ratio of butane to oxygen is 2:13. Thus, the volume of oxygen required is also 6.5 times greater.