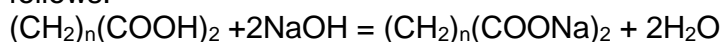# Answer on Question #54793 – Chemistry – Physical Chemistry

**Task:**

Succinc acid has the formula $(CH_2)_n(COOH)_2$ and reacts with dilute sodium hydroxide as follows:

$(CH_2)_n(COOH)_2 + 2NaOH = (CH_2)_n(COONa)_2 + 2H_2O$

2.0 grams of succinic acid were dissolved in water and the solution made up to 250 cm$^3$. This solution was placed in a burette and 18.4 cm$^3$ was required to neutralize 25 cm$^3$ of 0.1 mol/dm$^3$ of NaOH. Deduce the molecular formula of the acid and hence the value of n.

**Answer:**

$$C_M = \frac{v}{V} \qquad\qquad v = \frac{m}{M}$$

$$C_M((CH_2)_n(COOH)_2) \cdot V((CH_2)_n(COOH)_2) = 2 \cdot (C_M(NaOH) \cdot V(NaOH))$$

$$C_M((CH_2)_n(COOH)_2) \cdot 0.0184 = 2 \cdot (0.100 \cdot 0.025)$$

$$C_M((CH_2)_n(COOH)_2) = \frac{2 \cdot (0.100 \cdot 0.025)}{0.0184} = 0.272 \text{ M}$$

$$v((CH_2)_n(COOH)_2) = 0.272 \cdot 0.25 = 0.068 \text{ mol}$$

$$m((CH_2)_n(COOH)_2) = \frac{2.0}{250} \cdot 1,000 = 8 \text{ g/l}$$

$$M((CH_2)_n(COOH)_2) = \frac{8}{0.068} = 117.65 \text{ mol/l}$$

$$M((COOH)_2) = 90 \text{ g/mol}$$
$$M(CH_2) = 14 \text{ g/mol}$$
$$M((CH_2)_n) = 117.65 - 90 = 27.65 \text{ mol/l}$$

$$n = \frac{27.65}{14} \approx 2$$

That is why, the molecular formula of the acid is: $(CH_2)_2(COOH)_2$.