

Task:

if your concentrations of two different acids were the same, would you have to add the same or different amounts of titrant?

Answer:

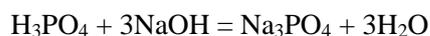
No, the amount of the titrant added depends on how many H⁺ ions there are in the acid or how many OH⁻ ions there are in the base (titrant).

For example, if we titrate 100 mL 0.1M H₃PO₄ and 100mL 0.1M HCl with 0.1M NaOH

1) For the **H₃PO₄** we have:

The amount of H₃PO₄ $n = C(\text{H}_3\text{PO}_4) \times V(\text{H}_3\text{PO}_4) = 0.1\text{M} \times 0.1\text{L} = 0.01 \text{ mol}$

According to the chemical equation



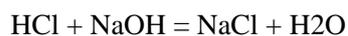
The amount of NaOH needed is $n(\text{NaOH}) = 3 \times n(\text{H}_3\text{PO}_4) = 3 \times 0.01 = 0.03 \text{ mol}$

The volume of NaOH added is $V = n(\text{NaOH}) / C(\text{NaOH}) = 0.03 / 0.1 = 0.3 \text{ L} = \mathbf{300 \text{ mL}}$

2) For **HCl** we have

The amount of HCl $n = C(\text{HCl}) \times V(\text{HCl}) = 0.1\text{M} \times 0.1\text{L} = 0.01 \text{ mol}$

According to the chemical equation



The amount of NaOH needed is $n(\text{NaOH}) = n(\text{HCl}) = 0.01 \text{ mol}$

The volume of NaOH added is $V = n(\text{NaOH}) / C(\text{NaOH}) = 0.01 / 0.1 = 0.1 \text{ L} = \mathbf{100 \text{ mL}}$

As we can see for the same amount of different acids with equal concentrations we have different amount of base (titrant).