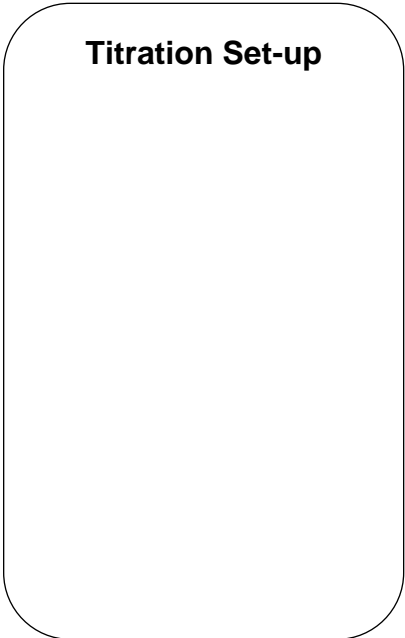# Acid-Base Chemistry Practice
Chemistry

1   Sodium hydroxide is used as a base in a simple acid/base reaction with hydrochloric acid.

a)   Complete the chemical reaction below. Write the names of each chemical (reactants and products) under each respective formula.

Equation: $NaOH(aq) + HCl(aq) \longrightarrow$

Names:

b)   You will need 400mL of 0.15*M* NaOH for this lab. Calculate the mass in grams of NaOH you should mix in water to make this solution.

c)   250mL of 0.80*M* HCl is required for this lab. A 2.0*M* HCl solution is found, so you decide to dilute this for your lab. Calculate the amount of 2.0*M* solution you should use for this dilution with water.

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2   Water molecules can interact with each other.

a)   Why do water molecules interact with one another?

b)   Draw a network of at least five water molecules and show how at least two of them interact.

c)   Draw the autoionization of water. Write names for the products.

3   Titrations are an important part of acid-base analysis.
a)   Write a step by step procedure for performing a titration. Underline required equipment.
b)   Draw a set-up of a titration to the right of the procedure. Label major equipment.

Titration Set-up

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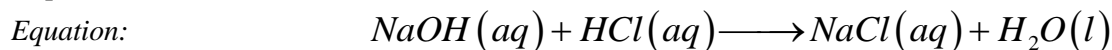
4.   Acids and bases are very important in chemistry.
a)   Give one definition of an acid.

b)   Give one definition of a base.

c)   What is the pH scale? How can you relate acids and bases on the pH scale?

d)   What happens when an acid and a base react? Give an example of such a reaction and diagram any combinations, decompositions, or displacements on the reaction.

1   Sodium hydroxide is used as a base in a simple acid/base reaction with hydrochloric acid.
a)   Complete the chemical reaction below. Write the names of each chemical (reactants and products) under each
       respective formula.

Equation: $$NaOH(aq) + HCl(aq) \longrightarrow NaCl(aq) + H_2O(l)$$

Names: sodium hydroxide   hydrochloric acid   sodium chloride   water

b)   You will need 400mL of 0.15M NaOH for this lab. Calculate the mass in grams of NaOH you should mix in water
       to make this solution.

$$M = \frac{n}{V} \qquad\qquad \Rightarrow\ n = 0.15 \times 0.400 = 0.06 mol\ NaOH$$

$$0.15M = \frac{n}{0.400L} \quad \Rightarrow$$

$$\Rightarrow\ 0.06 mol\ NaOH \cdot \frac{40.00g}{mol} = 2.4g\ NaOH$$

c)   250mL of 0.80M HCl is required for this lab. A 2.0M HCl solution is found, so you decide to dilute this for
       your lab. Calculate the amount of 2.0M solution you should use for this dilution with water.

$$M_1V_1 = M_2V_2$$
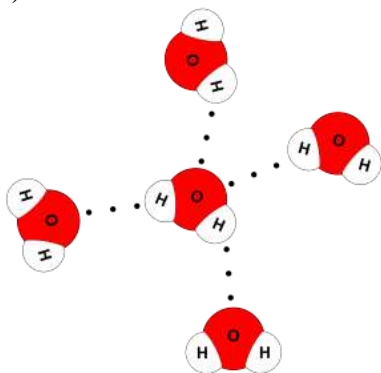
$$2M \cdot V_1 = 0.80M \cdot 250ml$$

$$V_1 = 100ml$$
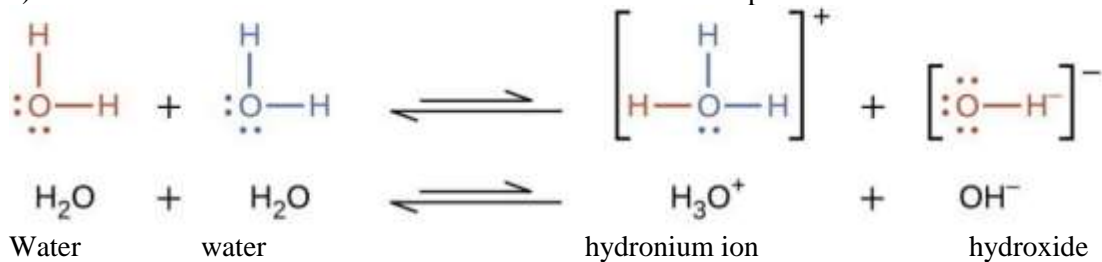
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2   Water molecules can interact with each other.
a)   Why do water molecules interact with one another?

- Hydrogen bonds
- Polarity
- Lone pairs on oxygen

b)   Draw a network of at least five water molecules and show how at least two of them interact.

c)   Draw the autoionization of water. Write names for the products.

$$H_2O \quad + \quad H_2O \quad \rightleftharpoons \quad H_3O^+ \quad + \quad OH^-$$

Water   water   hydronium ion   hydroxide

3   Titrations are an important part of acid-base analysis.
a)   Write a step by step procedure for performing a titration. Underline required equipment.
b)   Draw a set-up of a titration to the right of the procedure. Label major equipment.

|		**Titration Set-up**
1	Fill <u>buret</u> near top with <u>standard</u> <u>solution</u>. Record initial reading.	
2	Obtain unknown acid (or base) using <u>graduated</u> <u>cylinder</u>. Record exact volume. Place in <u>Erlenmeyer</u> <u>flask</u>.	
3	Place one drop of <u>indicator</u> solution (such as phenolphthalein) in flask with unknown.	
4	Place Erlenmeyer flask under buret. Open <u>stopcock</u> on buret and allow standard solution into the unknown dropwise while swirling.	
5	Once color indicator shows change, slow or stop standard solution. Continue adding dropwise until color change is permanent after swirling. Record final buret volume.	
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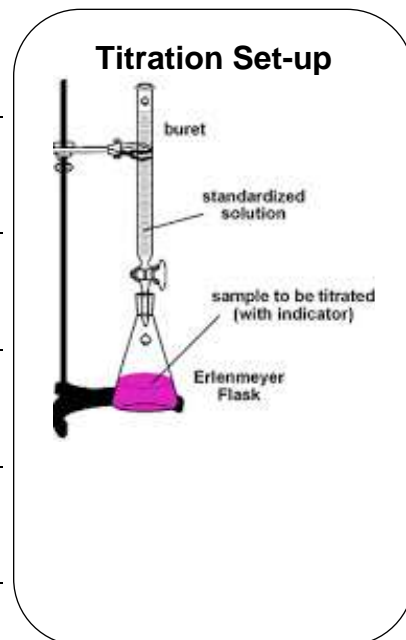
4.   Acids and bases are very important in chemistry.
a)   Give one definition of an acid.
- Excess H^+
- Proton donor
- Electron acceptor
- pH < 7

b)   Give one definition of a base.
- Excess OH^-
- Proton acceptor
- Electron donor
- pH > 7

c)   What is the pH scale? How can you relate acids and bases on the pH scale?
$pH = -\log[H^+]$. Measures acid or base content of a solution compared to neutral water, pH=7. Acids have pH < 7. Bases have a pH > 7.

d)   What happens when an acid and a base react? Give an example of such a reaction and diagram any combinations, decompositions, or displacements on the reaction.
Acid + Base → water + salt

An example is: $NaOH + HCl \rightarrow NaCl + H_2O$