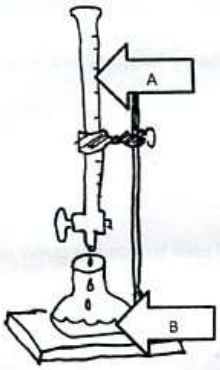
second titration day

Name_____

Period_____



1. If you begin the titration and you are using phenolphthalein, where do you put it? (A / B)
2. If you start out with NaOH in the burette at A and have HCl in the flask at B, the color of the phenolphthalein will be (colorless / pink) at the beginning of the titration and (colorless / pink) at the end of the titration.
3. A student put NaOH in the burette, HCl in the flask, did a titration and recorded the following:
   [NaOH] = 0.449M
   volume of HCl in the flask: 44 mL
   initial reading of the burette: 45.00 mL
   final reading of the burette: 23.76 mL
   Calculate the [HCl]

Answer: $\frac{9.5\times10^{-3}\ \text{mol HCl}}{0.044\ \text{L HCl}} = 0.237\ \text{M HCl}$

4. Calculate the pH of the HCl

↳ $pH = -\log(0.237\ \text{M HCl})$ $\boxed{pH = 0.62}$

1. Which of the following solutions is the most acidic?

a. $[H^+] = 1 \times 10^{-14}$

b. $[OH^-] = 1 \times 10^{-7}$

c. $[H^+] = 1 \times 10^{-7}$

d. $[OH^-] = 1 \times 10^{-9}$

2. When tested, a solution turns red litmus to blue. This indicates that the solution contains more
   a. more H+ ions than OH- ions
   b. more H_3O^+ ions than OH- ions
   c. more OH- ions than H_3O^+ ions
   d. more H+ and OH- ions than H_2O molecules
3. If an aqueous solution turns blue litmus red, which relationship exists between the hydronium ion and hydroxide ion?
   a. $[H_3O^+] < [OH^-]$
   b. $[H_3O^+] = [OH^-]$
   c. $[H_3O^+] > [OH^-]$
   d. Neither ion is present

ANSWERS

second titration day

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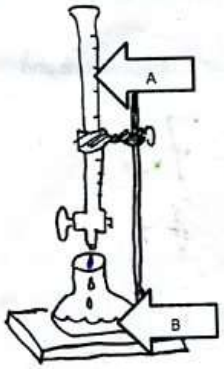

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   [NaOH] = 0.449M
   volume of HCl in the flask: 44 mL
   initial reading of the burette: 45.00 mL
   final reading of the burette: 23.76 mL
   Calculate the [HCl]

① Subtract NaOH volumes: 45.00mL − 23.76mL = 21.24 mL = 0.02124L

② The "lonely number" should be the same substance as for the known concentration.

$$0.02124\ L\ NaOH \times \left(\frac{.449\ mol\ NaOH}{1\ L\ NaOH}\right) \times \left(\frac{1\ mol\ HCl}{1\ mol\ NaOH}\right) = 9.5\times10^{-3}\ mol\ HCl$$

$$.237 = \frac{9.5\times10^{-3}\ mol}{0.044L}$$

.237 moles/L HCl

4. Calculate the pH of the HCl

$pH = -\log(.237)$

pH = 0.62

1. Which of the following solutions is the most acidic?

a. $[H^+] = 1 \times 10^{-14}$

b. $[OH^-] = 1 \times 10^{-7}$ $H^+ = 1\times10^{-7}$

c. $[H^+] = 1 \times 10^{-7}$

d. $[OH^-] = 1 \times 10^{-9}$ $H^+ = 1\times10^{-5}$

ANSWER: D is most acidic

2. When tested, a solution turns red litmus to blue. This indicates that the solution contains more
   a. more H+ ions than OH- ions
   b. more H_3O^+ ions than OH- ions
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FROM HERE DOWN IS SORT OF A REVIEW OF UNIT 9 (APRIL 7 THROUGH APRIL 24)

1. $3\ H_2 + N_2 \rightarrow 2\ NH_3 + 92kJ$

a) How many litres of hydrogen are required to produce 5.0 litres of NH_3 at the same temperature and pressure? Assume STP conditions.

$$5.0\ L\ NH_3 \times \left(\frac{1\ mol\ NH_3}{22.4\ L\ NH_3}\right)\left(\frac{3\ mol\ H_2}{2\ mol\ NH_3}\right)\left(\frac{22.4\ L\ H_2}{1\ mol\ H_2}\right) = 7.5$$

b) What amount of energy is released when 5.00 grams of NH_3 are produced?

$$5.00\ g\ NH_3 \times \left(\frac{1\ mol\ NH_3}{17.04\ g\ NH_3}\right) \times \left(\frac{92\ kJ}{2\ mol\ NH_3}\right) = 13.50\ kJ$$

c) Given the reaction above, what mass of nitrogen is needed to produce 889.0 kJ of energy?

$$889.0\ kJ \times \left(\frac{1\ mol\ N_2}{92\ kJ}\right)\left(\frac{28.02\ g\ N_2}{1\ mol\ N_2}\right) = 270\ grams\ N_2$$

2. $2\ C_{10}H_{22} + 31\ O_2 \rightarrow 20\ CO_2 + 22\ H_2O + 13483kJ$

a) What volume of CO_2 is produced when 17.4 litres of oxygen is used? Assume STP conditions.

$$17.4\ L\ O_2 \times \left(\frac{1\ mol\ O_2}{22.4\ L}\right) \times \left(\frac{20\ mol\ CO_2}{31\ mol\ O_2}\right) \times \left(\frac{22.4\ L\ CO_2}{1\ mol\ CO_2}\right) = 11.2\ L\ CO_2$$

b) What amount of energy is released when 1.00 gram of $C_{10}H_{22}$ is burned?

$$1.00\ g\ C_{10}H_{22} \times \left(\frac{1\ mol\ C_{10}H_{22}}{142.32\ g}\right) \times \left(\frac{13483\ kJ}{2\ mol\ C_{10}H_{22}}\right) = 47.4\ kJ$$

3. $4\ NH_3 + 5\ O_2 \longrightarrow 6\ H_2O + 4\ NO + 905kJ$

a) What mass of NO is produced when 2.0 moles of NH_3 react?

$$2.0 \text{ moles } NH_3 \times \left(\frac{4 \text{ mol NO}}{4 \text{ mol } NH_3}\right)\left(\frac{30.01 \text{ grams NO}}{1 \text{ mol NO}}\right) = 60.02 \text{ grams NO}$$

b) What volume of NH_3 is required to react with 3.00 litres of oxygen at STP?

$$3.0 \text{ L } O_2 \left(\frac{1 \text{ mol } O_2}{22.4 \text{ L } O_2}\right)\left(\frac{4 \text{ mol } NH_3}{5 \text{ mol } O_2}\right)\left(\frac{22.4 \text{ L } NH_3}{1 \text{ mol } NH_3}\right) = \text{liters } NH_3$$

answer: 2.4 liters NH_3

$4\ NH_3 + 5\ O_2 \longrightarrow 6\ H_2O + 4\ NO + 905kJ$

c) What volume of gaseous water, at STP, is produced along with 2.83 litres of NO gas at STP?

$$2.83 \text{ L NO} \left(\frac{1 \text{ mol NO}}{22.4 \text{ L NO}}\right)\left(\frac{6 \text{ mol } H_2O}{4 \text{ mol NO}}\right)\left(\frac{22.4 \text{ L } H_2O}{1 \text{ mol } H_2O}\right) = 4.25 \text{ L } H_2O \text{ gas}$$

d) How much energy is produced when 2.70 grams of NH_3 are burned?

$$2.70 \text{ g } NH_3 \left(\frac{1 \text{ mol } NH_3}{17.04 \text{ grams } NH_3}\right)\left(\frac{905 \text{ kJ}}{4 \text{ mol } NH_3}\right) = 35.8 \text{ kJ}$$