

Chemistry: Spring Final Review
Unit 7: Chemical Equations

NAME _____
Date: _____ Hr _____

1. Give the symbols/states of matter for the following:

Solid = _____ aqueous = _____
= (l) _____ = (g) _____

2. Describe when and where the following are used in a balanced equation.

Superscript: _____ When _____ Where _____

Subscript: _____

Coefficient: _____

3. Relate the Law of Conservation of Mass to balancing an equation:

4. Define the following terms and give an example:

Combustion:

Example: _____

Decomposition:

Example: _____

Synthesis:

Example: _____

Single replacement:

Example: _____

Double replacement:

Example: _____

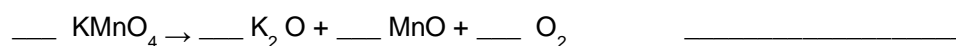
Endothermic Reaction:

Example: _____

Exothermic Reaction:

Example: _____

5. Balance and classify the following reactions:



Unit 8: Stoichiometry

Define the following:

Theoretical Yield:

Actual Yield:

Percent Yield:

Mole Ratio:

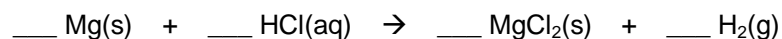
Limiting Reactant:

Excess Reactant:

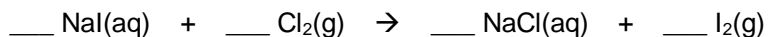
Molar Mass:

Balance the equations; then solve the following problems. Assume that excess amounts of other reactants are available, unless otherwise specified.

1. If 20.0 g of magnesium react with excess hydrochloric acid, what mass of magnesium chloride is produced?



2. How many dm^3 of chlorine gas are needed (at STP) if 10.0 g of sodium chloride must be produced?



3. If 30.0 g of calcium hydroxide react with ammonium sulfate, how many molecules of ammonia are produced?



4. If 554 L of oxygen are consumed at STP, how many kJ of energy are released?



5. If 36.5 g of hydrochloric acid and 73.0 g of zinc are put together...

a. ...write a balanced chemical equation for this reaction.

b. ...determine the limiting reactant.

c. ...find the maximum volume of hydrogen gas formed at STP.

d. ...determine the mass of excess reactant that is left over, if the reaction is 100% efficient.

e. ...find actual volume of hydrogen produced at STP if the percent yield is 91.6%.

Unit 9: The Gas Laws

1. List the top five (5) gases of the atmosphere from the largest percentage to the smallest. Include the percentages.

2. Describe the difference between Greenhouse Effect (greenhouse gases) and Ozone Depletion. (Be sure to include the substances that contribute to each.)

Greenhouse Effect:

Ozone Depletion:

3. The following gases (CO_2 , N_2 , & H_2), on average are at the same temperature and pressure. Put them in order of slowest to fastest and describe why.

4. Kinetic Energy (KE) is related to mass and velocity. To keep the same KE what has to happen to its mass and velocity?

5. PVT Relationships: Describe what happens to the other two under the following conditions: (See your notes)

At constant P _____

At constant V _____

At constant T _____

6. What are the conditions established as STP? (Temp, kPa, atm, mm Hg, L)

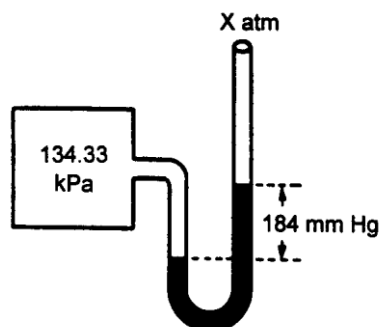
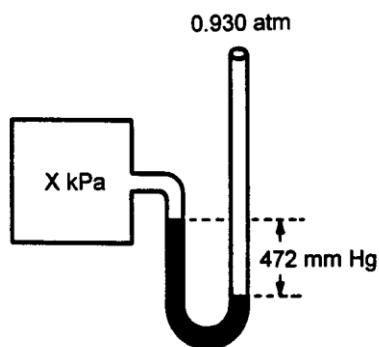
7. Convert 425 K to $^{\circ}\text{C}$

Convert 1965 mm Hg to atm

8. At 350°C , nitrogen has a velocity of 800 m/s. Find the velocity of helium at the same temperature.

9. At room temperature, acetylene (C_2H_2) has a velocity of 480 m/s. At the same temperature, an unknown noble gas has a velocity of 267 m/s. What is the unknown gas?

10. Given the following manometer diagrams, determine the unknown pressure.



Solve each of the problems below, showing your work and using proper units.

11. A sample of hydrogen has an initial volume of 75.0 cm^3 and an initial temperature of 20.0°C . If the temperature drops to -10.0°C and the pressure remains constant, find the new volume.
12. A gas occupies 560.0 dm^3 of space at 120.0°C . To what temperature (in $^\circ\text{C}$) must the gas be cooled for it to occupy 400.0 dm^3 ?
13. At 25.0°C and 121 kPa , find the volume occupied by a 183 g sample of chlorine.
14. At 58°C and an unknown pressure, a sample of oxygen has a volume of 433 mL . If the gas takes up 868 mL at STP, find the initial pressure, in atm.
15. Propane burns according to the equation: $\text{C}_3\text{H}_8(\text{g}) + 5 \text{O}_2(\text{g}) \rightarrow 3 \text{CO}_2(\text{g}) + 4 \text{H}_2\text{O}(\text{g})$
- If the sample of propane occupies 22 L at 30°C and under 12 atm of pressure, how many grams of oxygen are needed to react with all of the propane?

Unit 10: Solutions

1. Define the following terms:

Solution:

Solvent:

What is the most universal/common solvent?

Solute:

Soluble:

Miscible:

Amalgam:

Aqueous solution:

Emulsifying agent:

2. Describe the difference between the following solutions:

Saturated:

Unsaturated:

Supersaturated:

3. What is soap made from?

What is detergent made from?

4. How do polar and nonpolar molecules differ?

Explain "Like dissolves like":

5. Describe how temperature, particle size, and mixing affect the rate of dissolution.

6. Describe how dilution of a solution affects its molarity.

Solve each of the problems below, showing your work and using correct units.

7. Calculate the molarity of the following solutions.

a. 30.0 g of acetic acid (CH_3COOH) in 825 mL of solution

b. 49.0 g of phosphoric acid (H_3PO_4) in 2.05 L of solution

c. 0.375 kg of potassium hydroxide (KOH) in 4750 mL of solution

8. Calculate the number of liters of solution needed to make each of the following.

a. 2.00 M solution using 80.0 g of sodium hydroxide (NaOH)

b. 0.500 M solution using 56 g of ammonium hydroxide (NH_4OH)

c. 6.00 M solution using 126 g of nitric acid (HNO_3)

9. Calculate the mass of solute in the following solutions.

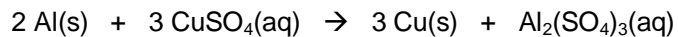
a. 250.0 mL of 2.00 M $\text{Na}_2\text{SO}_4 \cdot 7\text{H}_2\text{O}$ solution

b. 1.500 L of 0.240 M KH_2PO_4 solution

c. 25,000 mL of 4.00 M HCl solution

10. What volume of 2.50 M H_2SO_4 can be made from 4.00 L of 12.3 M H_2SO_4 ?

11. Given the balanced chemical equation:



What volume of 0.25 M CuSO_4 is required to completely react with 125 g of aluminum?

Unit 11: Acids and Bases/Equilibrium

1. Describe the differences between Acids and Bases (include pH scale)

Acid

Base

2. Describe the difference between a strong and a weak acid or base.

3. Define the following terms:

Monoprotic acid:

Diprotic acid:

Dilute vs. Concentrated:

4. List and describe three indicators used to identify acids and bases.

Answer each question below by writing *SHIFT LEFT* (or \leftarrow), *SHIFT RIGHT* (or \rightarrow), or *NO SHIFT* to indicate what happens to the equilibrium position when the indicated stress or condition change occurs.

5. For the balanced chemical equation: $\text{N}_2(\text{g}) + 3 \text{H}_2(\text{g}) \leftrightarrow 2 \text{NH}_3(\text{g}) + \text{energy}$

remove $\text{NH}_3(\text{g})$ _____

decrease pressure _____

6. For the balanced chemical equation:



decrease temperature _____

add a catalyst _____

7. For the balanced chemical equation: $2 \text{SO}_2(\text{g}) + \text{O}_2(\text{g}) \leftrightarrow 2 \text{SO}_3(\text{g}) + \text{energy}$

increase $\text{SO}_2(\text{g})$ concentration _____

increase temperature _____

Solve each of the problems below, showing your work and using correct units.

8. Calculate the concentration of hydroxide ion in an aqueous solution in which the hydrogen ion concentration is $2.42 \times 10^{-12} \text{ M}$. Then calculate the pH and pOH, and tell whether the solution is an acid or a base.

9. Find the hydronium ion concentration in a water solution in the hydroxide ion concentration is $5.11 \times 10^{-8} \text{ M}$. Then calculate the pH and pOH, and tell whether the solution is an acid or a base.

10. Calculate the hydronium and hydroxide ion concentrations in a solution having a pH of 5.46. Also find the pOH, and tell whether the solution is an acid or a base.
11. Calculate the concentration of a magnesium hydroxide solution, given that 99.3 mL of the basic solution is neutralized by 383.0 mL of a 0.325 M solution of nitric acid. Assume 100% dissociation.
12. Calculate the number of milliliters of 0.540 M sulfuric acid required to neutralize 0.750 L of 0.283 M potassium hydroxide. Assume 100% dissociation.
13. Find the pH of a solution consisting of 0.0023 g of H_2SO_4 that is dissolved in 7.38 L of solution.
14. If 956 mL of 5.8×10^{-5} M lithium hydroxide solution are added to the solution of Question 13, find the new pH of the resulting mixture.

Selected Answers

Unit 8

1. 78.4 g MgCl_2
2. $1.91 \text{ dm}^3 \text{ Cl}_2$
3. $4.87 \times 10^{23} \text{ m}^3 \text{ NH}_3$
4. $1.18 \times 10^4 \text{ kJ}$
- 5c. 11.2 L H_2
- 5d. 40.29 g Zn in excess
- 5e. 10.26 L H_2

Unit 9

3. $\text{CO}_2 < \text{N}_2 < \text{H}_2$
7. 152°C
8. 2117 m/s
9. 84.0 g/mol ; Kr
- 10a. 31.3 kPa
- 10b. 1.084 atm
11. 67.3 cm^3
12. 7.71°C
13. 52.8 L Cl_2
14. 2.43 atm
15. 1697.6 g O_2

Unit 10

- 7a. 0.606 M
- b. 0.243 M
- c. 1.41 M
- 8a. 0.250 L
- b. 3.2 L
- c. 0.33 L
- 9a. $134.1 \text{ g Na}_2\text{SO}_4 \cdot 7\text{H}_2\text{O}$
- b. $49.0 \text{ g KH}_2\text{PO}_4$
- c. 3650 g HCl
10. 19.68 L
11. 27.7 L

Unit 11

8. $[\text{H}^+] = 2.42 \times 10^{-12} \text{ M}$
 $[\text{OH}^-] = 0.0041 \text{ M}$
 $\text{pH} = 11.6$
 $\text{pOH} = 2.4$
Base
9. $[\text{H}^+] = 1.96 \times 10^{-7} \text{ M}$
 $[\text{OH}^-] = 5.11 \times 10^{-8} \text{ M}$
 $\text{pH} = 6.7$
 $\text{pOH} = 7.3$
Acid
10. $[\text{H}^+] = 3.5 \times 10^{-6} \text{ M}$
 $[\text{OH}^-] = 3.0 \times 10^{-9} \text{ M}$
 $\text{pH} = 5.46$
 $\text{pOH} = 8.54$
Acid
11. 0.626 M
12. 165 mL
13. 5.20
14. 8.01