Chemistry SOL Review #1 (REG) Name: _____

1) Indicate the number of sig figs for each value below
   0.00230 21.00 3001 0.00034 2.578×10^{3} 4.60×10^{-4}

2) What is the dependent and independent variable in the following experiment: A person changes the wavelength of light to see how a plant grows.

3) A catalyst was used to speed up a reaction. The reaction times were 34.2 sec, 34.6 sec, and 34.5 sec. The CRC handbook reports that the theoretical reaction time is 34.3 sec. Is the data accurate, precise, both, or neither?

4) Label each as qualitative or quantitative:
   Red smoke banana smell 2.3 grams solid to liquid change 126 mL

5) Circle the uncertain or estimated digit:
   4.135 .002456 34.457

6) Put the following numbers into scientific notation
   54000 .000476 180000

7) A student performed three trials to find the density of a rock. Her results were 4.57 g/mL, 4.59 g/mL, and 4.55 g/mL. What value should she report as the density of the rock? Use the correct number of significant figures.

8) The mass of an object was recorded as 4.43 g, 4.40 g, and 4.52 g. What is the average of these three masses expressed to the correct number of significant figures?
   A) 13.35 B) 4.40 C) 4.45 D) 4.450

9) Perform the following conversions:
   600 mL to L 571 mg to kg 8 L to mL

10) What is the density of an object if it has a mass of 24 grams and moves the water level from 4.5 mL to 7.5mL?

11) What is the mass of a piece of copper in grams if its density is 8.92g/ml and it displaces a volume of 12 mL?

12) Which of these would be the best instrument to measure 48.9 mL of sulfuric acid?
   A) test tube B) beaker C) graduated cylinder D) volumetric flask

13) What was the title of each scientists' experiment? Rutherford, Thomson, Millikan

Chemistry SOL Review #2 (Reg) Name: _____

1) What is the percent error if you calculate the density of aluminum to be 2.94 g/mL and the true density of aluminum is 2.70 g/mL

2) Magnesium has three isotopes. Magnesium-24 is 78.9% abundant, Magnesium-25 is 10.0% abundant, and Magnesium-26 is 11.1% abundant. Calculate the atomic mass of magnesium.

3) How many protons, electrons and neutrons are in each of the following:

	p	e	n
S^{-2}			
P			
Fe^{+3}			
$^{28}_{13}Al$			

	p	e	n
Ca			
$^{36}_{17}Cl$			
Sr^{+2}			
F^{-1}			

	p	e	n
Br-79			
N^{-3}			
Ti			
Fe^{+3}			

4) Write the electron configuration of the following: S _____
5) Write the electron configuration of the following: N _____

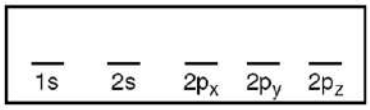
8) Which element has electron configuration ns^2np^3 Mg P Si Cl
9) Which element has electron configuration ns^2np^1 Na S Al Ar

10) Which element is in the same group as $1s^22s^22p^1$? Na C Ga Li
11) Which element is in the same group as $1s^22s^22p^63s^2$? Si Be Na Al

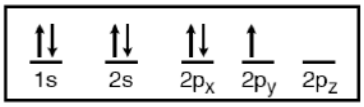
12) What is the octet rule?

13) Orbital box diagram:

O= _____



13b) How does the following orbital box diagram for Nitrogen violate Hund's rule?



_____
_____
_____

14) How many valence electrons are found in each group:
noble gases alkali metals alkaline earth metals halogens

15) Draw the Lewis dot structures for each: P Al Ne

16) What atomic particle gives an atom its identity? _____

17) What is the name of an atom that varies on the number of neutrons? _____

18) How would having different numbers of neutrons affect the atom? _____

Chemistry SOL Review #3 REG Name: _____

1) Which elements would have similar properties to Na? Mg K Al Li

2) Define: Ionic bond _____

3) Define: Covalent bond _____

4) Indicate if each is *ionic/covalent* and *name*: (ex) $MgCl_2$= magnesium chloride (ionic)

SiO_2 Ca_3N_2

AlI_3 Na_2O

F_2O_7 N_2O_4

NH_4OH $Fe_2(CO_3)_3$

5) Indicate if each is *ionic/covalent* and *write formula* (ex) CO_2 carbon dioxide (covalent)

carbon tetrachloride iron III nitride

cobalt (II) phosphide diphosphorous pentoxide

calcium phosphate ammonium nitride

nickel (III) sulfate magnesium oxide

6) What do most acids start with? _____ What do most bases end with? _____

7) Give the formula or write the name for the following acids & bases

strontium hydroxide hydrochloric acid

phosphoric acid nitric acid

H_2SO_4 $Fe(OH)_3$

8) If pH = 12, then pOH = _____ Acid or Base? If pOH = 8, then pH = _____ Acid or Base?

9) If $[H^{+1}] = 1 \times 10^{-4}$ then pH = _____ If litmus paper turns red, then the substance is a(n) _____.

10) What are the seven diatomic molecules? When do they become diatomic?

11) What is used when naming covalent compounds? _____ What is used with transitions? _____

12) What is a period on the periodic table? _____

13) What are two other names for a column on the periodic table? _____

14) Review: for the isotope $^{11}_{8}O^{-2}$ protons = _____ electrons = _____ neutrons = _____

Chemistry SOL Review #4 REG Name: _____

1) What is molarity if 294.3 grams of sulfuric acid (H_2SO_4) is dissolved in 2.8 L of water?

2) What is the final concentration if 50.0 mL of a 2.00 M solution are diluted to 500.0 mL?

3) How many grams of NaCl must be dissolved in 3500 mL of water to make a 0.25 M solution?

4) A 0.500 L solution of 6 M HCl has to be made. How much 12 M HCl is needed?

Find percent composition of each element (round to one decimal place)

5) K_2SO_4 %K = _____ %S = _____ %O = _____

6) $Al(OH)_3$ %Al = _____ % O = _____ % H = _____

Empirical & Molecular Formula Questions

7) A compound has 64% nitrogen and 36% oxygen. What is its empirical formula?
A) NO_2 B) N_2O_4 C) N_2O D) N_4O_2

8) A compound is composed of 39% phosphorus and 61% oxygen and the molar mass is 79 g/mol. What is the molecular formula for this compound?
A) PO_4 B) P_2O_4 C) PO_3 D) P_2O_6

9) The empirical formula for a substance is CH_4. If the molecular mass of the substance is 48, the molecular formula is –
A) CH_4 B) C_2H_8 C) C_4H D) C_3H_{12}

Review

10) Indicate the number of atoms and elements for each compound:

$Ga_2(CO_3)_3$ Elements=_____ Atoms = _____ $(NH_4)_2O$ Elements=_____ Atoms = _____

11) If the pH = 5, what is the pOH? _____ Is the solution acidic or basic? _____
What color would it turn litmus paper? _____

12) The hydrogen ion concentration is 1×10^{-11}. What is the pH of this solution? _____
Is the solution acidic or basic? _____ What color would it turn litmus paper? _____

13) What does pH measure? _____

Chemistry SOL Review #5 REG **Name: _____**

Identify the type of reaction in the blank, complete the reaction, and balance.

_____ Lithium oxide + Gallium nitride →

_____ Potassium nitride →

_____ Aluminum + Chlorine →

_____ Aluminum iodide + Fluorine →

_____ Calcium nitrate + Potassium phosphate →

Half Life Practice:

1) Define ***half-life***: _____
   _____

2) If carbon has a half-life of 5730 years, how much of a 500 grams sample will be left after 17190 years?

3) Radioactive iodine-131 has a half-life of eight days. How much of a 600.0 gram sample will be left after 32 days?

Review

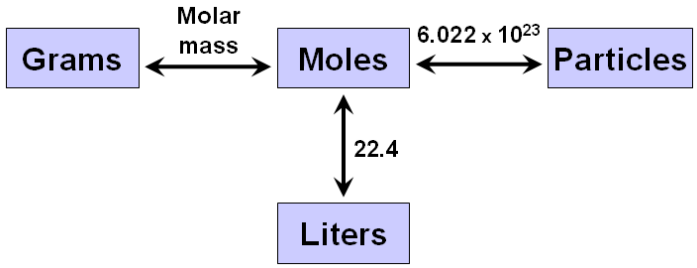
4) What are the seven diatomic elements? *When* are they diatomic?

5) What does a roman numeral tell you about a transition metal?

6) How can you tell if something is ionic or covalent?

SOL Review Notes #6

Molar Conversions -- staying with the same compound
22.4 L of gas at STP = 1 moles of gas at STP *(standard temperature and pressure)*
6.02 X 10^{23} particles = 1 mole



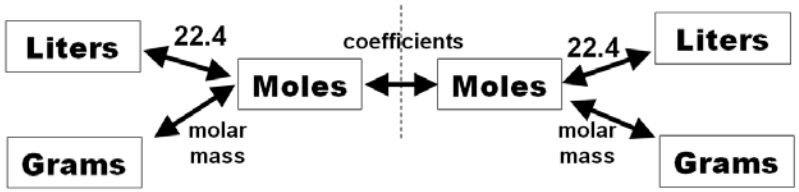
Convert the following

3.45 x 10^{24} molecules N_2O_4 = _____ grams N_2O_4

89.6 L of O_2 at STP = _____ grams O2

128 grams CO_2 at STP = _____ L of CO_2

Stoichiometry – converting between different compounds



Steps
1) Determine what is given and what is needed
2) Set up units to cancel
3) Insert values on chart

$$C_3H_8 + 5\ O_2 \rightarrow 3CO_2 + 4H_2O$$

Ex Using reaction above, calculate how many grams of C_3H_8 are needed to make 176 grams of CO_2

Ex Using the reaction above, how many moles of H_2O can be made if you have 15 moles of oxygen

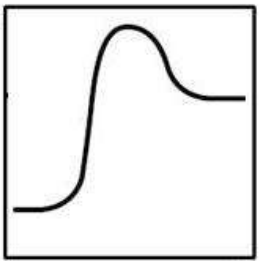
Ex Using the reaction above, how many liters of CO_2 can be made if you have 200 Liters of O_2

Chemistry SOL Review #7 (REG) Name: _____

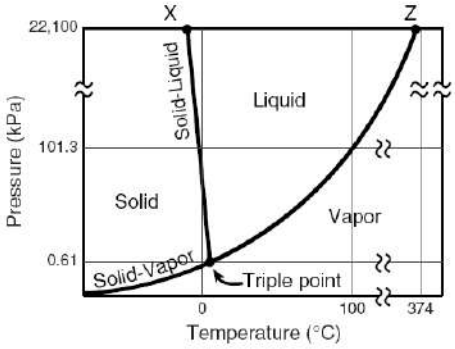
1) Explain three differences between exothermic and endothermic reactions.

2) Indicate the three parts of the definition of a catalyst.

3) Label the following on the graph:
reactants, products, Ea with catalyst,
Ea without catalyst, is it exothermic or endothermic



4) What is the "triple point" of water?



5) Describe the relationship between kinetic energy and an increase in temperature.

6) What happens at absolute zero? What is the temperature of absolute zero in Kelvin and Celsius?

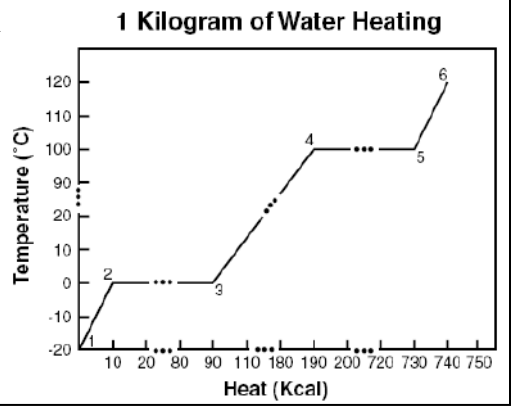
7) What is entropy?

Give an example of an increase in entropy: _____
and a decrease in entropy: _____

8) Define specific heat: _____

9) **Define each phase change-**
Sublimation: _____
Condensation: _____
Melting: _____
Deposition: _____
Boiling: _____
Freezing: _____

10) **Label each part of the heating curve:**



Specific heat problems

11) How many calories of energy are required to raise the temperature of 105g of water from 30.0°C to 70.0°C?

12) A 83.7g sample of nickel absorbs 483 cal of energy when the temperature increases from 13.8°C to 26.8°C. What is the specific heat of nickel?

13) What is the amount of heat required to raise 200.0 g of water from 70.0°C to 100.0°C? Specific heat of water is 4.184 $\frac{J}{g \cdot ^\circ C}$

Chemistry SOL Review #8 (REG) Name: _____

Perform the following conversions

354.5 dm^3 = _____ L

4500 mL = _____ L

25 mL = _____ cm^3

48 ^oC = _____ Kelvin

5.6 dm^3 = _____ mL

322 Kelvin = _____ ^oC

$R = 0.0821 \frac{atm \cdot dm^3}{mol \cdot K}$ $R = 8.314 \frac{kPa \cdot dm^3}{mol \cdot K}$

1) The total pressure of an O_2-Ar-He gas mixture is 644 mmHg. If the partial pressure of Ar is 183 mmHg and the partial pressure of He is 375 mmHg, what is the partial pressure of O_2 ?
Type: _____

2) A balloon starts off with a volume of 4.5 L and has a pressure of 8 atm. What will be the new volume if we increase the pressure to 32 atm.
Type: _____

3) A propane (C_3H_8) tank has a volume of 2.8 liters. If the temperature of the environment is 22^oC, what will be the pressure in kPa if 3.7 mol of propane is added to the tank?
Type: _____

4) A sample of hydrogen is collected of water at 25^oC. The vapor pressure over water at 25^oC is 23.8 mmHg. If the total pressure is 612.8 mmHg, what is the partial pressure of the hydrogen?
Type: _____

5) A car tire has a volume of 17 L at a temperature of 35^oC. What will be the new volume in liters if we heat it up to 55^oC? Type: _____

6) A mixture of gases with a pressure of 753.0 mmHg contains 70% nitrogen and 30% oxygen by volume. What is the partial pressure of oxygen in this mixture? Type: _____

7) In a closed system, 128 grams of oxygen exerts a pressure of 541 kPa at a temperature of 55^oC. What is the volume of this system?
Type: _____

8) What happens to volume as temperature increases? _____
Is this a direct or inverse relationship?

9) What happens to volume as pressure increases?
_____
Is this a direct or inverse relationship?

SOL Review Notes & Practice #9 (REG) **Name: _____**

Molecular Geometry

Compound Lewis Dot Structure Shape _____

(1) Water

(2) PCl_3

(3) CBr_4

(4) BF_3

(5) Cl_2

(6) NH_3

(7) $SiBr_4$

(8) CO_2

(9) N_2