CP CHEMISTRY MP 1 EXAM REVIEW PACKET Name:

# CHAPTER 2

1. a) State the law of conservation of matter and energy \_\_\_\_in any chemical or physical process, matter and energy cannot be created or destroyed. \_\_\_\_\_\_\_

b) Hydrogen reacts with oxygen to produce water. 2 H2 + O2  2 H2O.

How many grams of hydrogen reacts with 32 grams of oxygen to produce 36 grams of water?

2 H2 + O2  2 H2O

4 grams H2

 x + 32 g = 36 g

1. Matter is defined as\_\_\_ anything that has mass and takes up space (has volume)\_\_\_\_\_\_\_\_.
2. What is a physical ***property***? quality of a substance that can be observed or measured without changing the identity of the substance

Example: \_\_\_\_ color \_\_\_\_\_\_\_\_\_\_ Example: \_ freezing-point \_\_\_\_

1. What is a chemical ***property***? \_\_\_\_ quality that describes how a substance reacts \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Example: \_\_\_\_ rusts \_\_\_\_\_\_\_\_\_\_\_\_\_ Example: \_\_\_\_ bake/cook \_\_\_\_\_\_

1. What is a physical ***change***? a change during which some properties of a material change, but the composition of the material does not change

Example: \_\_\_ tear/rip \_\_\_\_\_\_\_\_\_ Example: \_\_\_\_ boil \_\_\_\_\_\_\_\_

1. What is a chemical ***change***? a change that produces matter with a different composition than the original matter

Example: \_\_\_\_\_ rot \_\_\_\_\_\_\_\_\_\_\_\_ Example: \_\_\_\_\_ react \_\_\_\_\_\_\_\_\_\_\_

1. Define element the simplest form of matter that has a unique set of properties; an element cannot be broken down into simpler substances by chemical means.
2. Define compound a substance that contains two or more elements chemically combined in a fixed proportion.
3. Define homogeneous mixture: a mixture that is uniform in composition; components are evenly distributed and not easily distinguished.
4. Define heterogeneous mixture: a mixture that is not uniform in composition; components are not evenly distributed throughout the mixture.
5. **Classify** each as either an element, a compound, homogeneous or heterogeneous mixture.
6. salt \_\_\_compound\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. distilled water \_\_\_compound\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. soil \_\_\_homogenous or heterogeneous mixture\_\_\_\_\_\_\_\_\_\_\_\_
9. air \_\_\_homogeneous mixture\_\_\_\_\_\_\_\_\_\_\_\_
10. carbon dioxide \_\_\_compound\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. gold \_\_\_element\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
12. brass \_\_\_homogeneous mixture (alloy)\_\_\_\_\_\_\_\_\_\_\_\_
13. oxygen \_\_\_element\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
14. mayonnaise \_\_\_homogeneous mixture\_\_\_\_\_\_\_\_\_\_\_\_
15. sea water \_\_\_heterogeneous mixture\_\_\_\_\_\_\_\_\_\_\_\_
16. What two things are classified as pure substances?\_\_\_ compounds \_\_\_\_\_ and \_\_\_\_ elements \_\_\_\_\_\_
17. Describe each of the following separation techniques:
18. crystallization a process that separates homogeneous mixture (liquid evaporates and crystal stays behind)

b) distillation a process used to separate components of a mixture using differences in boiling points

1. filtration a process that separates a solid from the liquid in a heterogeneous mixture

# CHAPTER 3

1. The density of sulfur is 2.06 g/cm3. Find the volume of 34.9 grams of sulfur.

 V = $\frac{m}{D}$ = $\frac{34.9 g}{2.06 g/cm3}$

16.94 cm3

1. A piece of iron (mass = 47.5 grams) is placed into a graduated cylinder filled with 50.0 ml of water. The new volume reading on the graduated cylinder is (with the metal) is 62.0 ml. Calculate the density of iron.

 V = 62.0 ml – 50.0 ml = 12.0 ml

3.96 g/ml

 D = $\frac{m}{v}$ = $\frac{47.5 g}{12.0 mL}$



1. Make the following metric conversions using dimensional analysis.

a) 0.044 m = \_\_44.00\_\_\_\_\_\_ mm b) 0.063 kg = \_\_\_0.14\_\_\_\_\_ pound

0.044 m 1000 mm 0.063 kg 1000 g 1 pound

 1 m 1 kg 454g

1 foot = 12 inches

2.54 cm = 1 inch

5280 ft = 1 mile

1. Convert 0.50 miles to m.

804.7 m

 0. 50 miles 5280 ft 12 inches 2.54 cm 1 m
 1 mile 1 foot 1 inch 100 cm

1. Read each piece of lab equipment below:

 \_\_\_35.0\_\_ mL \_\_\_\_28.1\_\_\_\_\_ °C

1. Define mass \_\_\_\_\_\_ the amount of matter that an object contains \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Define volume \_\_\_\_ the space occupied by a sample \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

10. State the use of each piece of lab equipment listed below and what it is used to measure:

a. beaker: holds liquids (mL)

b. funnel: to put solids or liquids into another container.

c. graduated cylinder: to measure precise volumes of liquids (mL)

d. balance: measures mass (g)

e. stirring rod – used to stir solutions

f. ruler – used to measure length (cm)

## CHAPTER 4

1. Atoms are composed of \_\_protons\_\_\_\_\_\_\_\_, \_\_neutrons\_\_\_\_\_\_\_\_\_\_, and \_\_electrons\_\_\_\_\_.
2. The mass number of an element is the total number of \_\_ protons \_\_\_\_\_\_ + \_\_\_ neutrons \_\_\_\_\_\_\_\_
3. Define atom \_\_\_\_ smallest particle of an element that retains its identity in a chemical reaction \_\_\_\_\_
4. C-12 and C-14 are isotopes. What does that mean? \_\_\_\_they are atoms of the same element that have the same atomic number but different atomic masses due to a different number of neutrons\_\_\_\_.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Complete the table using the periodic table. Round when necessary.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Isotopic Notation** | **# of protons** | **# of neutrons** | **# of electrons** | **charge** |
| $$**+** | **37** | **48** | **36** | **+1** |
| $$**+** | **11** | **12** | **10** | **+1** |
| $$**-** | **35** | **45** | **36** | **-1** |
| **12C** | **6** | **6** | **6** | **0** |
| **14C** | **6** | **8** | **6** | **0** |

1. There are two isotopes of lithium, Li-6 and Li-7, found in nature at 7.50% and 92.5% respectively. Calculate the average atomic mass of lithium.

(6)(7.50) + (7)(92.5)

6.9 amu

 100

1. Determine the mass of 0.25 moles of silver.

0.25 moles 107.9 g Ag

27.0 g Ag

1 mole

1. How many atoms are in 45 g of aluminum?

1.0 x 1024 atoms

45 g Al 1 mol 6.02 x 1023 atoms

 27.0 g Al 1 mol

**CHAPTER 5**

1. All waves have what four properties? \_\_ wavelength \_\_\_\_\_\_, \_\_\_\_\_\_ frequency \_\_\_\_\_\_

\_\_\_\_\_\_\_\_ energy \_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_ amplitude \_\_\_\_\_\_\_\_\_\_

1. Arrange the types of electromagnetic radiation listed below in order of INCREASING (smallest to largest) energy, wavelength and frequency:

**red light, violet light, radio waves, gamma rays**

energy: \_radio\_\_\_\_\_\_\_\_\_ < \_\_red\_\_\_\_\_\_\_\_\_\_ < \_\_violet\_\_\_\_\_\_\_\_\_\_\_ < \_\_gamma\_\_\_\_\_\_\_

wavelength: \_gamma\_\_\_\_\_\_\_\_ < \_\_violet\_\_\_\_\_\_\_\_ < \_\_red\_\_\_\_\_\_\_\_\_\_\_\_ < \_\_radio\_\_\_\_\_\_\_

frequency: \_\_radio\_\_\_\_\_\_\_\_\_ < \_\_red\_\_\_\_\_\_\_\_\_\_ < \_\_violet\_\_\_\_\_\_\_\_\_\_\_ < \_\_gamma\_\_\_\_\_

1. If you double the energy of a wave, the wavelength will \_\_\_\_\_\_\_\_ cut in half \_\_\_\_\_\_\_\_\_\_\_\_\_.

Sketch a graph for this relationship:



1. If you cut the frequency of a wave in half, the energy will \_\_\_\_\_\_\_\_\_ cut in half \_\_\_\_\_\_\_\_\_\_\_\_\_.

Sketch a graph for this relationship:



1. When an electron jumps from the excited state to the ground state, it \_\_\_\_\_releases\_\_\_\_ energy in the form of light.

**CHAPTER 25**

1. Complete the chart:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Name** | **Symbol** | **Charge** | **Mass** | **Level of Radiation** |
| Alpha | $$ or **** | 2+ | 4 | **Low** (0.05 mm body tissue) |
| Beta | $ $or **** | 1– | 1/1837 ~ 0 | **Moderate** (4 mm body tissue) |
| Gamma | **** | 0 | 0 | **Very high** (penetrates body easily) |

1. Complete the following nuclear reactions:
2. $$ 🡪 (alpha decay) $$ **🡪** $$ **+** $$
3. $$ 🡪 (beta decay) $ $🡪 $ $**+** $$
4. $$🡪 ****$$ + $$
5. $$+ $$$$ + $$

# CHAPTER 6

1. Label what each of the following parts of the orbital diagram represents, then identify the name of the element ending with this electron configuration:



A. **number of electrons**

B. **sublevel**

C. **energy level**

Name of the element: **Strontium**

1. Complete the chart below using the Periodic Table.

|  |  |  |
| --- | --- | --- |
| **Element** | **Electron Configuration****(complete or abbreviated)** | **Electron Dot Diagram** |
| 14Si | [Ne] 3s23p2 |  |
| 38Sr |  |  |
| 25Mn |  |  |

1. What was Mendeleev’s contribution to the development of the periodic table?\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_ he designed the first periodic table according to atomic mass \_\_\_\_\_\_\_\_\_\_

1. How did Moseley change Mendeleev’s periodic table? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_ he rearranged the periodic table so it was organized by atomic number \_\_\_\_\_\_\_\_\_\_\_\_\_

1. State the Periodic Law. when the elements are arranged in order of increasing atomic number, there is a periodic repetition of their physical and chemical properties

4. 4. Rows on the periodic table are called\_\_\_\_\_\_\_\_\_\_\_\_\_ periods \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. Columns on the periodic table are called groups\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. Name the following:

 a) Group I b) Group II c) Group VII

 alkali metals alkaline earth metals halogens

d) Group VIII e) the “d” block f) the “s” block

 noble gases transition metals alkali, alkaline

 g) elements on the staircase

 metalloids

1. A metal \_\_\_\_\_\_\_\_ loses \_\_\_\_\_\_\_\_\_\_\_\_\_\_ electrons in an ionic bond.
2. Nonmetals normally \_\_\_\_gain\_\_\_\_\_\_ electrons in an ionic bond or \_\_\_\_\_\_share\_\_\_\_\_\_\_\_ electrons in a covalent bond.
3. Define ionization energy and state its trend on the periodic table.

 Definition: \_\_ the energy required to remove an electron from an atom \_\_\_\_\_\_\_\_\_\_\_\_\_

 Trend: \_\_\_\_\_ increases across and up the periodic table \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Circle the element with higher ionization energy: Al or S F or I F or Ne

1. Define electronegativity and state its trend on the periodic table.

 Definition: \_\_ the ability of an atom to attract electrons \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Trend: \_\_ increases across and up the periodic table (except NOBLE GASES)\_\_\_

Circle the element with higher electronegativity: Al or S F or I F or Ne

1. Define atomic radius and state its trend on the periodic table.

 Definition: \_\_ one-half the distance between the nuclei of two adjacent atoms \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Trend: \_\_\_\_\_ increases to the left and down the periodic table \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Circle the element with the larger radius: Al or S F or I

1. When K turns into K1+, does it get larger or smaller? Why?

It gets smaller because the K atom loses an electron, so the nuclear pull on the remaining electrons is greater. It also loses an energy level\_\_\_\_\_\_\_\_\_\_

1. When O turns into O2-, does it get larger or smaller? Why?

It gets larger due to the increased amount of electrons. The nuclear pull is less on the greater number of valence electrons in the outer most energy level. Also, shielding remains constant.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. List the 7 diatomic elements.

 \_H2\_\_\_\_ \_\_N2\_\_\_\_ \_\_F2\_\_\_\_ \_\_O2\_\_\_\_ \_\_I2\_\_\_\_ \_\_Cl2\_\_\_\_ \_Br2\_\_\_\_\_

1. How many molecules are in 44.0 g of nitrogen gas?

9.5 x 1023 molecules

44.0 g N2 6.02 x 1023  molecules

28 g N2

**CHAPTER 7-8 (Bonding)**

# 16. a. Complete the chart below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **molecule** | **VSEPR diagram** | **geometry****(linear, bent, trigonal pyramidal, trigonal planar, tetrahedral)** | **angle** | **nonpolar/polar?** |
| CH2Cl2 |  | **tetrahedral** | **109.5°** | **polar** |
| HCN |  | **linear** | **180°** | **polar** |
| NI3 |  | **pyramidal** | **<109.5°** | **polar** |

**b.** Draw the Lewis structure for the compound below:

|  |  |  |
| --- | --- | --- |
| **Compound** | **Before bonding** | **After bonding** |
| AlF3 |  |  3 |
| Li2O |  | http://img1.mnimgs.com/img/shared/discuss_editlive/1984467/2013_11_21_21_18_24/nprkeust2800690202533088098.jpg |

17. Use the electronegativity values and scale provided to determine the type of bond that exists between the listed pair of atoms within a compound.

|  |  |
| --- | --- |
| Element | Electronegativity |
| Rb | 0.8 |
| Ca | 1.0 |
| H | 2.1 |
| O | 3.5 |
| Cl | 3.0 |

**Difference in electronegativity**

 **4.0 1.7 0.4 0**

|  |  |  |
| --- | --- | --- |
| **Ionic** | **Polar-covalent bond** | **Non-polar covalent bond** |

|  |  |  |
| --- | --- | --- |
| **a) Ca-Cl in CaCl2****3.0-1.0 = 2.0** **IONIC** | **b) Rb – O in Rb2O****3.5 – 0.8 = 2.7** **IONIC** | **c) H-O in H2O****3.5-2.1 = 1.4****POLAR COVALENT** |

18. **Mole Conversions for Ionic Compounds**

1. How many moles are in 12.3g of sodium chloride? **0.21 mol NaCl**
2. Find the mass of 4.85 x 1024 formula units of potassium nitride. **1,057.90g K3N**
3. How many molecules are in 25.5g fluorine? **4.04 x 1023 mlc F2**

#  d) How many moles are in 5.36 x 1025 atoms of carbon? 0.89 mol C

# CHAPTER 9 (Nomenclature)

19. **Name the following**

a) P2O5 diphosphorus pentoxide

b) CaCO3 calcium carbonate

c) CCl4 carbon tetrachloride

d) NH4F ammonium fluoride

e) AlN aluminum nitride

f) Mg(NO2)2 magnesium nitrite

20. **Write formulas for the following:**

1. lead (IV) sulfide PbS2
2. magnesium chloride MgCl2
3. sulfur dibromide SBr2
4. dinitrogen trioxide N2O3
5. ammonium oxide (NH4)2O
6. chromium (III) hydroxide Cr(OH)3
7. dinitrogen tetraoxide N2O4
8. iron (II) nitrite Fe(NO2)2
9. sodium carbonate Na2CO3

**Chapter 10 Chemical Quantities**

**21. FORMULA WRITING & MOLAR MASS**

|  |  |  |  |
| --- | --- | --- | --- |
| **NAME** | **FORMULA** | **WORK for MOLAR MASS CALCULATION** | **FINAL ANSWER** |
| Nickel (II) hydroxide | **Ni(OH)2** |  |  |
|  dicarbon tetrachloride | **C2Cl4** | **2C = 2 x 12.01 = 24.02****4 Cl = 4 x 35.45 = 141.8** | **165.82 g/mol****C2Cl4** |
| Calcium Nitrate  | **Ca(NO3)2** | **1 Ca = 1 x 40.1 = 40.1 +** **2 N = 2 x 14.01 = 28.02 +** **6 O = 6 x 16 = 96**    | **164.12 g/ mol** **Ca(NO3)2** |

22. Find the percent composition (% of each element) for calcium nitrate.

 40/164 \*100 = 24.39 %

 28.02/164 \*100 = 17.07 %

 96/164 \*100 = 58.54 %

 % Ca \_24.4%\_\_\_\_\_

%N \_17.1%\_\_\_\_\_\_\_

% O \_58.5%\_\_\_\_\_\_\_

23. Determine the mass of calcium in 47.0g of calcium nitrate.

b. Determine the mass of calcium nitrate that contains 12.0g of calcium

24. **Mole conversion Covalent Compounds**

a. How many molecules are in 14.0 g of dicarbon tetrachloride.

**14.0 g C2Cl4 1 mole C2Cl4 6.02 x 1023 molecules C2Cl4 =5.08 x 1022 molecules C2Cl4**

 **165.82 g C2Cl4 1 mole C2Cl4**

b. Find the mass of 1.50 moles of dicarbon tetrachloride.

**249.0 g C2Cl4**

**1.50 moles C2Cl4 165.82 g C2Cl4 =**

 **1 mole C2Cl4**

25. A student does a lab to determine the molar mass of barium chloride. In lab, he determines the mass to be 216.0 g/mol. Find his **percent error.**

BaCl2 = (1 x 137.3) + (2 x 35.5) = 208.3 g/mol (actual)

Percent error = experimental value - actual value x 100% = 3.56%

 actual value

Percent error = 216.0 - 208.3 x 100% = 3.70%

208.3

**3.70%**

**26. The following information is obtained in a CuSO4 • X H2O hydrate lab:**

**3.70%**

|  |  |
| --- | --- |
| mass of the evaporating dish | 22.00g |
| mass of the evaporating dish **and hydrate** | 24.50g  |
| mass of the evaporating dish **and anhydrous powder** | 23.59g  |

a) Find the mass of hydrate:

b) Find the mass of anhydrous compound:

c) Find the mass of the water driven off.

**Chapter 14 Gases**

27. What are the three components to the kinetic theory (for gases)?

1. **The particles in a gas are assumed to be small, hard spheres with an insignificant volume.**
2. **The motion of particles in a gas is rapid and random.**

**3. All collisions between gas particles and the walls of the container they are in are perfectly elastic.**

28. Pressure and volume of a gas at constant temperature are **inversely** proportional. If the volume of a gas triples, its pressure will **decrease by one third**

29. Volume and temperature of a gas at constant pressure are **directly** proportional. If the volume of a gas triples, its temperature will **triple**

30. Pressure and temperature of a gas at constant volume are **directly** proportional. If the temperature of a gas triples, the pressure will **triple**

31. If two containers are at the same temperature and pressure and their volumes are equal, they must contain the same number of **particles**

32. Molecules of oxygen gas and nitrogen gas are at the same temperature in equal sized flasks. Which molecules are moving faster? **Nitrogen since one N2 molecule is lighter than one O2 molecule (N2 has a molar mass of 28g/mol and O2 has a molar mass of 32 g/mol)**

33. If the oxygen gas molecules and nitrogen gas molecules in the scenario above are all at the same temperature, which gas has the greatest average kinetic energy? **Neither - temperature is a measure of average kinetic energy, and the temperature for both substances is the same**

34. A balloon is filled with 3.0 L of helium at 1 atm. What is the volume of the balloon when the pressure is only 0.25 atm? (ans: 12L)

Formula: **P1 V1= P2V2**

 **(1 atm)(3.0L)= (0.25atm)(x)**

**x= 12L**

35. The gas left in a used aerosol can is at a pressure of 3.4 atm at 27.0°C. If this can is thrown into a fire, what is the pressure of the gas when its temperature reaches 500.0°C? (ans: 8.8 atm)

Formula:  **P1 =P2 3.4 atm = P2 = 8.8ATM**

 **T1  T2 300 K 773 K**

36. 5.2 L of a gas is at STP. Find the new volume when the temperature rises to 38°C and the pressure drops to 600.0 mmHg. (ans: 7.5L)

Formula: **P1V1 = P2V2 (760mmHg)(5.2L) = (600mmHg)(V2) = 7.5L**

 **T1 T2 273K 311K**

37. Find the volume occupied by 14.0g of carbon dioxide at 25ºC and 0.880atm. (ans: 8.84L)

Formula: **PV = nRT**

**14.0g CO2 1 mol CO2 = 0.32 mol CO2**

 **44g CO2**

**0.88atm (V) = 0.32mol(0.0821)(298K)**

**V = 8.84 L**