

**GENERAL CHEMISTRY 2010-11**  
**First Semester Review Worksheet – ANSWERS**

- 2) Are the following physical or chemical changes?  
 a) boiling water to form steam – **physical**      b) hard-boiling of an egg – **chemical**
- 3) Classify each of the following as an element, a compound or a mixture.  
 a) iron, Fe                              b) a Pepsi                              c) baking soda,  $\text{NaHCO}_3$   
**element**                              **mixture**                              **compound**
- 4) Butane freezes at  $-130^\circ\text{C}$ . What is its freezing temperature in  $^\circ\text{F}$ ,  $^\circ\text{K}$ ?  
 $-130^\circ\text{C} + 273 = \mathbf{143\text{ K}}$   
 $-130^\circ\text{C} * 1.8 + 32 = \mathbf{-202^\circ\text{F}}$
- 5) Perform the indicated operations, giving the answer with the proper number of significant digits.:  
 a)  $13.67\text{ mL} + 2.845\text{ mL} + 1.3\text{ mL}$                               b)  $\frac{84 \times 2.50 \times 156.8}{0.034 \times 2.1568}$                               **450000**  
**17.8 mL**
- 6) Perform the following calculations:  
 a)  $\frac{25.6 + 34.8}{.048 - .0325}$                               b)  $\frac{(2.6 \times 10^5)^2}{(3.2 \times 10^{-5}) \times 48}$                               c)  $0.00073 \times 10^5 - 61000 \times 10^{-2}$   
**3900**                               **$4.4 \times 10^{13}$**                               **- 540**  
 d)  $3.5 \times 10^4 \times 2.25 \times 10^2$   
 **$7.9 \times 10^6$**
- 7) What is the density of a metal if 48 g of the metal caused the water level inside a graduated cylinder to rise from 30 mL to 36 mL when the metal is added to the water?  
 $36 - 30 = 6\text{ mL}$   
 $d = \frac{m}{v} = \frac{48\text{ g}}{6\text{ mL}} = \mathbf{8.0\text{ g/mL}}$
- 8) What is the density of a liquid if an empty graduated cylinder has a mass of 25.0 g and a mass of 40.0 g when filled with 20.0 mL of the liquid?  
 $40.0 - 25.0 = 15.0\text{ g}$   
 $d = \frac{m}{v} = \frac{15.0\text{ g}}{20.0\text{ mL}} = \mathbf{0.750\text{ g/mL}}$
- 9) Perform the following conversions:  
 a) 25 mg to grams                              d) 2.5 gal to milliliters  
**0.025 g**                              **9500 mL**  
 b) 0.25 inches to millimeters                              e) 2.5 tons to kilograms  
**6.35 mm**                              **2300 kg**  
 c) 8.25 Km to cm                              f) 20 Km/L to miles/gal  
 **$8.25 \times 10^5\text{ cm}$**                               **47 mi/gal**
- 10) What mass in grams is contained in a 5.0 gallon container of gasoline? ( $d = 0.87\text{ g/mL}$ )  
 $m = d \times v = \frac{0.87\text{ g}}{\text{mL}} \times \frac{5.0\text{ gal}}{1} \times \frac{3800\text{ mL}}{\text{gal}} = 16530 \text{ } \Rightarrow \mathbf{17000\text{ g}}$
- 11) A beaker with a diameter of 4.0 inches and a height of 8.0 inches will hold how many pounds of mercury? (Density of mercury =  $13.6\text{ g/cm}^3$ ;  $V_{\text{cylinder}} = \pi r^2 h$ )  
 $m = d \times v = \frac{13.6\text{ g}}{\text{mL}} \times \frac{\pi (2.0\text{ in})^2 (8.0\text{ in})}{1} \times \frac{(2.54\text{ cm})^3}{(1\text{ in})^3} \times \frac{1\text{ lb}}{453.6\text{ g}} = \mathbf{49.4\text{ lb}}$

- 12) An atom contains 17 protons, 20 neutrons, and 17 electrons. For this atom give:
- |                      |                    |                            |
|----------------------|--------------------|----------------------------|
| a) the atomic number | b) the mass number | c) the name of the element |
| <b>17</b>            | <b>37</b>          | <b>Chlorine</b>            |
- 13) How many of the following are contained in one atom of  $^{112}\text{Cd}^{+2}$ :
- |            |             |              |
|------------|-------------|--------------|
| a) protons | b) neutrons | c) electrons |
| <b>48</b>  | <b>64</b>   | <b>46</b>    |
- 14) Find each of the following on the periodic table. State whether it is a metal or a non-metal, give the charge of the ion(s) it forms, and the names of those ions.
- |  |  |   |
|--|--|---|
| a) sodium  | b) sulfur  | c) iron   |
| <b>metal, <math>\text{Na}^+</math>, sodium ion</b> | <b>nonmetal, <math>\text{S}^{2-}</math>, sulfide</b> | <b>metal, <math>\text{Fe}^{+2}</math>, iron(II)</b><br><b>metal, <math>\text{Fe}^{+3}</math>, iron(III)</b> |
- 15) What is the molar mass of magnesium acetate?
- |   |                     |
|---|---------------------|
| $\text{Mg}(\text{C}_2\text{H}_3\text{O}_2)_2$ | <b>142.42 g/mol</b> |
|---|---------------------|
- 16) Make the following formulas correct by adding the proper subscripts:
- |  |                                      |                                       |                                    |                                      |  |
|--|--------------------------------------|---------------------------------------|------------------------------------|--------------------------------------|--|
| a) <b><math>\text{Na}_2\text{O}</math></b> | b) <b><math>\text{Ca F}_2</math></b> | c) <b><math>\text{Al Cl}_3</math></b> | d) <b><math>\text{Zn O}</math></b> | e) <b><math>\text{Ni I}_2</math></b> | f) <b><math>\text{Ba}_3(\text{PO}_4)_2</math></b><br>or <b><math>\text{Ba}_3(\text{PO}_3)_2</math></b> |
|--|--------------------------------------|---------------------------------------|------------------------------------|--------------------------------------|--|
- 17) Name the following compounds:
- |  |  |   |
|--|--|---|
| a) $\text{BaCl}_2$<br><b>barium chloride</b>               | e) $\text{SnI}_2$<br><b>tin(II) iodide</b>                               | i) $\text{HBr}$<br><b>hydrogen bromide</b> or<br><b>hydrobromic acid</b>            |
| b) $\text{Cr}_2\text{S}_3$<br><b>chromium(III) sulfide</b> | f) $\text{SiO}_2$<br><b>silicon dioxide</b>                              | j) $\text{NH}_4\text{NO}_2$<br><b>ammonium nitrite</b>                              |
| c) $\text{FeBr}_3$<br><b>iron(III) bromide</b>             | g) $\text{Na}_2\text{SO}_3$<br><b>sodium sulfite</b>                     | k) $\text{Mg}(\text{HSO}_4)_2$<br><b>magnesium hydrogen sulfate</b>                 |
| d) $\text{SCl}_2$<br><b>sulfur dichloride</b>              | h) $\text{HClO}_3$<br><b>chloric acid</b> or<br><b>hydrogen chlorate</b> | l) $\text{H}_2\text{SO}_3$<br><b>dihydrogen sulfite</b> or<br><b>sulfurous acid</b> |
- 18) Give formulas for the following compounds:
- |                         |                                   |                       |   |
|-------------------------|-----------------------------------|-----------------------|---|
| a) carbon tetrachloride | <b><math>\text{CCl}_4</math></b>  | f) lead(II) bisulfate | <b><math>\text{Pb}(\text{HSO}_4)_2</math></b> |
| b) magnesium chloride   | <b><math>\text{MgCl}_2</math></b> | g) cuprous phosphate  | <b><math>\text{Cu}_3\text{PO}_4</math></b>    |
| c) silver nitrate       | <b><math>\text{AgNO}_3</math></b> | h) hydrofluoric acid  | <b><math>\text{HF}</math></b>                 |
| d) nitrous acid         | <b><math>\text{HNO}_2</math></b>  | i) ferrous fluoride   | <b><math>\text{FeF}_2</math></b>              |
| e) calcium fluoride     | <b><math>\text{CaF}_2</math></b>  | j) chromic acid       | <b><math>\text{H}_2\text{CrO}_4</math></b>    |
- 19) Calculate the molar mass of  $(\text{NH}_4)_3\text{PO}_4$  (ammonium phosphate).
- 149.10 g/mol**
- 20) The formula for rust is  $\text{Fe}_2\text{O}_3 \cdot 3 \text{H}_2\text{O}$ .
- a) What is the percentage of iron in rust?
- $$\frac{55.85 \times 2}{213.70} \times 100 = 52.27\%$$

b) What is the percentage of water in rust?

$$\frac{18.02 \times 3}{213.70} \times 100 = \mathbf{25.27\%}$$

21) How many grams of metal are in 250 g of aluminum oxide,  $\text{Al}_2\text{O}_3$ ?

$$\frac{26.98 \times 2}{101.96} \times 250 = \mathbf{132.3 \text{ g}}$$

22) Hydrated compounds like  $\text{CuSO}_4 \cdot 5 \text{H}_2\text{O}$  will lose their water of hydration when heated.

a) Calculate the theoretical percentage of water in the compound.

$$\frac{18.02 \times 5}{249.61} \times 100 = \mathbf{36.06\%}$$

b) When 2.467 g of the compound was heated a residue with a mass of 1.542 g was formed. What is the experimental percentage of water in the compound?

$$\frac{2.467 - 1.542}{2.467} \times 100 = \mathbf{37.49\%}$$

c) What is the calculated ratio of water to copper (II) sulfate in the experiment?

$$\text{H}_2\text{O}: 0.925/18.02 = 0.0513/0.00966 = 5.31$$

$$\text{CuSO}_4: 1.542/159.61 = 0.00966/0.00966 = 1 \qquad \mathbf{5.31:1}$$

23) Calculate the mass in grams of each of the following:

a) 5.0 moles of Mg  
**121.55g**

c) 2.05 liters of  $\text{NH}_3$  at STP  
**1.56 g**

b) 0.15 moles of  $\text{Al}(\text{OH})_3$   
**11.70 g = 12 g**

d)  $2.5 \times 10^{18}$  molecules of  $\text{C}_6\text{H}_{12}\text{O}_6$   
 **$7.5 \times 10^{-4}$  g**

24) Calculate the number of moles in each of the following:

a) 6.4 g of Cu  
**0.10 mol**

c) 1.60 Kg of NaOH  
**40.0 mol**

b) 6.2 liters of He at STP  
**0.28 mol**

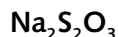
25) Calculate the number of molecules in each of the following:

a) 0.50 moles of  $\text{CO}_2$   
 **$3.01 \times 10^{23}$  molecules**

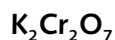
c) 672 mg of  $\text{O}_2$   
 **$1.26 \times 10^{22}$  molecules**

b) 0.672 liters of  $\text{C}_3\text{H}_8$  at STP  
 **$1.81 \times 10^{22}$  molecules**

26) Determine the empirical formula of the compounds with the following composition. 29.1% Na, 40.5% S, and 30.4% O



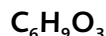
27) Determine the empirical formula for the compound that contains 0.890 g of potassium, 1.18 g of chromium, and 1.27 g of oxygen.



28) a) An organic compound has the following composition by weight: 55.8% carbon, 7.0% hydrogen, and 37.2% oxygen. What is the empirical formula?



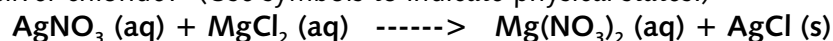
b) If the compound has a molecular mass of 129, what is its molecular formula?



29) Given the balanced equation:  $2 \text{Na} + 2 \text{H}_2\text{O} \rightarrow 2 \text{X} + \text{H}_2$  What is the correct formula for the product represented by the letter X?



30) What is the unbalanced chemical equation for a reaction where aqueous silver nitrate reacts with aqueous magnesium chloride to yield an aqueous solution of magnesium nitrate and solid silver chloride? (Use symbols to indicate physical states.)



31) If X represents any element from Group 1, the formula for its oxide is?



32) A compound is found to contain 2 grams of hydrogen for every 16 grams of oxygen. What is the empirical formula of this compound?



33) A certain gas sample has a mass of 32 grams for 0.500 mole. The molar mass of this gas is closest to what mass?

$$\frac{32 \text{ g}}{0.500 \text{ mol}} = 64 \text{ g}$$

34) The atomic number of an atom is always equal to the total number of

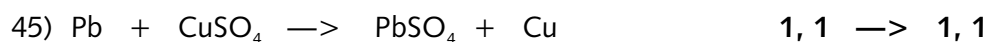
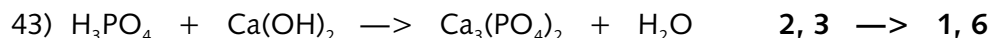
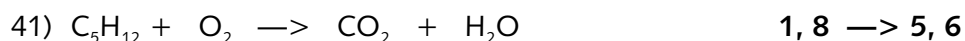
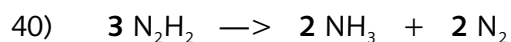
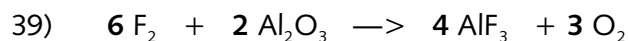
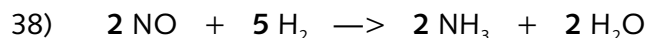
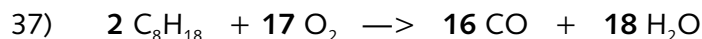
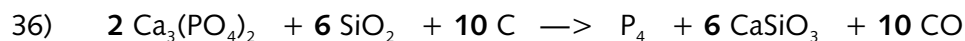
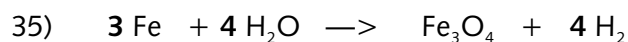
a) neutrons in the nucleus

c) neutrons plus protons in the atom

b) **protons in the nucleus**

d) protons plus electrons in the atom

Balance the following equations:



- 46)  $2 \text{Ba} + \text{O}_2 \rightarrow 2 \text{BaO}$
- 47)  $2 \text{Na} + \text{H}_2\text{O} \rightarrow 2 \text{NaOH} + \text{H}_2$
- 48)  $\text{Zn} + \text{CuSO}_4 \rightarrow \text{ZnSO}_4 + \text{Cu}$
- 49)  $3 \text{Cu} + 2 \text{FeF}_3 \rightarrow 3 \text{CuF}_2 + 2 \text{Fe}$
- 50)  $2 \text{HCl} + \text{Ca(OH)}_2 \rightarrow \text{CaCl}_2 + 2 \text{H}_2\text{O}$
- 51)  $\text{NaH}_2\text{PO}_4 + 2 \text{NaOH} \rightarrow \text{Na}_3\text{PO}_4 + 2 \text{H}_2\text{O}$
- 52)  $\text{H}_2\text{CO}_3 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- 53)  $2 \text{C}_3\text{H}_{10} + 15 \text{O}_2 \rightarrow 10 \text{CO}_2 + 10 \text{H}_2\text{O}$
- 54)  $\text{HC}_2\text{H}_3\text{O}_2 + 2 \text{O}_2 \rightarrow 2 \text{CO}_2 + 2 \text{H}_2\text{O}$
- 55)  $\text{H}_2\text{CrO}_4 + 2 \text{NaOH} \rightarrow \text{Na}_2\text{CrO}_4 + 2 \text{H}_2\text{O}$