Key

Chemistry 11 – Course Review

Unit 1 – Introduction

Topic	Hand-in Assignments
Unit Conversions	**#1**
Significant Figures	**#2**
Separation of Matter	
Electron Configurations	**#3**
Periodic Table Trends	**#4**
Lewis Structures	**#5**

1. Convert the following:

0.00065L = 650 uL

322mg = 0.322 g

4.56 mg/s = 4.56×10^{-12} kg/ms

$0.00065\ L \times \frac{1\ \mu L}{10^{-6}\ L} = 650\ \mu L$

$322\ mg \times \frac{10^{-3}\ g}{1\ mg} = 0.322\ mg$

$4.56\ \frac{mg}{s} \times \frac{10^{-3}\ g}{1\ mg} \times \frac{1\ kg}{10^{3}\ g} \times \frac{10^{-3}\ s}{1\ ms} = 4.56 \times 10^{-12}\ \frac{kg}{ms}$

2. How many significant figures are in the following?

2305 4 5.10×10^{-4} 3 0.000431 3 9000 1

3. Do the following calculations to the correct number of significant figures.

2.435 x 0.0116 = 0.0282 (3 s.f) 6.2352 – 0.321 = 5.914 (3 d.p.)

4. Answer the following:

a) Explain how distillation can be used to separate the substances in a solution.

Solution is heated to boiling point of one substance only; steam is then condensed and liquid is collected in a separate container.

b) What types of mixtures does paper chromatography work best for?

It is best for a mixture of several dissolved solids such as pigments in markers.

c) What is the simplest, most economical method of separating suspensions?

filtration

5. Fill in the chart.

Isotope	*Protons*	*Neutrons*	*Electrons*
$^{194}Ir^{3+}$	77	117	74
$^{244}Pu^{3+}$	94	150	91
$^{125}Te^{2-}$	52	73	54
$^{262}Db^{2+}$	105	157	103
$^{2}H^{+}$	1	1	0

6. Write the ground state electron configurations (eg. $1s^2\ 2s^2\ 2p^6$) for the following atoms or ions. You may use the core notation.

(15 e⁻) a) P [Ne] $3s^2\ 3p^3$

(42 e⁻) b) Mo [Kr] $5s^2\ 4d^4$

(34 e⁻) c) Se [Ar] $4s^2\ 3d^{10}\ 4p^4$

(13 − 3 = 10 e⁻) d) Al^{3+} [Ne]

(16 + 2 = 18 e⁻) e) S^{2-} [Ne] $3s^2\ 3p^6$

7. Circle the most reactive element in the following: (Na) Mg Si Al Ar

8. Circle the most reactive element in the following: Na K Rb (Cs) Li

9. Circle the most reactive element in the following: (Cl) Br I At Ne

10. Circle the element with the largest atomic radius of these: (Na) Mg Si Al Ar

11. Circle the element with the largest atomic radius of these: N P As Sb (Bi)

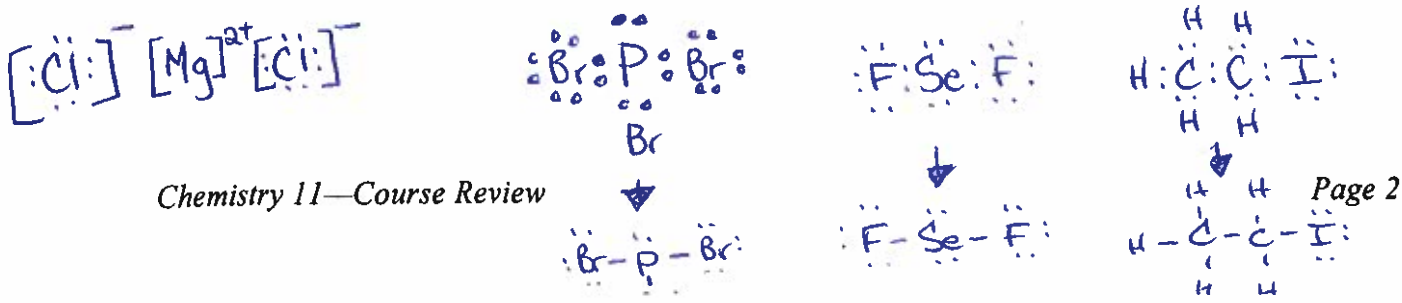
12. Circle the element with the largest ionization energy of these: K Ca Ga As (Kr)

13. Circle the element with the highest electronegativity of these: (Mg) Sr Ba Ra

14. In an ionic bond, electrons are
    a. shared equally by two atoms
    b. shared unequally by two atoms
    (c.) transferred from a metal to a non-metal
    d. transferred from a non-metal to a metal
    e. closer to one end of a molecule, forming a temporary dipole Answer C

15. In a covalent bond, electrons are
    (f.) shared equally by two atoms
    g. shared unequally by two atoms
    h. transferred from a metal to a non-metal
    i. transferred from a non-metal to a metal
    j. closer to one end of a molecule, forming a temporary dipole Answer f

16. Write Lewis structures (electron-dot diagrams) for:
    $MgCl_2$ (ionic) PBr_3(covalent) SeF_2(covalent) CH_3CH_2I(covalent)



Unit 2 – Compounds

Topic	Hand-in Assignments
Names and Formulas – ionic, hydrates, covalent, acids	**#6**
Mole conversions (Mol, mass, volume STP, molecules)	**#7 + #8**
% composition	**#9**
Molarity	**#9**
Dilution formula	**#9**

1. Write the correct formula for the following compounds:

a) ammonium chlorate ..... NH_4ClO_3

b) copper (II) sulphite..... $CuSO_3$

c) zinc carbonate tetrahydrate ..... $ZnCO_3 \cdot 4H_2O$

d) nitric acid ..... HNO_3

e) phosphorus pentaiodide .....COVALENT!..... PI_5

f) iron (III) thiocyanate..... $Fe(SCN)_3$

g) sulphuric acid..... H_2SO_4

h) dinitrogen tetrafluoride .....COVALENT!..... N_2F_4

2. Write the correct names for the following compounds:

a) $Mn(SO_4)_2$ ..... Manganese(IV) sulfate

b) $PbCrO_4 \cdot 6H_2O$ ..... Lead (II) chromate hexahydrate

c) As_2O_3 .....COVALENT!.....diArsenic trioxide

d) CH_3COOH ..... Ethanoic acid OR Acetic acid

e) $Ni_2(C_2O_4)_3$..... Nickel (III) oxalate

f) NF_3 .....COVALENT!..... Nitrogen trifluoride

g) $(NH_4)_2HPO_4$..... Ammonium Hydrogen phosphate

h) $Ba(OH)_2 \cdot 10H_2O$..... Barium hydroxide decahydrate

3. Make the following conversions, clearly showing your steps. Include proper units in all of your work and in your answer.

133.44 grams of PCl_5 = ? moles

molar mass = 31.0 + 5(35.5) = 208.5 g/mol

$133.44\,g\,PCl_5 \times \frac{1\,mol\,PCl_5}{208.5\,g\,PCl_5} = 0.640\,mol\,PCl_5$

b) 0.00256 moles of $Li_2Cr_2O_7$ = ? grams

molar mass = 2(6.9) + 2(52.0) + 7(16.0) = 229.8 g/mol

$0.00256\,mol \times \frac{229.8\,g}{mol} = 0.588\,g$

c) 170.24 L of NO_2 at STP = ? moles

$170.24\,L \times \frac{1\,mol}{22.4\,L} = 7.60\,L$

d) 570.625 g of PCl_3 gas = ? L (STP)

molar mass = 31.0 + 3(35.5) = 137.5 g/mol

$570.625\,g \times \frac{1\,mol}{137.5\,g} \times \frac{22.4\,L}{1\,mol} = 92.96\,L$

e) 1030.4 mL of C_2H_6 gas at STP = ? g

molar mass = 2(12.0) + 6(1.0) = 30.0 g/mol

$1030.4\,mL \times \frac{10^{-3}\,L}{1\,mL} \times \frac{1\,mol}{22.4\,L} \times \frac{30.0\,g}{1\,mol} = 1.38\,g$

4. Find the percent composition (% by mass of each element) in the following compound: $Sr_3(PO_4)_2$. Show your work.

molar mass = 3(87.6) + 2(31.0) + 8(16.0) = 452.8 g/mol

$\%Sr = \frac{3(87.6)}{452.8} \times 100\% = 58.0\%$

$\%P = \frac{2(31.0)}{452.8} \times 100\% = 13.7\%$

$\%O = \frac{8(16.0)}{452.8} \times 100\% = 28.3\%$

Answer _____%Sr, _____%P, _____%O

5. 123.11 g of zinc nitrate, $Zn(NO_3)_2$ are dissolved in enough water to form 650.0 mL of solution. Calculate the $[Zn(NO_3)_2]$ Include proper units in your work and in your answers.

molar mass = 65.4 + 2(14.0) + 6(16.0) = 189.4 g/mol

$123.11\,g \times \frac{1\,mol}{189.4\,g} = 0.650\,mol$

$650.0\,mL \times \frac{10^{-3}\,L}{1\,mL} = 0.650\,L$

$c = \frac{n}{V} = \frac{0.65\,mol}{0.6500\,L} = 1.000\,M$

6. 150.0 mL of water are added to 400.0 mL of 0.45 M HNO_3 . Calculate the final [HNO_3]. Include proper units in your work and in your answers.

$V_{DIL} = 400 + 150 = 550.0\,mL$

$C_{DIL} = \frac{V_{conc} \times C_{conc}}{C_{DIL}} = \frac{400.0\,mL \times 0.45\,M}{550.0\,mL} = 0.327\,M$

7. What volume of water needs to be added to 150.0 mL of 4.00 M H_2SO_4 in order to bring the concentration down to 2.50 M? Include proper units in your work and in your answers.

$V_{DIL} = \frac{V_{conc} \times C_{conc}}{C_{DIL}} = \frac{150.0\,mL \times 4.00\,M}{2.50\,M} = 240.0\,ml$

Water added = 240.0ml − 150.0 mL = 90.0mL

8. Give directions on how to make 5.00 L of 0.020 M $Ca(ClO)_2$ using solid $Ca(ClO)_2$ and water. Include proper units in your work and in your answers.

$n = c \times v = 0.020\,\frac{mol}{L} \times 5.00\,L = 0.100\,mol$

molar mass = 40.1 + 2(35.5) + 2(16.0) = 143.1 g/mol

$0.100\,mol \times \frac{143.1\,g}{mol} = 14.3\,g$

Directions = add 14.3g of $Ca(ClO)_2$ to enough water to make 5.00L of solution. Stir to dissolve.

Unit 3 - Chemical Reactions

Topic	Hand-in Assignments
Balancing Chemical Reactions	**#10**
Types of Chemical Reactions	**#11**
~~**Separation of Matter**~~ Enthalpy - Exothermic/endothermic	#12
~~**Electron Configurations**~~ Stoichiometry	#13
~~**Periodic Table Trends**~~ Excess/Limiting	#14
~~**Lewis Structures**~~ % yield	#14
Precipitation	#15

1. Balance the following equations

$3(NH_4)_2C_2O_4 + 2AlCl_3 \rightarrow Al_2(C_2O_4)_3 + 6NH_4Cl$

$2C_{14}H_{30} + 43O_2 \rightarrow 28CO_2 + 30H_2O$

$2Fe + 6HNO_3 \rightarrow 2Fe(NO_3)_3 + 3H_2$

$P_4 + 6Cl_2 \rightarrow 4PCl_3$

$Na_2Cr_2O_7 + 14HCl \rightarrow 2NaCl + 2CrCl_3 + 7H_2O + 3Cl_2$

2. Write a balanced chemical equation for each of the following, and classify each as synthesis, decomposition, single replacement, double replacement, neutralization or combustion.

a) potassium sulphate is mixed with cobalt (III) nitrate

Double Replacement: $3\,K_2SO_4 + 2Co(NO_3)_3 \rightarrow 6KNO_3 + Ca_2(SO_4)_3$

b) liquid propanol (C_3H_7OH) is burned in air

Combustion: $2\,C_3H_7OH + 9O_2 \rightarrow 6CO_2 + 8H_2O$

d) a piece of zinc is placed in a test-tube containing a solution of silver nitrate

Single Replacement: $Zn + 2Ag(NO_3) \rightarrow Zn(NO_3)_2 + 2Ag$

e) bromine reacts with aluminum

Synthesis: $3\,Br_2 + 2Al \rightarrow 2AlBr_3$

f) hydrochloric acid reacts with strontium hydroxide

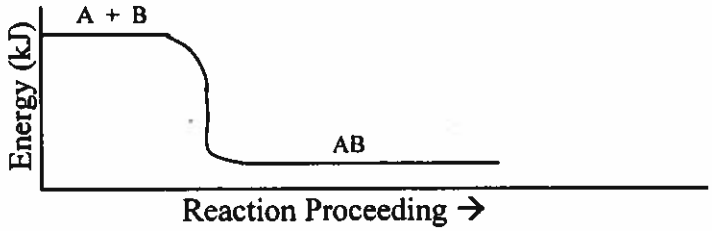
Neutralization: $2HCl + Sr(OH)_2 \rightarrow 2H_2O + SrCl_2$

3. State whether each of the following are ***exothermic*** or ***endothermic***.

$HCl + 432\text{ kJ} \rightarrow H + Cl$ Answer endothermic

$C_{12}H_{22}O_{11} + 12\,O_2 \rightarrow 12CO_2 + 11H_2O$ $\Delta H = -5638$ kJ Answer exothermic

$H_2O_{(s)} \rightarrow H_2O_{(l)}$ Answer endothermic



Answer exothermic

$CD \rightarrow C + D$ $\Delta H = 65.7$ kJ Answer endothermic

$E + F + 437\text{ kJ} \rightarrow G + H$ Answer endothermic

4. Given the following balanced equation, answer the questions following it:

$$2NF_{3(g)} + 3H_{2(g)} \rightarrow N_{2(g)} + 6HF_{(g)}$$

a) If 5.5 moles of H_2 are reacted, how many moles of NF_3 will be consumed?

$$5.5\ mol\ H_2 \times \frac{2\ mol\ NF_3}{3\ mol\ H_2} = 3.67\ mol\ NF_3$$

b) In order to produce 0.47 moles of HF, how many moles of NF_3 would be consumed?

$$0.47\ mol\ HF \times \frac{2\ mol\ NF_3}{6\ mol\ HF} = 0.157\ mol\ NF_3$$

c) If you needed to produce 180.6 g of N_2, how many moles of H_2 would you need to start with?

molar mass = $2 \times 14.0 = 28.0$ g/mol

$$180.6\ g\ N_2 \times \frac{1\ mol\ N_2}{28.0\ g\ N_2} \times \frac{3\ mol\ H_2}{1\ mol\ N_2} = 19.4\ mol\ H_2$$

d) If you completely react 17.04 g of NF_3, what mass of HF will be produced?

molar mass = $14.0 + 3(19.0) = 71.0$ g/mol

molar mass = $1.0 + 19.0 = 20$

$$17.04\ g\ NF_3 \times \frac{1\ mol\ NF_3}{71.0\ g\ NF_3} \times \frac{6\ mol\ HF}{2\ mol\ NF_3} \times \frac{20.0\ g\ HF}{1\ mol\ HF} = 14.4\ g\ HF$$

6. Given the following balanced chemical equation, answer the question below it.

$$MgCO_{3\,(s)} + 2HCl_{\,(aq)} \rightarrow CO_{2\,(g)} + H_2O_{\,(l)} + MgCl_{2(aq)}$$

a) What mass of $MgCO_3$ will react completely with 15.0 mL of 1.5 M HCl?

molar mass = $24.3 + 12.0 + 3(16.0) = 84.3$ g/mol

$$n = c \times v = 1.5\ M \times 0.01500\ L = 0.0225\ mol\ HCl$$

$$0.0225\ mol\ HCl \times \frac{1\ mol\ MgCO_3}{2\ mol\ HCl} \times \frac{84.3\ g\ MgCO_3}{1\ mol\ MgCO_3} = 0.948\ g\ Mg$$

b) Calculate the volume of 2.0 M HCl which would be needed to react completely with 37.935 grams of magnesium carbonate.

$$37.935\ g\ MgCO_3 \times \frac{1\ mol\ MgCO_3}{84.3\ g} \times \frac{2\ mol\ HCl}{1\ mol\ MgCO_3} = 0.900\ mol\ H$$

$$c = \frac{n}{v} = \frac{0.900\ mol\ HCl}{2.0\ M\ HCl} = 0.45\ L\ HCl$$

7. Given the following balanced equation, answer the questions below it.

$$3\ Cu_{(s)} + 8HNO_{3(l)} \rightarrow 3\ Cu(NO_3)_{2(aq)} + 2NO_{(g)} + 4\ H_2O_{(l)}$$

a) If 317.5 grams of Cu are placed into 756.0 grams of HNO_3, determine which reactant is in excess.

$317.5\text{ g Cu} \times \frac{1\text{ mol Cu}}{63.5\text{ g Cu}} \times \frac{2\text{ mol NO}}{3\text{ mol Cu}} \times \frac{30.0\text{ g NO}}{1\text{ mol NO}} = 100\text{ g NO}$

$756.0\text{ g } HNO_3 \times \frac{1\text{ mol } HNO_3}{63.0\text{ g } HNO_3} \times \frac{2\text{ mol NO}}{8\text{ mol } HNO_3} \times \frac{30.0\text{ g NO}}{1\text{ mol NO}} = 90.0\text{ g NO}$

Cu is in excess

31.4

b) If the reaction in (a) is carried out, what mass of NO will be formed?

based on limiting reagent, 90.0 g NO will be formed

6. Given the balanced equation: $2BN + 3F_2 \rightarrow 2BF_3 + N_2$,
When 161.2 grams of BN are added to an excess of F_2, a reaction occurs in which 326.118 grams of BF_3 are formed.
(actual)

a) Calculate the *theoretical* yield of BF_3 in grams.

$161.2\text{ g BN} \times \frac{1\text{ mol BN}}{24.8\text{ g BN}} \times \frac{2\text{ mol } BF_3}{2\text{ mol BN}} \times \frac{67.8\text{ g } BF_3}{1\text{ mol } BF_3} = 440.7\text{ g } BF_3$

b) Calculate the *percentage* yield of BF_3.

$\%\text{ yield} = \frac{\text{actual}}{\text{theoretical}} \times 100\% = \frac{326.118\text{ g } BF_3}{440.7\text{ g } BF_3} \times 100\% = 74\%$

7. Explain why polar solvents dissolve polar solutes and non-polar solvents dissolve non-polar solutes.

Only polar solvents with permanent dipoles are strong enough to separate polar or ionic solutes in solution.

8. An aqueous solution of silver nitrate is mixed with an aqueous solution of ammonium carbonate and a precipitate is observed.

a) Write a ***balanced formula equation*** for this reaction: *(include all subscripts)*

$2\ AgNO_{3(aq)} + (NH_4)_2CO_{3(aq)} \rightarrow Ag_2CO_{3(s)} + 2\ NH_4NO_{3(aq)}$

b) Write a ***balanced complete ionic equation*** for this reaction: *(include all subscripts)*

$2\ Ag^+_{(aq)} + 2\ NO_3^-{}_{(aq)} + 2\ NH_4^+{}_{(aq)} + CO_3^{2-}{}_{(aq)} \rightarrow Ag_2CO_{3(s)} + 2\ NH_4^+{}_{(aq)} + 2\ NO_3^-{}_{(aq)}$

c) Write a ***balanced net ionic equation*** for this reaction: *(include all subscripts)*

$2\ Ag^+_{(aq)} + CO_3^{2-}{}_{(aq)} \rightarrow Ag_2CO_{3(s)}$

d) This type of reaction is a type of double replacement called Precipitation

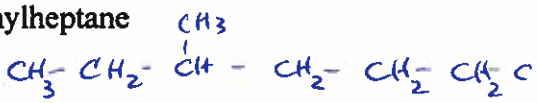
UNIT 4 Organic Chemistry

Topic	Hand-in Assignments
Hydrocarbons (Alkanes, Alkenes, Alkynes), halides, cyclos	**#16**
Isomers	
Functional Groups	
Aormatics, Alcohols, Carboxylic acids, esters	**#17**
Esterfication	
Oxidation of an alcohol	

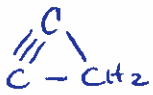
1. Draw the following molecules:

a) Hexane

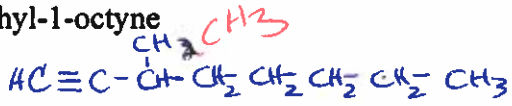
b) 3-methylheptane



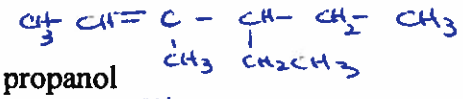
c) cyclopropyne



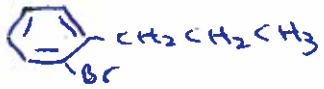
d) 3-ethyl-1-octyne



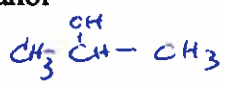
e) 4-ethyl-3-methyl-2-hexene



f) 1-bromo-2-propylbenzene

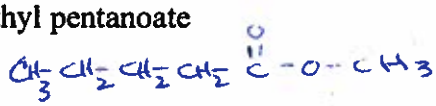


g) 2- propanol



h) butanoic acid

i)methyl pentanoate



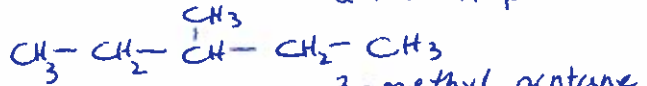
2. Write the reaction between propanol and butanoic acid. Draw and name all reactants and products.

propanol butanoic acid propyl butanoate water

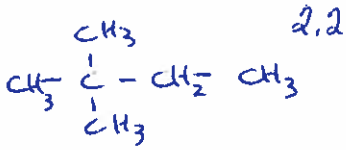
3. Draw and name all of the isomers of hexane. (5) C_6H_{14}

hexane

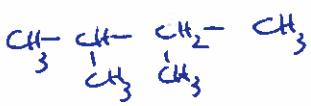
2-methyl pentane



3-methyl pentane

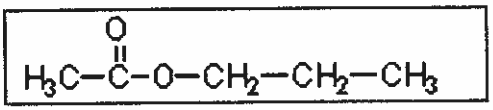


2,2-dimethyl butane

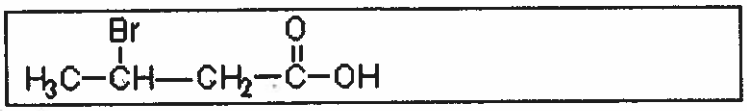


1,2-dimethyl butane

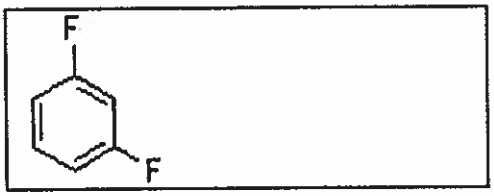
4. Name the following:



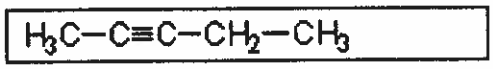
propyl ethanoate



2-bromo butanoic acid

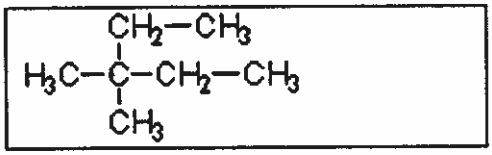


1,3-difluoro benzene



2-pentyne

2-chloro-1-propanol



2-ethyl 2-methyl butane

END OF REVIEW!!!! YOU ARE NOW READY FOR A PR☹ACTICE FINAL!