Name: __ANSWERS_____ Date: _____

BCI SCIENCE

SCH 4U

Grade 11 Chemistry Review

Stuff you will need to remember somewhat for grade 12

(You will need to do most of the work on a separate piece of paper)

1. SIGNIFICANT DIGITS

i) Determine the number of significant digits in each of the following:

a) 6.571 g 4 c) 2500 m 2 e) 30.07 g 4

b) 0.157 kg 3 d) 0.0700000 g 6 f) 0.106 cm 3

ii) Do the Following Calculations Using Scientific Notation and Using Correct Significant Figures:

g) 25.37 + 6.850 + 15.07 + 8.056 h) 27.68 – 14.369 i) 3.15 x 2.5 x 4.00 j) 40.8 / 5.05

55.35 **13.31** **32** **8.08**

2. STRUCTURE AND PROPERTIES OF MATTER

a) Calculate the number of protons, neutrons, and electrons for $^{213}_{82}Pb^{+4}$ **p^+=82, n^0=131, e^-=78**

b) Specifically explain the ranking of the following atoms from biggest to smallest atomic radius: Na, Mg, Ca

Ca > Na > Mg. Ca has the largest A.R. b/c it has 2 valence electrons in the 4th (largest) energy level. Na is next largest b/c its' valence e^- experience less Z_{eff} (pull from the nucleus) since it only has 11 protons in its' nucleus. Mg is smallest because its' valence electrons are in the third energy level and experience more z_{eff} b/c they are pulled by 12 p^+ making the AR smaller.

c) Specifically explain the ranking of the following atoms from biggest to smallest ionization energy: N, O, S

N and O have higher IE than S b/c the valence e^- are located in n=3 and therefore the nucleus has a greater pull on each e^- which will require more energy to remove them. (Nitrogen actually has the highest IE vs O which we will discuss it later in the unit).

3. NAMING

Complete the following chart

Formula	Name	Formula	Name
a) He	**helium gas**	F_2	i) fluorine gas
b) $AlBr_3$	**aluminum bromide**	Na_2S	j) sodium sulphide
c) CuO	**copper(II)oxide or cupric oxide**	$CuCl$	k) copper(I)chloride
d) $Sr_3(PO_4)_2$	**strontium phosphate**	$K_2Cr_2O_7$	l) potassium dichromate
e) $FrNO_4$	**francium pernitrate**	$Ni_2(SO_2)_3$	m) nickel(III)hyposulphite
f) $HCl_{(aq)}$	**hydrochloric acid**	SnF_2	n) stannous fluoride
g) $H_2SO_{4(aq)}$	**sulphuric acid**	SBr_6	o) sulphur hexabromide
h) $HClO_{(aq)}$	**hypochlorous acid**	Hg_3N_2	p) mercuric nitride

4. BALANCING AND TYPES OF REACTIONS

Balance and then identify each type of equation.

(a) ___ $H_2O_{(l)}$ + _3_ $NO_{2(g)}$ → _2_ $HNO_{3(aq)}$ + ___ $NO_{(g)}$ TYPE: **double displacement**

(b) ___ $Fe_{(s)}$ + ___ $Cl_{2(g)}$ → ___ $FeCl_{2(s)}$ TYPE: **synthesis**

(c) _2_ $C_4H_{10O(l)}$ + _~~13~~ 12_ $O_{2(g)} \rightarrow$ _8_ $CO_{2(g)}$ + _10_ $H_2O_{(g)}$ TYPE: **combustion**

(d) ___ $Sb_4S_{6(s)}$ + _9_ $O_{2(g)} \rightarrow$ ___ $Sb_4O_{6(s)}$ + _6_ $SO_{2(g)}$ TYPE: **combustion**

(4) ___ $Na_2CO_{3(aq)}$ + ___ $MgCl_{2(aq)} \rightarrow$ _2_$NaCl_{(aq)}$ + ___$MgCO_{3(s)}$ TYPE: **double displacement**

5. CHEMICAL QUANTITIES

Answer each of the following questions on a piece of paper.

(a) What mass of propane, $C_3H_{8(g)}$, reacting completely with excess oxygen, is required to produce 26.7 g of carbon dioxide gas?

$C_3H_{8(g)}$ + 5 $O_{2(g)} \rightarrow$ 3 $CO_{2(g)}$ + 4 $H_2O_{(g)}$

m=?

n= $\frac{m}{M}$

n= $\frac{26.7g}{44.01g/mol}$

n=0.6067mol

$\frac{3molCO_2}{0.6067mol} = \frac{1molC_3H_8}{x}$

x = 0.2022mol

m=nM

m=(0.2022)(44.09)

m=~~44.09~~ 8.92g

∴44.09g of propane is required to produce 26.7 g of $CO_{2(g)}$

(b) Examine the following reaction.

$SrH_{2(s)}$ + 2$H_2O_{(l)} \rightarrow$ $Sr(OH)_{2(s)}$ + 2$H_{2(g)}$

i) When 2.50 g of SrH_2 is reacted with 8.03×10^{22} molecules of water, what is the limiting reagent?

n= $\frac{m}{M}$ **n=** $\frac{2.50}{89.78}$

n=0.0278mol

n= $\frac{N}{N_A}$ **n=** $\frac{8.03x10^{22}}{6.02x10^{23}}$

n=0.1334mol

$\frac{1molSrH_2}{0.0278mol} = \frac{1molSr(OH)_2}{x}$

x =0.0278mol $Sr(OH)_2$

$\frac{2molH_2O}{0.1334mol} = \frac{1molSr(OH)_2}{y}$

y = 0.0667 mol $Sr(OH)_2$

∴SrH_2 is the limiting reagent.

ii) What mass of strontium hydroxide will be produced?

m=nM

m=(0.0278)(121.63)

m=3.38g

∴ 3.38g of $Sr(OH)_2$ will be produced.

6. SOLUTIONS AND SOLUBILITY

Answer each of the following questions on a piece of paper.

(a) What is the molar concentration of the solution made by dissolving 1.00 g of solid sodium nitrate in enough water to make 315 mL of solution?

n= $\frac{m}{M}$

n= $\frac{1.00}{84.99}$

n=0.01177mol

C= $\frac{n}{V}$

C= $\frac{0.01177mol}{0.315L}$

C=0.0374 M

∴ the molar concentration of the solution is 0.0374 M.

(b) By the addition of water, 80.0 mL of 4.00 mol/L sulfuric acid is diluted to 400.0 mL. What is the molar concentration of the sulfuric acid after dilution?

$C_2 = \frac{C_1V_1}{V_2}$ C_2=0.80M

$C_2 = \frac{(4.00M)(0.080L)}{0.400L}$ ∴ the $[H_2SO_{4(aq)}]$ is 0.80M

(c) Write the balanced molecular and net-ionic equations for the following reaction:

Molecular: $2\ Na_3PO_{4(aq)} + 3\ Ca(OH)_{2(aq)} \rightarrow 6\ NaOH_{(aq)} + Ca_3(PO_4)_{2(s)}$

N.I.E: $3\ Ca^{2+}_{(aq)} + 2\ PO_4^{3-}_{(aq)} \rightarrow Ca_3(PO_4)_{2(s)}$

(d) In a titration, 50.0 mL of 0.0800 mol/L $NaOH_{(aq)}$ is titrated by a 0.0500 mol/L $H_3PO_{4(aq)}$ solution. What volume of $H_3PO_{4(aq)}$ must be added to neutralize the NaOH?

$3\ NaOH_{(aq)} + H_3PO_{4(aq)} \rightarrow Na_3PO_{4(aq)} + 3H_2O_{(l)}$

n=CV V=? $\frac{3molNaOH}{0.004mol} = \frac{1molH_3PO_4}{x}$ $V = \frac{n}{C}$

n=(0.0800)(0.050) x=0.00133mol H_3PO_4 $V = \frac{0.00133}{0.0500}$

n=0.004mol V=0.0267L

∴ 26.7 mL of H_3PO_4 must be added to neutralize the solution.

(e) For each of the following reactions identify the acid, base, conjugate-acid, conjugate-base

i) $NH_4^+_{(aq)} + CN^-_{(aq)} \rightarrow HCN_{(aq)} + NH_{3(aq)}$

acid base conj acid conj base

ii) $HF_{(aq)} + NH_{3(aq)} \rightarrow NH_4^+_{(aq)} + F^-_{(aq)}$

acid base conj acid conj base

7. GASES AND ATMOSPHERIC CHEMISTRY

Answer each of the following questions on a piece of paper.

(a) One litre of a certain gas has a mass of 2.05 g at SATP. What is the molar mass of this gas?

$n = \frac{PV}{RT}$ n=0.0404mol $M = \frac{2.05g}{0.0404mol}$

$n = \frac{(100kPa)(1L)}{(8.314)(298K)}$ $M = \frac{m}{n}$ M=50.79g/mol

∴ the molar mass of the gas is 50.79g/mol.

(b) When a spark ignites a mixture of hydrogen gas and oxygen gas, water vapour is formed. What mass of oxygen gas would be required to react completely with 1.00 g of hydrogen?

$2\ H_{2(g)} + O_{2(g)} \rightarrow 2\ H_2O_{(g)}$

$n = \frac{m}{M}$ $\frac{2molH_2}{0.4961mol} = \frac{1molO_2}{x}$ m=nM

$n = \frac{1.00g}{2.016g/mol}$ x=0.248mol O_2 m=(0.248)(31.998)

n=0.4961mol m=7.94g

∴ 7.94g of O_2 is required to completely react with 1.00g of H_2.