Chemistry 11 – Course Review

Unit 2—Introduction to Chemistry

4. The density of iron is 7860 g/L. Calculate the mass of a 3.2 mL sample of iron.

$$\text{mass} = \left(\frac{7860\text{ g}}{\text{L}}\right)\left(\frac{0.0032\text{ L}}{1}\right) =$$

Answer 25 g

5. Manganese has a density of 7.20 g/mL. Calculate the volume occupied by a 4.0 kg piece of manganese.

2 SF

$$\text{Volume} = \left(\frac{4000\text{ g}}{1}\right)\left(\frac{\text{mL}}{7.20\text{ g}}\right)$$

Answer 555.6

$\rightarrow 5.6 \times 10^2$ mL

DO Unit Conversion

6. A 0.0460 L piece of copper has a mass of 410.32 g. Calculate the density of copper in g/mL.

$D = \frac{m}{V} = \frac{410.32\text{ g}}{0.0460\text{ L}} = 8.92\text{ g/mL}$

Answer 8.92×10^{3} g/L

7. Give the number of significant digits in each of the following. Assume they are all measurements.

a) 0.0023 2
b) 3953 000 4
c) 1.0200×10^{5} 5
d) 3.2×10^{-4} 2
e) 50020.000 8
f) 3450 3

8. Perform the following calculations and round the answers off to the correct number of significant digits as justified by the data. Assume all numbers are measurements.

a) 2.1500×0.31 ..... (2 SF) 0.67
b) $0.05 + 394.7322$ ..... (2 DP) 394.78
c) $4.905 \times 10^{6} \div 4 \times 10^{-2}$ .. (1 SF) 1×10^{8}
d) $(3.33 \times 9.52) + 13.983$. (3 SF) (1 DP) 45.7
e) $3.813 + 98.98 + 2.669$. (2 DP) 105.46
f) $8.90 \times 10^{3} \div 4.400 \times 10^{-6}$ ..... (3 SF) 2.02×10^{9}
g) $83.00 \div 1.2300 \times 10^{2}$ ..... (4 SF) 0.6748
h) 98.0076 - 2.195 ..... (3 DP) 95.813
i) $0.00000200 \times 245.912$ ..... (3 SF) 4.92×10^{-84}
j) $5.802 \div 6.21 + 2.41 \div 9.2565$ .. (3 SF) (3 SF) 0.934 + 0.260 = 1.195 (3 DP)

9. Round the following numbers to 2 significant digits. (4 marks)

a) 2 000 000 000..... 2.0×10^{9}
b) 106 000 ..... 1.1×10^{5}
c) 3.88945×10^{28} ..... 3.9×10^{28}
d) 0.000 000 7895 ..... 7.9×10^{-7}

Unit 4— Names and Formulas for Compounds

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 ..... PI_5

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

g) sulphuric acid ..... H_2SO_4

h) dinitrogen tetrafluoride ..... N_2F_4

2. Write the correct names for the following compounds:

a) $Mn(SO_4)_2$ ..... manganese (IV) sulphate

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

c) As_2O_3 ..... diarsenic trioxide

d) CH_3COOH ..... acetic acid ! acid

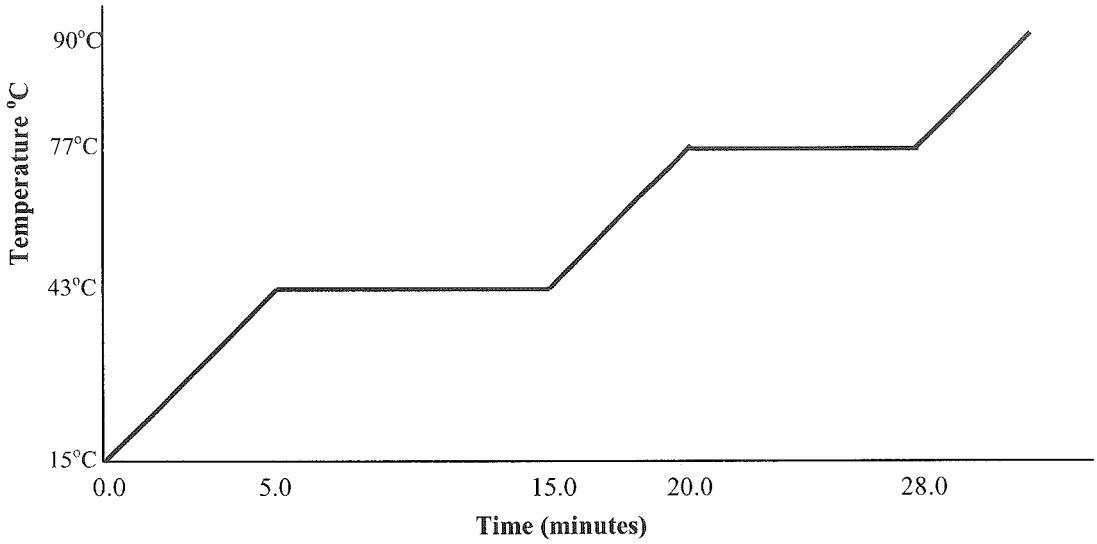
e) $Ni_2(C_2O_4)_3$ ..... nickel (III) oxalate

f) NF_3 ..... nitrogen trifluoride

g) $(NH_4)_2HPO_4$ ..... ammonium monohydrogen phosphate

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

6. Given the following graph of Temperature vs. Time for warming substance "X" which starts out as a solid, answer the questions below:



a) During time 0.0 – 5.0 minutes, the added heat energy is being used to
↑ temp of solid

b) During time 5.0 – 15.0 minutes, the added heat energy is being used to
melt the solid

c) During time 15.0 – 20.0 minutes, the added heat energy is being used to
↑ temp.

d) During time 20.0 – 28.0 minutes, the added heat energy is being used to
boil the liquid

e) The melting point of substance "X" is 43°C

f) The boiling point of substance "X" is 77°C

g) If a greater amount of substance "X" was used, the melting point would be
1. a lower temperature
2. a higher temperature
3. the same temperature Answer 3 → it's an unchangeable property

h) What phase is substance "X" at 90°C? GAS!!!

i) Explain WHY the curve levels off between 5.0 min. and 15.0 min.
all the added heat is being used to change phase! none available to warm substance, until melting is complete!

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

$$\text{volume} = \left(\frac{570.625\text{g}}{1}\right)\left(\frac{\text{mol}}{137.5\text{g}}\right)\left(\frac{22.4\text{L}}{\text{mol}}\right) =$$

Answer 93.0 L

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

$$\text{grams} = \left(\frac{1.0304\text{L}}{1}\right)\left(\frac{\text{mol}}{22.4\text{L}}\right)\left(\frac{30.0\text{g}}{\text{mol}}\right) =$$

Answer 1.38 g

f) 5.00 kg of nitrogen gas = ? L (STP)

(3SF)

$$\text{volume} = \left(\frac{5000\text{g}}{1}\right)\left(\frac{\text{mol}}{28.0\text{g}}\right)\left(\frac{22.4\text{L}}{\text{mol}}\right) =$$

Answer 4.00×10^3 L

g) 0.5696 kg of $CH_{4(g)}$ = ? mL

$$\text{volume} = \left(\frac{569.6\text{g}}{1}\right)\left(\frac{\text{mol}}{16.0\text{g}}\right)\left(\frac{22.4\text{L}}{\text{mol}}\right) = 797.44\text{L}$$

Answer 7.97×10^5 mL

Unit 5— The Mole Concept

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

   a) 133.44 grams of PCl_5 = ? moles

$$\text{moles} = \left(\frac{133.44\text{g}}{1}\right)\left(\frac{\text{mol}}{208.5\text{g}}\right) =$$ Answer 0.6400 mol

   b) 0.00256 moles of $Li_2Cr_2O_7$ = ? grams

$$\text{grams} = \left(\frac{0.00256\text{mol}}{1}\right)\left(\frac{229.8\text{g}}{\text{mol}}\right) =$$ Answer 0.588 g

   c) 170.24 L of NO_2 at STP = ? moles

$$\text{moles} = \left(\frac{170.24\text{L}}{1}\right)\left(\frac{\text{mol}}{22.4\text{L}}\right) =$$ Answer 7.60 mol

7. A compound was analyzed and the following results were obtained:
Molar mass: 270.4 g/mol
Mass of sample: 162.24 g
Mass of potassium: 46.92 g
Mass of sulphur: 38.52 g
Mass of oxygen: the remainder of the sample is oxygen

a) Determine the mass of oxygen in the sample.

$162.24\,g - (46.92\,g + 38.52\,g) = 76.80$ Answer Oxygen = 76.80g

b) Determine the empirical formula for this compound.

Get Moles

$\%K = \frac{46.92}{162.24} \times 100 = 28.92\,g \times \frac{mol}{39.1\,g} = 0.7396$ ÷ 0.73956 = 1

$\%S = \frac{38.52}{162.24} \times 100 = 23.74\,g \times \frac{mol}{32.1\,g} = 0.73956$ ÷ 0.73956 = 1

$\%O = \frac{76.80}{162.24} \times 100 = 47.34\,g \times \frac{mol}{16.0\,g} = 2.95875$ ÷ 0.73956 = 4

Answer: Empirical Formula: KSO_4

c) Determine the molecular formula for this compound.

MM(EF) = MM(KSO_4) = 135.2 g/mol

MM (MF) → given in Q = 270.4

$N = \frac{270.4}{135.2} = 2$ 2(KSO_4) =

Answer: Molecular Formula: $K_2S_2O_8$

8. 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.

$[Zn(NO_3)_2] = \left(\frac{123.11\,g}{1}\right)\left(\frac{mol}{189.4\,g}\right)\left(\frac{1}{0.6500\,L}\right)$

Answer 1.000 M

2. The density of liquid ethanol (C_2H_5OH) is 0.790 g/mL. Calculate the number of molecules in a 35.0 mL sample of liquid ethanol. (NOTE: You CAN'T use 22.4 L/mol since this is NOT a gas at STP!)

$$\#\text{molecules} = \left(\frac{0.790\text{ g}}{\text{mL}}\right)\left(\frac{35.0\text{ mL}}{1}\right)\left(\frac{\text{mol}}{46.0\text{ g}}\right)\left(\frac{6.02\times10^{23}\text{ molecules}}{\text{mol}}\right)$$

Answer 3.62×10^{23} molecules

3. A 100.0 mL sample of liquid mercury contains 6.78 moles. Calculate the density of liquid mercury from this data.

① get mass $= \left(\frac{6.78\text{ mol}}{1}\right)\left(\frac{200.6\text{ g}}{\text{mol}}\right) =$ 1360.068 g (3SF)

$D = \frac{m}{V} \rightarrow \frac{1360.068\text{ g}}{100.0\text{ mL}} =$

Answer 13.6 g/mL

4. Calculate the density of $PCl_{3(g)}$ at STP.

$$D = \frac{m}{V} = \left(\frac{\text{mol}}{22.4\text{ L}}\right)\left(\frac{137.5\text{ g}}{\text{mol}}\right) =$$

Answer 6.14 g/L

5. a) The density of a gas at STP is 4.955 g/L. Calculate the molar mass of this gas.

$$MM = \left(\frac{4.955\text{ g}}{\text{L}}\right)\left(\frac{22.4\text{ L}}{\text{mol}}\right) = 111\text{ g/mol}$$

b) The gas is an oxide of selenium. Determine the molecular formula.

trial and error

$MM(SeO) = 95.0\text{ g/mol}$ ∴ not it!

$SeO_2 = 111\text{ g/mol}$ ∴ this is it!

Answer SeO_2

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

$MM(Sr_3(PO_4)_2) = 262.8 + 62.0 + 128.0 = 452.8\text{ g/mol}$

$\%Sr = \frac{262.8}{452.8} = 58.08\%$

$\%P = \frac{62.0}{452.8} = 13.7\%$

$\%O = \frac{128.0}{452.8} = 28.30\%$

Answer 58.0%Sr, 13.7%P, 28.3%O

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

DR

$3K_2SO_4 + 2Co(NO_3)_3 \rightarrow Co_2(SO_4)_3 + 6KNO_3$

b) liquid propanol (C_3H_7OH) is burned in air

comb

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

c) ammonium nitrate is decomposed into it's elements

Decomp

$2NH_4NO_3 \rightarrow 2N_2 + 4H_2 + 3O_2$

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

SR

$Zn + 2AgNO_3 \rightarrow 2Ag + Zn(NO_3)_2$

e) bromine reacts with sodium iodide

SR

$Br_2 + 2NaI \rightarrow I_2 + 2NaBr$

f) bromine reacts with aluminum

synth

$3Br_2 + 2Al \rightarrow 2AlBr_3$

g) rubidium reacts with chlorine gas

synth

$2Rb + Cl_2 \rightarrow 2RbCl$

h) hydrochloric acid reacts with strontium hydroxide

neut

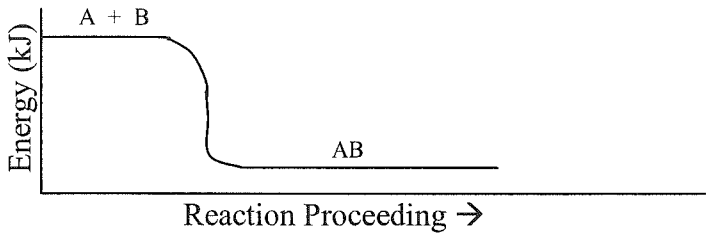
$2HCl + Sr(OH)_2 \rightarrow 2H_2O + SrCl_2$

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

$HCl + 432\ kJ \rightarrow H + Cl$ Answer endo

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

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



Answer exo

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

$E + F + 437\ kJ \rightarrow G + H$ Answer endo

13. 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.

mass $Ca(ClO)_2$ needed $= \left(\frac{0.020\ mol}{L}\right)\left(\frac{5.00\ L}{1}\right)\left(\frac{143.1\ g}{mol}\right) = 14.3\ g$
$\Rightarrow 14\ g$

Directions:

Add 14g of solid $Ca(ClO)_2$ to 5.00L H_2O! (in a volumetric flask)

Unit 6— Chemical Reactions

1. Balance the following equations

$(2NH_3 + \frac{5}{2}O_2 \rightarrow 2NO + 3H_2O)^{\times 2} \rightarrow 4NH_3 + 5O_2 \rightarrow 4NO + 6H_2O$

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

$(C_{14}H_{30} + \frac{43}{2}O_2 \rightarrow 14CO_2 + 15H_2O)^{\times 2} \rightarrow 2C_{14}H_{30} + 43O_2 \rightarrow 28CO_2 + 30H_2O$

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

$P_4 + 6Cl_2 \rightarrow 4PCl_3$

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

$2H_3PO_4 + 3Ca(OH)_2 \rightarrow Ca_3(PO_4)_2 + 6H_2O$

$Ba(ClO_4)_2 \rightarrow Ba + Cl_2 + 4O_2$

$2C_7H_{15}OH + 21O_2 \rightarrow 14CO_2 + 16H_2O$

$MgSO_4 \cdot 5H_2O \rightarrow MgSO_4 + 5H_2O$

9. Calculate the mass of potassium sulphite (K_2SO_3) needed to make 800.0 mL of a 0.200 M solution of K_2SO_3. Include proper units in your work and in your answers.

$$\text{mass } K_2SO_3 = \left(\frac{0.200\text{ mol}}{\text{L}}\right)\left(\frac{0.8000\text{ L}}{1}\right)\left(\frac{158.3\text{ g}}{\text{mol}}\right) =$$

Answer 25.3 g

10. What volume of 2.50 M Li_2CO_3 would need to be evaporated in order to obtain 47.232 g of solid Li_2CO_3? Include proper units in your work and in your answers.

$$\text{volume} = \left(\frac{\text{L}}{2.50\text{ mol}}\right)\left(\frac{47.323\text{ g}}{1}\right)\left(\frac{\text{mol}}{73.8\text{ g}}\right) =$$

Answer 0.256 L

11. 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.

$$[HNO_3] = 0.45\text{ M}\left(\frac{400.0\text{ mL}}{550.0\text{ mL}}\right) =$$

Answer 0.33 M

12. 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.

$$C_1V_1 = C_2V_2$$

$$V_2 = \frac{(150.0\text{ mL})(4.00\text{ M})}{2.50\text{ M}}$$

$$= 240.\text{ mL}$$

Answer 90. mL

$$\text{Vol. added} = 240.\text{ mL} - 150.0\text{ mL} = 90.\text{ mL}$$

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.

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

mass BF_3 formed $= \left(\frac{161.2\text{g}}{1}\right)\left(\frac{\text{mol}}{24.8\text{g}}\right)\left(\frac{2}{2}\right)\left(\frac{67.8\text{ g}}{\text{mol}}\right) =$

Answer 441 g

b) Calculate the *percentage* yield of BF_3.

$\%\text{ yield} = \frac{326.118}{441} \times 100 =$

Answer 74.0%

7. When reacting NH_3 with O_2 according to the reaction:

$$4\ NH_3 + 5\ O_2 \rightarrow 4\ NO + 6\ H_2O$$

Using 163.2 grams of NH_3 with an excess of O_2 produces a 67% yield of NO.

a) Calculate the *theoretical yield* of NO in grams.

mass NO produced $= \left(\frac{163.2\text{g}}{1}\right)\left(\frac{\text{mol}}{17.0\text{g}}\right)\left(\frac{4}{4}\right)\left(\frac{30.0\text{g}}{\text{mol}}\right) =$

Answer 288 g

b) Calculate the *actual yield* of NO in grams.

$\% = \frac{\text{actual}}{\text{expected}} \rightarrow 0.67 = \frac{a}{288\text{g}} =$

Answer 193 g

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

$$Ba(OH)_{2(aq)} + 2\,HNO_{3(aq)} \rightarrow 2\,H_2O_{(l)} + Ba(NO_3)_2$$

a) In a titration, 18.20 mL of 0.300 M $Ba(OH)_2$ is required to react completely with a 25.0 mL sample of a solution of HNO_3. Find the $[HNO_3]$.

$$[HNO_3] = \left(\frac{0.300\,mol}{L}\right)\left(\frac{0.01820\,L}{1}\right)\left(\frac{2}{1}\right)\left(\frac{1}{0.0250\,L}\right) =$$

Answer 0.437 M

b) In a titration, 11.06 mL of 0.200 M HNO_3 is required to react completely with a sample of 0.250M $Ba(OH)_2$. Find the volume of the $Ba(OH)_2$ sample.

$$\text{volume } Ba(OH)_2 = \left(\frac{0.200\,mol}{L}\right)\left(\frac{0.01106\,L}{1}\right)\left(\frac{1}{2}\right)\left(\frac{L}{0.250\,mol}\right) =$$

Answer 0.00442 L

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

	$3\,Cu_{(s)}$	$+\ 8HNO_{3(l)}$	$\rightarrow\ 3\,Cu(NO_3)_{2(aq)}$	$+\ 2NO_{(g)}$	$+\ 4\,H_2O_{(l)}$
I	5.00	12.0		0	
C	-4.50	-12.0		+3.00	
E	0.50	0		3.00	

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

$$\text{moles Cu} = \left(\frac{317.5\,g}{1}\right)\left(\frac{mol}{63.5\,g}\right) = 5.00$$

$$\text{moles } HNO_3 = \left(\frac{756.0\,g}{1}\right)\left(\frac{mol}{63.0\,g}\right) = 12.0$$

Answer Cu in excess.

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

$$\text{mass NO formed} = \left(\frac{3.00\,mol}{1}\right)\left(\frac{30.0\,g}{mol}\right) =$$

Answer 90.0 g

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

$$HBrO_3 + 5\,HBr \rightarrow 3\,H_2O_{(l)} + 3\,Br_{2(g)}$$

a) If 3.56 moles of HBr are reacted, how many Litres of Br_2 will be formed at STP?

"L" Br_2 = $\left(\frac{3.56\,mol}{1}\right)\left(\frac{3}{5}\right)\left(\frac{22.4\,L}{mol}\right)$ =

Answer 47.8 L

b) In order to produce 3.311×10^{24} molecules of Br_2, what mass of HBr is needed?

mass HBr = $\left(\frac{3.311\times10^{24}\,molec}{1}\right)\left(\frac{mol}{6.02\times10^{23}\,molec}\right)\left(\frac{5}{3}\right)\left(\frac{80.9\,g}{mol}\right)$ =

Answer 7.42×10^2 g

3. 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?

mass $MgCO_3$ = $\left(\frac{1.5\,mol}{L}\right)\left(\frac{0.0150\,L}{1}\right)\left(\frac{1}{2}\right)\left(\frac{84.3\,g}{mol}\right)$ =

Answer 0.95 g

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

Volume HCl = $\left(\frac{37.935\,g}{1}\right)\left(\frac{mol}{84.3\,g}\right)\left(\frac{2}{1}\right)\left(\frac{L}{2.0\,mol}\right)$ =

Answer 0.45 L

Unit 7— Stoichiometry

1. 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?

$$\text{mol } NF_3 = \left(\frac{5.5 \text{ mol}}{1}\right)\left(\frac{2}{3}\right) =$$

Answer 3.7 mol

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

$$\text{mol } NF_3 = \left(\frac{0.47 \text{ mol}}{1}\right)\left(\frac{2}{6}\right) =$$

Answer 0.16 mol

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

$$\text{mol } H_2 = \left(\frac{180.6 \text{ g}}{1}\right)\left(\frac{\text{mol}}{28.0 \text{ g}}\right)\left(\frac{3}{1}\right) =$$

Answer 19.4 mol

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

$$\text{mass HF} = \left(\frac{17.04 \text{ g}}{1}\right)\left(\frac{\text{mol}}{71.0 \text{ g}}\right)\left(\frac{6}{2}\right)\left(\frac{20.0 \text{ g}}{\text{mol}}\right)$$

Answer 14.4 g

9. Regions in space occupied by electrons are called orbitals

10. The principal quantum number is given the letter "n" and refers to the energy level.

11. 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.

a) P ($[Ne]3s^23p^3$)

b) Mo ($[Kr]5s^24d^4$)

c) Se ($[Ar]4s^23d^{10}4p^4$)

d) Rb ($[Kr]5s^1$)

e) Cl^- ($[Ne]3s^23p^6$)

f) Al^{3+} ($[He]2s^22p^6$)

g) K^+ ($[Ne]3s^23p^6$)

h) S^{2-} ($[Ne]3s^23p^6$)

12. In order to become stable,

an atom of Sr will lose 2 electrons and become the ion Sr^{2+}

an atom of As will gain 3 electrons and become the ion As^{3-}

an atom of Al will lose 3 electrons and become the ion Al^{3+}

an atom of Se will gain 2 electrons and become the ion Se^{2-}

an atom of N will gain 3 electrons and become the ion N^{3-}

an atom of I will gain 1 electrons and become the ion I^-

an atom of Cs will lose 1 electrons and become the ion Cs^+

an atom of Te will gain 2 electrons and become the ion Te^{2-}

13. Circle the metalloid: Be Rb Os (Ge) Pb Al

6. Give the number of protons, neutrons and electrons in the following:

Isotope	*Protons*	*Neutrons*	*Electrons*
$^{194}Ir^{3+}$	77	117	74
$^{202}Hg^{2+}$	80	122	78
$^{125}Te^{2-}$	52	73	54
^{263}Sg	106	157	106
$^{2}H^{+}$	1	1	0

7. Give the nuclear notation of the following:

Isotope	*Protons*	*Neutrons*	*Electrons*
$^{262}_{105}Db^{2+}$	105	157	103
$^{123}_{51}Sb^{3+}$	51	72	48
$^{75}_{33}As^{3-}$	33	42	36
$^{133}_{54}Xe$	54	79	54
$^{244}_{94}Pu^{3+}$	94	150	91

8. Element "X" is composed of the following naturally occurring isotopes:

Isotope	% Abundance
^{79}X	50.69
^{81}X	49.31

Calculate the average atomic mass of element "X" to 3 decimal places.

Element "X" is actually the real element _____.

don't do do this

Unit 8— Atoms, Periodic Table and Bonding

1. The Greek who developed the idea of atoms was Democritus

2. Consider the following ideas:
   - Compounds are made up of molecules which are combinations of atoms
   - All atoms of an element are the same
   - Atoms of different elements are different
   - Atoms are indivisible particles

   Who came up with these ideas? John Dalton He called the ideas, the Atomic Theory.

3. JJ Thompson measured the charge/mass ratio of an electron and came up with the so-called "plum pudding" model of the atom.

4. Rutherford devised the Scattering Experiment, which showed that all atoms had a small dense nucleus.

5. Bohr came up with an atomic model to explain the spectrum of hydrogen.

   He said that the atom has certain energy levels which are allowed. These levels corresponded to orbitals/shells in which electrons move. If an electron absorbs a certain photon of energy, it will jump to a higher level. It will release this energy (in the form of light) when it jumps back to a lower level.

   What were two limitations of Bohr's atomic model?

   - only worked for hydrogen
   - no evidence that e⁻ travel in orbitals.

14. Circle the most reactive element in the following: (Na) Mg Si Al Ar
15. Circle the most reactive element in the following: Na K Rb (Cs) Li
16. Circle the most reactive element in the following: (Cl) Br I At Ne
17. Circle the element with the largest atomic radius of these: (Na) Mg Si Al Ar
18. Circle the element with the largest atomic radius of these: N P As Sb (Bi)
19. Circle the element with the largest ionization energy of these: K Ca Ga As (Kr)
20. Circle the element with the largest ionization energy of these: (C) Si Ge Sn Pb
21. What is meant by ionization energy? energy required to remove an electron from a neutral atom
22. Circle the element with the largest density of these: C Si Ge Sn (Pb)
23. Circle the element with the largest density of these: Na K Rb (Cs) Li
24. Circle the element with the highest electronegativity of these: (Mg) Sr Ba Ra
25. Circle the element with the highest electronegativity of these: Mg Si S (Cl)
26. Circle the element with the highest electronegativity of these: (F) Cl Br I
27. What is meant by electronegativity? ability to remove electrons from a neighbouring atom.
28. Circle the most metallic element of these: Be Mg Ca Sr (Ba)
29. Circle the most metallic element of these: B Al Ga In (Tl)
30. Circle the most metallic element of these: (Ga) Ge Se Br Kr
31. Write a balanced equation for the reaction of potassium with water.

$2K + 2H_2O \rightarrow H_2 + 2KOH$

32. Write a balanced equation for the reaction of aluminum with bromine.

$2Al + 3Br_2 \rightarrow 2Al_2Br_3$

33. Which gas is used to fill ordinary light bulbs? Argon Why? Inert (will not react)
34. Why is argon used when welding metals like aluminum?

Who knows...

35. Which halogen is pale yellow? _____ pale green _____
a silvery solid _____ a reddish liquid _____

36. Why is sodium iodide added to our table salt? iodine! we need it!!

37. 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

38. 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

39. In a polar covalent bond, electrons are
    k. shared equally by two atoms
    l. shared unequally by two atoms
    m. transferred from a metal to a non-metal
    n. transferred from a non-metal to a metal
    o. closer to one end of a molecule, forming a temporary dipole Answer l & o

40. In London forces, electrons are
    p. shared equally by two atoms
    q. shared unequally by two atoms
    r. transferred from a metal to a non-metal
    s. transferred from a non-metal to a metal
    t. closer to one end of a molecule, forming a temporary dipole Answer t

not temporary though

41. What physical evidence to we have that ionic bonds are very strong? high melting pts.

42. Diamond, silicon carbide and boron nitride have covalent bonds between all the atoms.
This type of bonding is called network bonding.

43. Write electron-dot diagrams for:

$MgCl_2$ (ionic)	PBr_3(covalent)	SeF_2(covalent)	CH_3CH_2I(covalent)