

Chemistry 11 – Course Review

Unit 2—Introduction to Chemistry

Pages in Student Workbook	Class Assignments	Extra Questions (SW)
9-40	Hand-In #1—Unit Conversions Hand-In #2—Significant Digits Experiment 3-A - Determining the Mass/Volume Relation for 3 Liquids	p.21, p.26, p.33-34, p.39, p.40

1. $0.0006 \text{ mm} = ? \mu\text{m}$

Answer _____

2. $0.054 \text{ mL} = ? \text{ nL}$

Answer _____

3. $3.5 \mu\text{g/L} = ? \text{ mg/mL}$

Answer _____

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

Answer _____

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

Answer _____

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

Answer _____

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

a) 0.0023 _____ d) 3.2×10^{-4} _____

b) 3953 000 _____ e) 50020.000 _____

c) 1.0200×10^5 _____ f) 3450 _____

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 _____ f) $8.90 \times 10^3 \div 4.400 \times 10^{-6}$ _____

b) $0.05 + 394.7322$ _____ g) $83.00 \div 1.2300 \times 10^2$ _____

c) $4.905 \times 10^6 \div 4 \times 10^{-2}$.. _____ h) $98.0076 - 2.195$ _____

d) $(3.33 \times 9.52) + 13.983$. _____ i) $0.00000200 \times 245.912$ _____

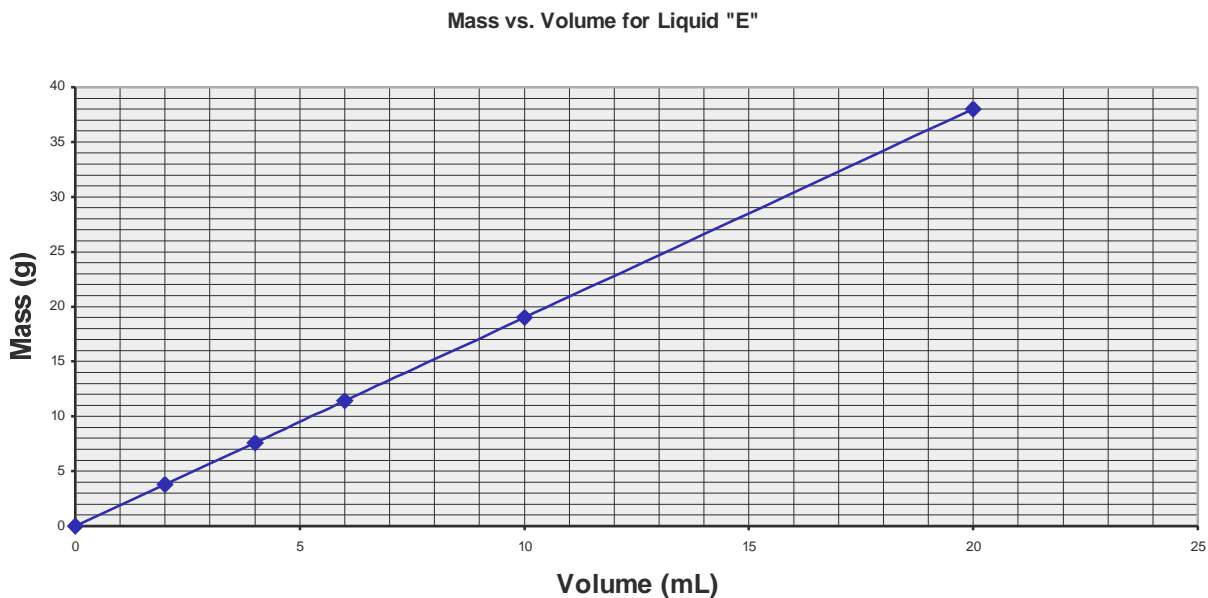
e) $3.813 + 98.98 + 2.669$.. _____ j) $5.802 \div 6.21 + 2.41 \div 9.2565$... _____

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

a) 2 000 000 000 _____ c) 3.88945×10^{28} _____

b) 106 000 _____ d) 0.000 000 7895 _____

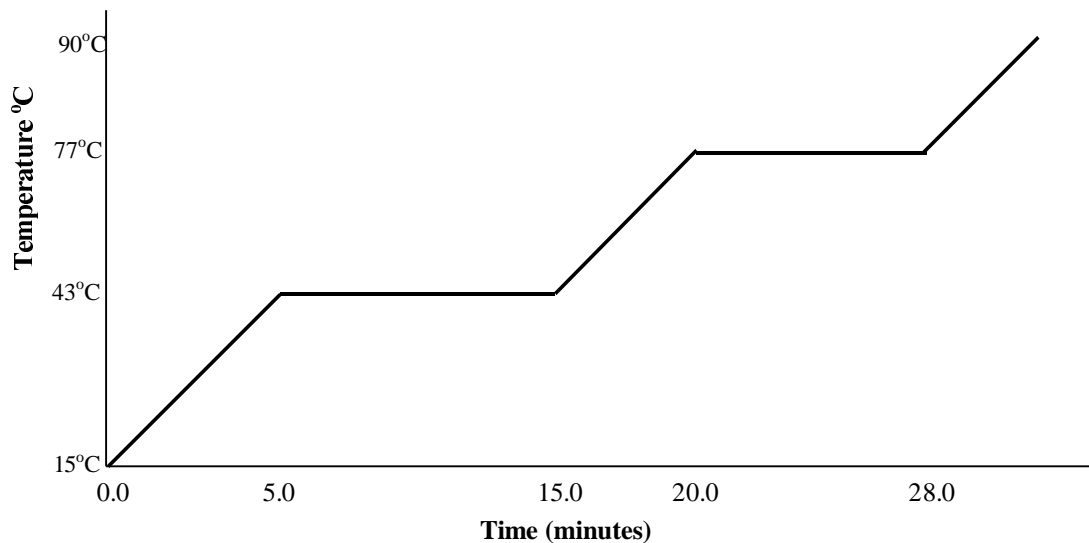
10. Given the following graph of Mass (g) vs. Volume (mL) for Liquid "E", answer the questions below it:



- Calculate the slope of the line and express it in the correct units.
- What is the Y-Intercept for the line? _____
- Write a mathematical equation for the line in terms of Mass and Volume.
- Predict the mass of 150 mL of Liquid "E". (Use the equation from (c))
- Predict the volume occupied by a 240 g sample of Liquid "E"
- What is the density of Liquid "E" in g/mL? _____

3. Review p.53-58. Answer the following:
- Explain how distillation can be used to separate the substances in a solution.
 - What types of mixtures does paper chromatography work best for?
 - What is the simplest, most economical method of separating suspensions?
 - Solvent extraction involves using two different solvents which are (*miscible/immiscible*) _____. A device called a _____ funnel is used.
 - Explain how a centrifuge separates the components of a suspension.
4. Define a physical change –
Give some examples of physical changes.
5. Define a chemical change –
Give some examples of chemical changes.

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



- During time 0.0 – 5.0 minutes, the added heat energy is being used to _____
- During time 5.0 – 15.0 minutes, the added heat energy is being used to _____
- During time 15.0 – 20.0 minutes, the added heat energy is being used to _____
- During time 20.0 – 28.0 minutes, the added heat energy is being used to _____
- The melting point of substance “X” is _____
- The boiling point of substance “X” is _____
- If a greater amount of substance “X” was used, the melting point would be
 - a lower temperature
 - a higher temperature
 - the same temperature
 Answer _____
- What phase is substance “X” at 90°C? _____
- Explain WHY the curve levels off between 5.0 min. and 15.0 min.

Unit 4— Names and Formulas for Compounds

Pages in Student Workbook	Class Assignments	Extra Questions (SW)
65 - 76	Hand-In Assignment #3 - Formulas and Names for Ionic Compounds	p.75-76

1. Write the correct formula for the following compounds:

- a) ammonium chlorate _____
- b) copper (II) sulphite..... _____
- c) zinc carbonate tetrahydrate _____
- d) nitric acid _____
- e) phosphorus pentaiodide _____
- f) iron (III) thiocyanate _____
- g) sulphuric acid..... _____
- h) dinitrogen tetrafluoride _____

2. Write the correct names for the following compounds:

- a) $\text{Mn}(\text{SO}_4)_2$ _____
- b) $\text{PbCrO}_4 \cdot 6\text{H}_2\text{O}$ _____
- c) As_2O_3 _____
- d) CH_3COOH _____ acid
- e) $\text{Ni}_2(\text{C}_2\text{O}_4)_3$ _____
- f) NF_3 _____
- g) $(\text{NH}_4)_2\text{HPO}_4$ _____
- h) $\text{Ba}(\text{OH})_2 \cdot 10\text{H}_2\text{O}$ _____

Unit 5— The Mole Concept

Pages in Student Workbook	Class Assignments	Extra Questions (SW)
77 - 104	Experiment 4B—Moles of Iron and Copper Hand-In Assignment # 4 – Mass-Mole-Volume Conversions Do Experiment 7B—The Molar Volume of a Gas Hand-In Assignment #5 – Summary of Mole Conversions Tutorial 5-1 Do Experiment 5-1 - Percent Oxygen in KClO_3 Hand-In Assignment #6—Percent Composition, Empirical and Molecular Formulas, Molarity and Dilution Calculations	p.82, p.84, p.87, p.88-90, p.93, p.95, p.98, p.102, p.103-104

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

Answer _____

b) 0.00256 moles of $\text{Li}_2\text{Cr}_2\text{O}_7$ = ? grams

Answer _____

c) 170.24 L of NO_2 at STP = ? moles

Answer _____

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

Answer _____

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

Answer _____

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

Answer _____

g) 0.5696 kg of $\text{CH}_4(\text{g})$ = ? mL

Answer _____

2. The density of liquid ethanol ($\text{C}_2\text{H}_5\text{OH}$) 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!)

Answer _____

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

Answer _____

4. Calculate the density of $\text{PCl}_3(\text{g})$ at STP.

Answer _____

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

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

Answer _____

6. Find the percent composition (% by mass of each element) in the following compound: $\text{Sr}_3(\text{PO}_4)_2$. Show your work.

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

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.

Answer _____

- b) Determine the empirical formula for this compound.

Answer: Empirical Formula: _____

- c) Determine the molecular formula for this compound.

Answer: Molecular Formula: _____

8. 123.11 g of zinc nitrate, $\text{Zn}(\text{NO}_3)_2$ are dissolved in enough water to form 650.0 mL of solution. Calculate the $[\text{Zn}(\text{NO}_3)_2]$ Include proper units in your work and in your answers.

Answer _____

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.

Answer _____

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.

Answer _____

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.

Answer _____

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.

Answer _____

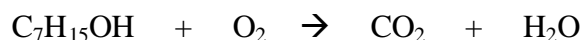
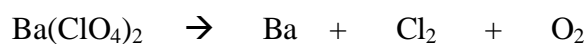
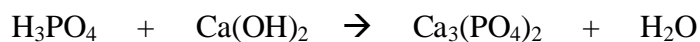
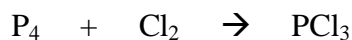
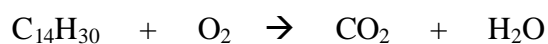
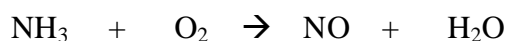
13. Give directions on how to make 5.00 L of 0.020 M $\text{Ca}(\text{ClO})_2$ using solid $\text{Ca}(\text{ClO})_2$ and water. Include proper units in your work and in your answers.

Directions:

Unit 6— Chemical Reactions

Pages in Student Workbook	Class Assignments	Extra Questions (SW)
105 - 122	Hand-In Assignment #7—Chemical Equations Do Experiment 5C—Types of Chemical Reactions Hand-In Assignment #8—Completing, Balancing and Classifying Chemical Equations. Do Experiment 17B—Heat of Fusion of Ice Hand-In Assignment #9—Energy in Chemical Reactions	p.110-112, p.113-114, p.118, p.122

1. Balance the following equations



$CD \rightarrow C + D \quad \Delta H = 65.7 \text{ kJ}$ Answer _____

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

4. Given the equation: $C_{12}H_{22}O_{11} + 12O_2 \rightarrow 12CO_2 + 11H_2O + 5638 \text{ kJ}$

a. How much heat is released during the formation of 880.0 g of CO_2 ?

Answer _____

b. How much heat is released during the formation of 5.6 moles of H_2O ?

Answer _____

c. If 179.2 L of O_2 (STP) are consumed, how much heat is released?

Answer _____

5. Calculate the amount of heat (in Joules) required to warm 200.0 g of water from 8.0°C to 45.0°C . (Heat Capacity (C) for H_2O is $4180 \text{ J/kg} \cdot ^\circ\text{C}$)

Answer _____

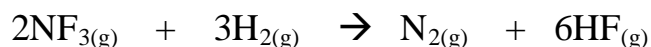
6. 13.376 kJ of heat are added to a 400.0 gram sample of water initially at 4.0°C . Calculate the final temperature of the water sample. Be careful with units! (Heat Capacity (C) for H_2O is $4180 \text{ J/kg} \cdot ^\circ\text{C}$)

Answer _____

Unit 7— Stoichiometry

Pages in Student Workbook	Class Assignments	Extra Questions (SW)
123 - 138	Experiment 6A—Mass and Moles in a Chemical Reaction Hand-In Assignment # 10—Stoichiometry Problems Experiment 20-C Acid-Base Titration Hand-In Assignment # 11—Molarity, Excess and Percentage Yield Problems.	p.124, p.127, p.131, p.133, p.137

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



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

Answer _____

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

Answer _____

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

Answer _____

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

Answer _____

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



- a) If 3.56 moles of HBr are reacted, how many Litres of Br₂ will be formed at STP?

Answer _____

- b) In order to produce 3.311×10^{24} molecules of Br₂, what mass of HBr is needed?

Answer _____

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



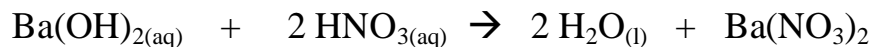
- a) What mass of MgCO₃ will react completely with 15.0 mL of 1.5 M HCl?

Answer _____

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

Answer _____

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



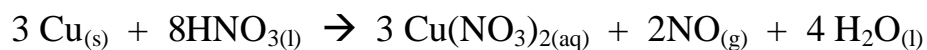
- a) In a titration, 18.20 mL of 0.300 M Ba(OH)_2 is required to react completely with a 25.0 mL sample of a solution of HNO_3 . Find the $[\text{HNO}_3]$.

Answer _____

- 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.

Answer _____

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



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

Answer _____

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

Answer _____



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.

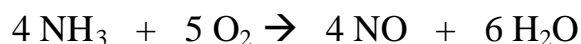
- a) Calculate the *theoretical* yield of BF_3 in grams.

Answer _____

- b) Calculate the *percentage* yield of BF_3 .

Answer _____

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



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.

Answer _____

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

Answer _____

Unit 8— Atoms, Periodic Table and Bonding

Pages in Student Workbook	Class Assignments	Extra Questions (SW)
139 - 192	Hand-In Assignment # 12—Electronic Structure of the Atom Experiment on Trends in Reactivity of Elements Activity on Trends on the Periodic Table Hand-In Assignment #13—Electron Arrangement and Ion Formation “Web-Elements” Computer Activity Hand-In Assignment #14—Chemical Bonding Review Sheet on Unit 8	p.146-147, p.149, p.150, p.155, p.157-158, p.164, p.170-171, p.181, p.183, p.191-192

- The Greek who developed the idea of atoms was _____
- 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? _____ He called the ideas, the _____ Theory.

- _____ measured the charge/mass ratio of an electron and came up with the so-called “plum pudding” model of the atom.
- _____ devised the Scattering Experiment, which showed that all atoms had a small dense _____.
- Bohr came up with an atomic model to explain the spectrum of _____.

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

What were two limitations of Bohr’s atomic model?

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

Isotope	Protons	Neutrons	Electrons
$^{194}\text{Ir}^{3+}$			
$^{202}\text{Hg}^{2+}$			
$^{125}\text{Te}^{2-}$			
^{263}Sg			
$^2\text{H}^+$			

7. Give the nuclear notation of the following:

Isotope	Protons	Neutrons	Electrons
	105	157	103
	51	72	48
	33	42	36
	54	79	54
	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 _____.

9. Regions in space occupied by electrons are called _____
10. The principal quantum number is given the letter _____ and refers to the _____ 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
 - b) Mo
 - c) Se
 - d) Rb
 - e) Cl^-
 - f) Al^{3+}
 - g) K^+
 - h) S^{2-}
12. In order to become stable,
- an atom of Sr will _____ electrons and become the ion _____
- an atom of As will _____ electrons and become the ion _____
- an atom of Al will _____ electrons and become the ion _____
- an atom of Se will _____ electrons and become the ion _____
- an atom of N will _____ electrons and become the ion _____
- an atom of I will _____ electrons and become the ion _____
- an atom of Cs will _____ electrons and become the ion _____
- an atom of Te will _____ electrons and become the ion _____
13. Circle the metalloid: Be Rb Os Ge Pb Al

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?
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?
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.
32. Write a balanced equation for the reaction of aluminum with bromine.
33. Which gas is used to fill ordinary light bulbs? _____ Why? _____
34. Why is argon used when welding metals like aluminum?

35. Which halogen is pale yellow? _____ pale green _____
a silvery solid _____ a reddish liquid _____
36. Why is sodium iodide added to our table salt?
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 _____
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 _____
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 _____
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 _____
41. What physical evidence do we have that ionic bonds are very strong?
42. Diamond, silicon carbide and boron nitride have covalent bonds between all the atoms. This type of bonding is called _____ bonding.
43. Write electron-dot diagrams for:
MgCl₂ (ionic) PBr₃(covalent) SeF₂(covalent) CH₃CH₂I(covalent)

THIS IS THE END OF THE REVIEW. THE EXAM ALSO COVERS UNIT 9. GOOD LUCK!!!!