Honors Chemistry
Exam 1 Study Guide

Exam Date:
Friday, September 26

Content:
All of Chapter 1 and Chapter 2 sections 2.1-2.7, inclusive

Format:
Multiple choice, short answer, problem solving, and one essay

Time allotted:
87 minutes

YOU MUST BRING A CALCULATOR TO THE EXAM. IF YOU DO NOT HAVE ACCESS TO ONE, PLEASE LET ME KNOW TWO DAYS PRIOR TO THE EXAM.

Topics

Chapter 1: Matter and Measurement

    Ozone layer

    Chlorofluorocarbons

    Chemistry

    Matter

    Atoms

    Three Physical States of Matter

    Substances

        Elements

        Compounds

    Law of Constant Composition

    Law of Definite Proportions

    Mixtures

        Homogeneous versus heterogeneous mixtures

    Physical and Chemical Properties

    Extensive and Intensive Properties

    Separation Techniques

The Steps of the Scientific Method

Qualitative and quantitative data

Hypothesis, theory, scientific law

Independent and Dependent Variables

Control

Metric system

SI base units

Temperature Scales

Prefixes (specifically kilo, milli, centi, deci, and micro)

Derived units

    Volume

    Density

Density problem solving (calculator permitted)

Accuracy

Precision

Significant Figures

    Identifying significant figures

    Adding and subtracting with sig fig rules (calculator permitted)

    Multiplying and dividing with sig fig rules (calculator permitted)

Dimensional Analysis and Conversion Factors

Chapter 2: Atoms, Molecules, and Ions

History of the Atom

Atomic Structure

Atomic Number

Mass Number

Atomic Weight (Average Atomic Mass)

Protons, Neutrons, Electrons

Isotopes

Ions

Periodic Table

Families of the Periodic Table

Metals, Nonmetals, Metalloids

Molecules

Chemical Formulas

        Molecular Formula

        Empirical Formula

Diatomic Molecules

Structural Formulas

        Perspective drawings

        Ball-and-stick models

        Space-filling models

Ionic Compounds

Polyatomic ions

Sample Problems

Remember to put your answer in correct significant figures and provide units in order to get full credit.

Density

Answer the following questions keeping in mind significant figures and dimensional analysis.

1. What is the density of an object that has a mass of 67.0 g and a volume of 14.7 mL?

2. What is the density of an object that has a mass of 17.0 g and is a cube with dimensions of 1.2 cm x 7.4 cm x 3.0 cm?

3. What volume will 88.0 g of an object with a density of 3.44 g/ mL occupy?

4. How many quarts will 15.0 lbs of a liquid with density of 2.08 g/ mL occupy? 1 L = 1.0567 qt

5. What will be the mass of 0.047 liters of a substance with a density of 8.73 g/ mL?

Dimensional Analysis

1. The speed of light in a vacuum is 2.998 x 10^8 m/s. Calculate its peed in km/hr.

2. How many feet in 0.5 meters?

3. How many square inches in 34 square centimeters?

4. 4.22 g/cm3 to lbs./ft3

5. 37.5 g/mL to kg/cubic meter

6. If an automobile is able to travel 254 miles on 11.2 gallons of gasoline, what is its mileage in km/L? 1 L= 1.057 qt; 4qt = 1 gal

Significant Figures

Determine the number of significant figures in each of the following:

a) 3427

b) 0.00456

c) 123,453

d) 172

e) 0.000984

f) 0.502

g) 3100.0×10^2

h) 0.0114×10^4

i) 107.2

j) 0.0000455

k) 2205.2

l) 30.0×10^{-2}

m) 0.982×10^{-3}

n) 0.0473

o) 650,502

p) 3.03×10^{-1}

q) 20.4×10^5

r) 1000×10^{-3}

Round each of the following to 3 significant figures.

a) 77.0653

b) 6,300,278.2

c) 0.00023350

d) 10.2030

e) 2.895×10^{21}

Perform the following mathematical operations and express your answers to the proper number of significant figures.

1. 642 x (4.0 x 10⁻⁵)

2. 17/ 3.88 x 10⁷

3. (2.9 x 10⁻⁵) x (8.1 x 10²)

4. (4.3 x 10⁻⁵)³

5. 5.40 x 10⁻¹⁸/ 769

6. 59 x (3.24 x 10⁻²)/ 4.80 x 10⁴

7. 42 x (6.02 x 10²³)/ .016

8. 12.0/ (6.02 x 10²³)

9. 0.00000016/ 74.3

10. 10.0/ 54,600

Scientific Method

Don thinks that a special juice will increase the productivity of workers. He creates two groups of 50 workers each and assigns each group the same task (in this case, they're supposed to staple a set of papers). Group A is given the special juice to drink while they work. Group B is not given the special juice. After an hour, Don counts how many stacks of papers each group has made. Group A made 1,587 stacks, Group B made 2,113 stacks.	Identify the: 1. Control Group 2. Independent Variable 3. Dependent Variable 4. What should Don's conclusion be? 5. How could this experiment be improved?

Atomic Weight Problems

1. Lead (Pb) has four naturally occurring isotopes with atomic masses 203.97302, 205.97444, 206.97587, and 207.97663 amu. The relative abundance of these four isotopes are 1.4, 24.1, 22.1, and 52.4%, respectively. Calculate the atomic weight of lead.

2. Only two isotopes of copper (Cu) occur naturally., ^{63}Cu (62.9296 amu; abundance 69.17%) and ^{65}Cu (64.9278 amu; abundance 30.83%). Calculate the atomic weight of copper.

Atomic Structure Chart

Element	Symbol	Atomic Number	# of Protons	# of Neutrons	# of Electrons	Atomic Mass	Charge	Isotope? Y or N	Cation, Anion, or Atom
		22				50	-1		
	W							N	Atom
Francium				137	86				
	Na					26	+2		
Manganese				30	26				
		2		2	2				

Empirical/ Molecular Formula Problems

1. Determine the empirical formula of a compound containing 42.9% C and 57.1% O.

2. The analysis of a compound consisting of carbon, hydrogen and sulfur revealed that it was 57.04% C and 4.78% H. What is the empirical formula of this compound?

3. An oxide of nitrogen, NxOy, contains 30.43% N. Its molecular mass is determined to be 92 g/mol. What are the empirical and molecular formulas of this compound?

4. 10.7.8 g of an arsenic oxide was formed when 5.9 g of As reacted with O. What is the empirical formula of this oxide?

Predicting Ionic Charges and Compounds

1. Using the periodic table, predict the charges of the ions of the following elements: (a) Sr, (b) Sc, (c) P, (d) I, (e) Se.

2. Predict the chemical formula for the ionic compound formed by: (a) Ca^{2+} and Br^- (b) K^+ and CO_3^{2-} (c) Al^{3+} and $C_2H_3O_2^-$ (d) NH_4^+ and SO_4^{2-} (e) Mg^{2+} and PO_4^{3-}.