

Name: _____
Hour: _____ Date: _____

Chemistry: *Properties*

Recall that *physical properties* can be observed without producing new substances. *Chemical properties* describe how a substance interacts with other substances to produce new substances. *Extensive properties* depend upon the amount of matter in the sample; *intensive properties* do not.

Directions, Part 1: Classify each of the properties listed below as extensive or intensive. Then classify each property as physical or chemical. Write the word out to earn full credit.

<i>Property</i>	<i>Extensive or Intensive Property</i>	<i>Physical or Chemical Property</i>
color		
combustibility		
hardness		
density		
mass		
melting point		
ductility		
volume		
reactivity with acid		
odor		
weight		
malleability		
tendency to corrode		

Directions, Part 2: Some measurements or descriptions of properties are listed below. Write which property is being described in each case. Select properties that are listed in the table from Part 1.

- | | |
|--|----------|
| A. 15 dm ³ | A. _____ |
| B. can easily be hammered into sheets | B. _____ |
| C. 2.8 g/cm ³ | C. _____ |
| D. burns when heated in the presence of O ₂ | D. _____ |
| E. shiny metal forms a chalky white layer on its surface | E. _____ |
| F. can be scratched by a diamond | F. _____ |
| G. 500°C | G. _____ |
| H. can easily be drawn into a wire | H. _____ |



WORKSHEET ON CHEMICAL VS PHYSICAL PROPERTIES AND CHANGES

Background: Keeping the difference between physical and chemical properties as well as changes can be a challenge! This worksheet will help you do this. First, use the book to define the following terms.

VOCABULARY WORD	DEFINITION
Physical Property	
Physical Change	Change in which the identity of the substance does NOT change
Chemical Property	
Chemical Change	

Part One: Physical or Chemical Property? Fill in the chart using the vocabulary words or phrases provided.

Vocabulary words

Boiling point	Ability to rust	Melting point	Brittleness	Reactivity with vinegar
elasticity	Flammability	Density	Transparency	ductility

Each word is used once. Define the word when done!

Chemical Property↓	Definition
	• The ability to burn
	• Reacts with oxygen to produce rust

Physical Property↓	Definition
	• The property of letting light pass through something

Part Two: Physical or Chemical Change? Indicate with a 'P' or a 'C' which type of change is taking place.

1. _____ glass breaking	10. _____ mixing salt and water
2. _____ hammering wood together	11. _____ mixing oil and water
3. _____ a rusting bicycle	12. _____ water evaporating
4. _____ melting butter	13. _____ cutting grass
5. _____ separate sand from gravel	14. _____ burning leaves
6. _____ bleaching your hair	15. _____ fireworks exploding
7. _____ frying an egg	16. _____ cutting your hair
8. _____ squeeze oranges for juice	17. _____ crushing a can
9. _____ melting ice	18. _____ boiling water

Name: _____
 Hour: _____ Date: _____

Chemistry: Classifying Matter

Classify each of the materials below. In the center column, state whether the material is a **pure substance** or a **mixture**. If the material is a pure substance, further classify it as either an **element** or **compound** in the right column. Similarly, if the material is a mixture, further classify it as **homogeneous** or **heterogeneous** in the right column. Write the entire word in each space to earn full credit.

<i>Material</i>	<i>Pure Substance or Mixture</i>	<i>Element, Compound, Homogeneous, Heterogeneous</i>
concrete		
sugar + pure water ($C_{12}H_{22}O_{11} + H_2O$)		
iron filings (Fe)		
limestone ($CaCO_3$)		
orange juice (w/pulp)		
Pacific Ocean		
air inside a balloon		
aluminum (Al)		
magnesium (Mg)		
acetylene (C_2H_2)		
tap water in a glass		
soil		
pure water (H_2O)		
chromium (Cr)		
Chex mix		
salt + pure water ($NaCl + H_2O$)		
benzene (C_6H_6)		
muddy water		
brass (Cu mixed with Zn)		
baking soda ($NaHCO_3$)		

Name: _____
Hour: _____ Date: _____

Chemistry: Density Problems

For each problem below, write the equation and show your work. Always use units and box in your final answer.

- The density of silver (Ag) is 10.5 g/cm^3 . Find the mass of Ag that occupies 965 cm^3 of space.
- A 2.75 kg sample of a substance occupies a volume of 250.0 cm^3 . Find its density in g/cm^3 .
- Under certain conditions, oxygen gas (O_2) has a density of 0.00134 g/mL . Find the volume occupied by 250.0 g of O_2 under the same conditions.
- Find the volume that 35.2 g of carbon tetrachloride (CCl_4) will occupy if it has a density of 1.60 g/mL .
- The density of ethanol is 0.789 g/mL at 20°C . Find the mass of a sample of ethanol that has a volume of 150.0 mL at this temperature.
- 30.0 g of each of the following acids are needed. Find the volume of each that must be measured out in a graduated cylinder.
 - hydrochloric acid (HCl), density = 1.164 g/mL
 - sulfuric acid (H_2SO_4), density = 1.834 g/mL
 - nitric acid (HNO_3), density = 1.251 g/mL
- A rectangular block of lead (Pb) measures $20.0 \text{ mm} \times 30.0 \text{ mm} \times 45.0 \text{ mm}$. If the density of Pb is 11.34 g/cm^3 , calculate the mass of the block.
- A cube of gold (Au) has a side length of 1.55 cm . If the sample is found to have a mass of 71.9 g , find the density of Au.
- An irregularly-shaped sample of aluminum (Al) is put on a balance and found to have a mass of 43.6 g . The student decides to use the water-displacement method to find the volume. The initial volume reading is 25.5 mL and, after the Al sample is added, the water level has risen to 41.7 mL . Find the density of the Al sample in g/cm^3 . (Remember: $1 \text{ mL} = 1 \text{ cm}^3$.)
- If you are sure that a sample of material is aluminum but have no measuring instruments AND are not allowed to handle the sample, how would you determine the sample's density?
- A gas has a mass of 3175 g and takes up enough space to fill a room that is $2.00 \text{ m} \times 2.00 \text{ m} \times 5.00 \text{ m}$. Use the table below, which lists densities in units of g/mL to help you determine what the gas is. (Hint: Change the units on the size of the room.)

Answers:
1. $1.01 \times 10^4 \text{ g Ag}$
2. 11 g/cm^3
3. $1.87 \times 10^5 \text{ mL}$
4. 22.0 mL
5. 118.35 g ethanol

6A. 25.8 mL HCl
6B. $16.4 \text{ mL H}_2\text{SO}_4$
6C. 24.0 mL HNO_3
7. 306 g Pb
8. 19.3 g/cm^3

9. 2.69 g/cm^3
11. helium

Atomic Number/Mass Fill-In

Complete the chart using the periodic table for help.

Atomic number= number of protons and also the number of electrons in a neutral atom

Atomic mass= number of protons PLUS number of neutrons

	Atom	Symbol	Atomic #	Mass #	# Protons	# neutrons	# electrons
1	Hydrogen	H	1				
2	Boron	B	5				
3							10
4	Chromium	Cr					
5					7		7
6				207			
7	Gold						
8			54				
9							92
10		K					
11					47		
12				222			
13	Iron						
14			20				
15							13
16							
17					16		
18				84			
19	Chlorine						
20		Na					
21							80

Name: _____
Hour: _____ Date: _____

Chemistry: Atoms, Mass, and the Mole

Directions: Use appropriate conversion factors and unit cancellation to solve the following problems. In order to get full credit, you must show the set-up and include units in all quantities.

1. Find the number of atoms of phosphorus (P) in 3.44 moles of phosphorus.

2. What is the mass of 0.38 moles of cobalt (Co)?

3. How many moles of nickel (Ni) is 3.88×10^{25} atoms of nickel?

4. How many atoms is 3.75 moles of iron (Fe)?

5. Find the number of moles of sodium (Na) in 145 g of sodium.

6. How many moles is 0.55 g of magnesium (Mg)?

7. If you have 7.22×10^{23} atoms of chromium (Cr), how many moles of chromium do you have?

8. What mass of tungsten (W) is 35 moles of tungsten?

9. How many atoms is 5.2 moles of titanium (Ti)?

10. How many moles of iron (Fe) is 5.98×10^{24} atoms of iron?

11. What mass of molybdenum (Mo) is 6.68 moles of molybdenum?

12. How many moles is 586 g of rhenium (Re)?

13. How many atoms of palladium (Pd) is 400 g of palladium?

14. Find the mass of 4.55×10^{28} atoms of vanadium (V).

15. Find the mass of 4.77×10^{22} atoms of scandium (Sc).

16. Find the number of atoms in 36 g of germanium (Ge).

17. How many atoms are in 8500 g of selenium (Se)?

18. Find the mass of 1.43×10^{28} atoms of polonium (Po).

Answers:

1. 2.07×10^{24} atoms P	7. 1.20 mol Cr	13. 2.26×10^{24} atoms Pd
2. 22.4 g Co	8. 6433 g W	14. 3.85×10^7 g V
3. 64.4 mol Ni	9. 3.13×10^{24} atoms Ti	15. 3.6 g Sc
4. 2.26×10^{24} atoms Fe	10. 9.93 mol Fe	16. 3.0×10^{23} atoms Ge
5. 6.3 mol Na	11. 641 g Mo	17. 6.48×10^{23} atoms Se
6. 0.023 mol Mg	12. 3.15 mol Re	18. 4.96×10^8 g Po

Name _____ Period _____ Date _____

Average Atomic Mass

Calculate the average atomic masses. Round all answers to two decimal places.

1. What is the atomic mass of hafnium if, out of every 100 atoms, 5 have a mass of 176, 19 have a mass of 177, 27 have a mass of 178, 14 have a mass of 179, and 35 have a mass of 180.0?
2. Iodine is 80% ^{127}I , 17% ^{126}I , and 3% ^{128}I . Calculate the average atomic mass of iodine.
3. Calculate the average atomic mass of gold with the 50% being gold-197 and 50% being gold-198.
4. Calculate the average atomic mass of lithium, which occurs as two isotopes that have the following atomic masses and abundances in nature: 6.017 u, 7.30% and 7.018 u, 92.70%.
5. Hydrogen is 99% ^1H , 0.8% ^2H , and 0.2% ^3H . Calculate its average atomic mass.

6. Calculate the average atomic mass of magnesium using the following data for three magnesium isotopes.

<u>isotope</u>	<u>mass (u)</u>	<u>relative abundance</u>
Mg-24	23.985	0.7870
Mg-25	24.986	0.1013
Mg-26	25.983	0.1117

7. Calculate the average atomic mass of iridium using the following data for two iridium isotopes.

<u>isotope</u>	<u>mass (u)</u>	<u>relative abundance</u>
Ir-191	191.0	0.3758
Ir-193	193.0	0.6242

8. Lithium has two naturally occurring isotopes: lithium-6 and lithium-7. If the average atomic mass of lithium is 6.941 amu, which isotope is the most abundant? How do you know?

Ion Practice Set

Name _____ Class # _____

1. What is an ion?

2. Use a periodic table to complete the following table.

Element Name	Ion Symbol	# Protons	# Electrons	# of Electrons Lost Or Gained
Fluorine	F ⁻	9	10	Gained one
		53	54	
		16		Gained Two
Potassium				Lost One
	Ca ⁺²			
		35	36	
	Rb ⁺			
Aluminum			10	
		17	18	
Lithium				Lost One
		8		Gained Two

3. If Li loses an electron to another atom, why is it written Li⁺¹ (with a +1)?

4. If N gains 3 electrons from other atoms, why is it written N⁻³ (with a -3)?

5. a. What do you think happens to atomic radius (size) of a cation (positive ion) & why?

b. an anion & why?

Isotope Practice Set

1. What is an isotope?

2. Fill in each chart below with information about each isotope. Assume all atoms are neutral.

	Chromium-58	Chromium-63
# protons		
# neutrons		
# electrons		

	Carbon-12	Carbon-16
# protons		
# neutrons		
# electrons		

3. Fill in the isotope names and any missing information, including isotope numbers. Assume all atoms are neutral.

	Iodine -	Iodine -
# protons		
# neutrons	32	35
# electrons		

# protons	32	
# neutrons	30	32
# electrons		

4. Uranium-235 and Uranium-238 are considered isotopes of one another. How are uranium-235 similar, and how are they different?

5. The isotope notation for nitrogen-15 is as follows:

a. The number 15 is the _____ number.

b. The number 7 is the _____ number.

c. How many neutrons does nitrogen-15 have? _____

UNIT 1
Molar Mass Worksheet

Calculate the molar masses of the following chemicals:

- | | |
|-----------------------------|----------------------------------|
| 1) Cl_2 | 8) UF_6 |
| 2) KOH | 9) SO_2 |
| 3) BeCl_2 | 10) H_3PO_4 |
| 4) FeCl_3 | 11) $(\text{NH}_4)_2\text{SO}_4$ |
| 5) BF_3 | 12) CH_3COOH |
| 6) CCl_2F_2 | 13) $\text{Pb}(\text{NO}_3)_2$ |
| 7) $\text{Mg}(\text{OH})_2$ | 14) $\text{Ga}_2(\text{SO}_4)_3$ |

Avogadro's Number and the Mole

- 1) How many moles of water does 6.02×10^{23} molecules represent?
- 2) Convert 3.01×10^{23} molecules of C_2H_6 to moles
- 3) How many moles of glucose does 1.2×10^{24} molecules represent?
- 4) How many moles of CaCl_2 does 2.41×10^{24} formula units represent
- 5) How many atoms does 2.0 moles of He represent?
- 6) How many sodium ions are in 3.0 moles of NaCl?
- 7) How many molecules are in 0.25 moles of CH_4 ?
- 8) How many total atoms are in 1.0 moles of H_2O ?

Mass and the Mole

- 1) How many moles are in 15 grams of lithium?
- 2) How many grams are in 2.4 moles of sulfur?
- 3) How many moles are in 22 grams of argon?
- 4) How many grams are in 88.1 moles of magnesium?
- 5) How many moles are in 2.3 grams of phosphorus?
- 6) How many grams are in 11.9 moles of chromium?
- 7) How many moles are in 9.8 grams of calcium?
- 8) How many grams are in 238 moles of arsenic?

What are the molecular weights of the following compounds?

- | | |
|--------------------------|----------------------------------|
| 9) NaOH | 12) H_3PO_4 |
| 10) H_2O | 13) Mn_2Se_7 |
| 11) MgCl_2 | 14) $(\text{NH}_4)_2\text{SO}_4$ |

- 15) How many grams are in 4.5 moles of sodium fluoride, NaF?
- 16) How many moles are in 98.3 grams of aluminum hydroxide, $\text{Al}(\text{OH})_3$?
- 17) How many grams are in 0.02 moles of beryllium iodide, BeI_2 ?
- 18) How many moles are in 68 grams of copper (II) hydroxide, $\text{Cu}(\text{OH})_2$?
- 19) How many grams are in 3.3 moles of potassium sulfide, K_2S ?
- 20) How many moles are in 1.2×10^3 grams of ammonia, NH_3 ?
- 21) How many grams are in 2.3×10^{-4} moles of calcium phosphate, $\text{Ca}_3(\text{PO}_3)_2$?
- 22) How many moles are in 3.4×10^{-7} grams of silicon dioxide, SiO_2 ?
- 23) How many grams are in 1.11 moles of manganese sulfate, $\text{Mn}_3(\text{SO}_4)_7$?