

AP Chemistry Summer Work

Welcome to AP Chemistry! To ensure the best start for everyone, I have prepared a summer assignment that reviews basic chemistry concepts you learned in your first year of Chemistry. You will quickly notice that things are different from what they were in Honors Chemistry. Material that you were not asked to memorize, you now have to know without reference material.

This is a college-level course and has different expectations from honors classes. Plan ahead. Find a study group, seek help when needed, and look for resources (test prep guides, videos, web pages) to be successful.

Your goal should be to complete the summer assignment and ask your teacher for help when needed.

Spread out the summer assignment (Tasks 1-5). DO NOT try to complete it all in the final week of the summer. Chemistry takes time to process and grasp at a level necessary for success in AP Chemistry. All research on human memory shows that frequent, short study sessions spread over long periods produce much greater retention than long study sessions completed in a short period.

The course will move on from the quick, initial chemistry review into the nine AP Chemistry Units: Atomic Structure and Properties, Compound Structure and Properties, Properties of Substances and Mixtures, Chemical Reactions, Kinetics, Thermochemistry, Equilibrium, Acids and Bases, and Thermodynamics and Electrochemistry. The topics will build upon your knowledge from your first-year chemistry class and cover more applications and details.

I will collect Pages 7-23 from the summer assignment on the first day of class for a homework grade, and you will have a quiz on the material within the first week of school.

Task 1: Review material from sophomore/junior chemistry that was most challenging

[Unit 0 - Getting Ready for AP Chemistry Video Playlist](#) - Use this playlist from Jeremy Krug as a starting point to see what you need to review before the school year begins.

Here are other online chemistry tutorial websites and videos to help you review content that you may have forgotten:

- Khan Academy videos
- [Bozeman Science AP Chemistry](#)
- YouTube - Tyler DeWitt AP Chemistry Resources Playlist
- YouTube- Crash Course Chemistry- Chemistry Playlist
- <https://chemfiesta.org>
- www.chemteam.info

Task 2: Memorize the names of the elements and their corresponding symbols, phases (solid, liquid, gas), and subscripts, if applicable.

- You should memorize the “Names and Symbols of Common Elements & Their Phases” list on page 6 of this document. While the AP exam will never require that you name an element, knowing the elements’ symbols will increase your fluency in the language of chemistry and make life easier.
- Many of these elements you will already know.
- Making flashcards or using Quizlet will be helpful. Many of these already exist on Quizlet.
- It’s important that you know these elements because the periodic table you are provided in AP Chem has only the symbols and not the names of the elements.
- There are many memorization tools to help you remember the diatomic elements (Br_2 , I_2 , N_2 , Cl_2 , H_2 , O_2 , and F_2):
 - Brinclhof (sounds like brinckle-hof)
 - H NO, halogens
 - They make a 7 on the periodic table
 - Cleveland Browns IN Hall Of Fame.

Task 3: Memorize the ionic charges of the monatomic ions

1. Ionic Charge by Location on the Periodic Table

Most elements form normal monatomic ions in a clear and easy-to-remember pattern on the periodic table. Their place on the periodic table suggests the charge on the ion, since the neutral atom gains or loses a predictable number of electrons in order to obtain a noble gas configuration. This was a focus in first-year chemistry, so if you are unsure what this means, get help BEFORE the start of the year.

- a. All Group 1 metals lose one electron to form an ion with a 1+ charge
- b. All Group 2 metals lose two electrons to form an ion with a 2+ charge
- c. Group 13 metals lose three electrons to form an ion with a 3+ charge
- d. All Group 17 nonmetals gain one electron to form an ion with a 1- charge
- e. All Group 16 nonmetals gain two electrons to form an ion with a 2- charge
- f. All Group 15 nonmetals gain three electrons to form an ion with a 3- charge

Notice that cations keep their name (sodium ion, Na^+ or calcium ion, Ca^{2+}) while anions get an *-ide* ending (chloride ion, Cl^- or oxide ion, O^{2-}).

2. Ionic Charge of Transition Metals

Many transition metals (plus lead and tin) can often form more than one cation. The only major exceptions to this rule for transition metals are silver (Ag^+), zinc (Zn^{2+}), and cadmium (Cd^{2+}), which form no other ions. This tendency of transition metals to form different ions under different circumstances is the reason we have to use Roman numerals in the names of compounds of transition elements to identify which ion is present.

For example, iron (II) oxide when the Fe^{2+} ion is present and iron (III) oxide when the Fe^{3+} ion is present.

- All transition metals will have an ion with a charge of 2+ as one of their forms. This is because the atoms lose their s-orbital electrons before any others.

Transition Metals to Memorize

Ion	Name
Fe^{3+}	Iron (III)
Fe^{2+}	Iron (II)
Co^{3+}	Cobalt (III)
Co^{2+}	Cobalt (II)
Hg^{2+}	Mercury (II)
Hg_2^{2+}	Mercury (I)

Ion	Name
Cu^{2+}	Copper (II)
Cu^+	Copper (I)
Sn^{4+}	Tin (IV)
Sn^{2+}	Tin (II)
Pb^{4+}	Lead (IV)
Pb^{2+}	Lead (II)

Task 4: Memorize the names, symbols, and charges of polyatomic ions

Polyatomic ions are ions that include more than one element, but they remain together as a group and have one overall charge for the group of atoms involved. There are many of these; the ones you need to memorize are listed below. Be sure to learn the names, formulas, and charges.

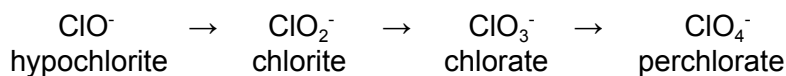
As with memorizing the names and symbols of elements, the AP exam will never ask you to name a specific polyatomic ion. But it will greatly benefit you to have a working knowledge of the common polyatomic ions and their charges. There are many patterns with polyatomic ions that will greatly reduce the amount of memorizing that you must do.

Oxyanions are polyatomic anions containing oxygen, whose names end in *-ate* or *-ite*.

1. *-ate* is used for the most common form of the polyatomic
 - a. *-ate* anions have one more oxygen than the *-ite* ion, but the same charge.
 - b. If you memorize the *-ate* ions, then you should be able to derive the formula for the *-ite* ion and vice-versa.
 - i. sulfate is SO_4^{2-} , so sulfite has the same charge but one less oxygen, SO_3^{2-}
 - ii. nitrate is NO_3^- , so nitrite has the same charge but one less oxygen, NO_2^-
2. Adding hydrogen to the front of the polyatomic changes the charge on the ion. Since a hydrogen atom has a 1+ charge, the net charge on the new ion is less negative by one.
 - a. Example:



3. Prefixes are also used
 - a. *Hypo-* indicates one fewer oxygen than the *-ite* form because the prefix *hypo* means “under” or “below”
 - b. *Per-* indicates one more oxygen than the *-ate* form because the prefix *per-* come from the prefix *hyper-* which mean “above” or “over”
 - c. Example: Notice how this sequence increases in oxygen while retaining the same charge



- d. If you learn the chlorate series, you automatically know the bromate, iodate, and fluorate series, as well because all of the halogens behave in the same way.

You should be able to use the above rules to name most polyatomic ions, even if they are not on the following list to memorize.

Watching a YouTube video about Nick the Camel may help with the most common polyatomics.

Polyatomic Ions to Memorize

<u>+1 ions</u> Ammonium, NH_4^+		
<u>-1 ions</u> Acetate, $\text{C}_2\text{H}_3\text{O}_2^-$ or CH_3COO^- Bromate, BrO_3^- Chlorate, ClO_3^- Chlorite, ClO_2^- Cyanide, CN^- Hydrogen carbonate or biocarbonate, HCO_3^- Hydrogen sulfate or bisulfate, HSO_4^- Hydroxide, OH^- Hypochlorite, ClO^- Iodate, IO_3^- Nitrate, NO_3^- Nitrite, NO_2^- Permanganate, MnO_4^- Perchlorate, ClO_4^- Thiocyanate, SCN^-	<u>-2 ions</u> Carbonate, CO_3^{2-} Chromate, CrO_4^{2-} Dichromate, $\text{Cr}_2\text{O}_7^{2-}$ Oxalate, $\text{C}_2\text{O}_4^{2-}$ Peroxide, O_2^{2-} Sulfate, SO_4^{2-} Sulfite, SO_3^{2-} Thiosulfate, $\text{S}_2\text{O}_3^{2-}$	<u>-3 ions</u> Phosphate, PO_4^{3-}

A. Be able to name other polyatomic ions using the rules above:

HPO_4^{2-} _____

FO_3^- _____

HSO_3^- _____

HCO_3^- _____

B. Be able to write formulas for other polyatomic ions using the rules above:

Bromite _____

Dihydrogen phosphite _____

Periodate _____

Hydrogen chromate _____

Task 5: Complete Worksheets 1-3 from page 7 to page 23 (Worksheets to be turned in for a homework grade the first day of class)

Names and Symbols of Common Elements & Their Phases

Al aluminum	Mn manganese
Sb antimony	Hg mercury
Ar argon	Ne neon
As arsenic	Ni nickel
Ba barium	N nitrogen
Be beryllium	O oxygen
B boron	Pd palladium
Br bromine	P phosphorus
Cd cadmium	Pt platinum
Ca calcium	Pu plutonium
C carbon	K potassium
Cs cesium	Ra radium
Cl chlorine	Rn radon
Cr chromium	Rb rubidium
Co cobalt	Se selenium
Cu copper	Si silicon
F fluorine	Ag silver
Fr francium	Na sodium
Ge germanium	Sr strontium
Au gold	S sulfur
He helium	Te tellurium
H hydrogen	Th thorium
I iodine	Sn tin
Fe iron	W tungsten
Kr krypton	U uranium
Pb lead	Xe xenon
Li lithium	Zn zinc
Mg magnesium	

Phases:

- All metals are solid at room temperature, except for mercury, which is a liquid.
- All metalloids are solids.
- Nonmetals:
 - Carbon, phosphorus, sulfur, & selenium are solids
 - Bromine is a liquid
 - All other nonmetals are gases

Subscripts:

- Diatomic elements: Br₂, I₂, N₂, Cl₂, H₂, O₂, F₂
- Other subscripts: P₄,

Worksheet #1- Math Skills

Use dimensional analysis (factor labeling method) when appropriate. Use significant figures when solving problems.

Significant Figures (sig figs)

Five rules of significant figures:

1. All non-zero digits are significant. (1,245 = 4 sig figs)
2. Zeroes between non-zero digits are always significant. (1,051 = 4 sig figs)
3. Leading zeros are **never** significant. (0.00023 = 2 sig figs)
4. Zeros after a number (on the right) are **only** significant if there is a decimal in the number.
(0.00230 = 3 sig figs, 230.0 = 4 sig figs, 2,300 = 2 sig figs)

1. How many significant figures are in each of the following?

- | | |
|---------------------------------|-------------------------------|
| a. 1.9200 _____ | e. 0.000036 _____ |
| b. 0.0301001 _____ | f. 10000 _____ |
| c. 6.022×10^{23} _____ | g. 2.9×10^{-3} _____ |
| d. 460.000 _____ | h. 0.001345 _____ |

2. Solve the following problems. Round your answer to the correct number of sig figs (and use the correct unit in your answer).

- **Addition and subtraction** with sig figs- the answer should contain the **smallest number of decimal places** that was in the problem ($3.2145 - 0.25 = 2.96$)
- **Multiplication and division** with sig figs- the answer should contain the **smallest number of sig figs** that was in the problem ($8.210 \times 2,700 = 22,000$)

- | | |
|--|-------|
| a. $1.270 \text{ g} / 5.20 \text{ cm}^3$ | _____ |
| b. $12.0 \text{ g} / 1.010 \text{ L}$ | _____ |
| c. $12.1 \text{ g} + 0.38 \text{ g}$ | _____ |
| d. $170 \text{ g} + 2.785 \text{ g}$ | _____ |
| e. $2.100 \text{ cm} \times 3.2102 \text{ cm}$ | _____ |
| f. $2.35 \text{ L} - 0.4 \text{ L} - 1.23 \text{ L}$ | _____ |

Scientific Notation

3. Record the following in correct **scientific notation**:

- | | |
|----------------------|-------|
| a. 4050,000,000 cal | _____ |
| b. 0.000123 mol | _____ |
| c. 0.00345 g | _____ |
| d. 700,000,000 atoms | _____ |

Density

4. A cube of ruthenium metal is 1.5 cm on a side and has a mass of 42.0 g. What is the density in g/cm³? Will ruthenium float on water?

5. The density of bismuth metal is 9.8 g/cm³. What is the mass of a sample of bismuth that displaces 65.8 mL of water?

Units

6. Classify each of the following as units of mass, volume, length, density, or amount of substance.

a. kg _____
b. Liter _____
c. m³ _____
d. Mm _____

e. kg/m³ _____
f. mm _____
g. g/mL _____
h. mol _____

Temperature

7. Most laboratory experiments are performed at room temperature, which is 25°C. Express this temperature in Kelvin: _____

Conversions

The following metric prefixes will be used throughout the year and will be useful to memorize:

- kilo (k) = 10³ or 1,000 (To convert base unit into kilo, move the decimal 3 places left)
- centi (c) = 10⁻² or 0.01
- milli (m) = 10⁻³ or 0.001 (To convert base unit into milli, move the decimal 3 places to the right, to convert milli into base unit, move the decimal 3 places to the left)
- micro (μ) = 10⁻⁶
- nano (n) = 10⁻⁹

8. Use factor labeling method (dimensional analysis) to convert the following values. Round answers to the correct number of sig figs and show work with units.

a. 450. milliliters to liters

b. 650.0 inches to meters (1 inch = 2.54 cm)

c. 4 years to seconds

d. 16.2 m to km

e. 5.44 nL to mL

f. 45.7 mL/s to kL/hr

Atomic Structure

9. What is an isotope? In what ways are isotopes similar and different from each other?

10. Determine the number of protons and neutrons in each of the following isotopes.

a. ${}_{19}^{39}\text{K}$	b. ${}_{11}^{23}\text{Na}$	c. ${}_{82}^{208}\text{Pb}$	d. ${}_{15}^{33}\text{P}$
p-	p-	p-	p-
n-	n-	n-	n-

11. Determine the number of protons, neutrons, and electrons in the following:

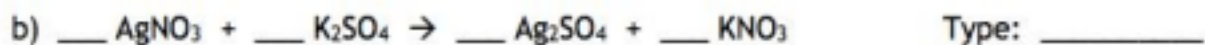
- a. A neutral atom of Vanadium
- b. A neutral atom of Germanium
- c. A Bromide ion
- d. A Rubidium ion

12. An ion has 20 protons, 21 neutrons, and 18 electrons. What is the isotopic symbol of the ion?

13. An ion has 15 protons, 32 neutrons, and 18 electrons. What is the isotopic symbol of the ion?

Chemical Reactions

14. Balance the following equations and tell what type of reaction it is (synthesis, decomposition, single replacement, double replacement, or combustion).



Writing Chemical Equations

15. Write balanced chemical equations from the following word equations. Include state symbols.

a. The reaction of boron trifluoride gas with water gives liquid hydrogen fluoride and solid boric acid, (H_3BO_3).

b. The reaction of solid magnesium oxide with iron metal forms solid iron (III) oxide and magnesium metal.

c. Dinitrogen monoxide gas decomposes to its elements.

d. The reaction of calcium carbide (CaC_2) solid with water forms a calcium hydroxide precipitate and acetylene (C_2H_2) gas.

e. Ethane gas (C_2H_6) burns in air (oxygen).

Molar Mass

16. Calculate the molar masses (g/mol) of:

a. Ammonia (NH_3)

b. Sodium bicarbonate (NaHCO_3)

c. Acetic acid (CH_3COOH)

d. Aluminum carbonate [$\text{Al}_2(\text{CO}_3)_3$]

Percent Composition

17. Calculate the percent composition of the following compounds for all elements.

a. SO_3

b. $\text{CH}_3\text{COOCH}_3$

c. $\text{Ca}(\text{HCO}_3)_2$

d. $\text{CaSO}_4 \bullet 2 \text{H}_2\text{O}$

18. In an experiment, a student gently heated a hydrated copper compound to remove the water of hydration. The following data was recorded:

Mass of crucible, cover, and hydrated compound before heating	23.4 g
Mass of empty crucible and cover	18.82 g
Mass of crucible, cover, and contents after heating to constant mass	20.94 g

Calculate the experimental percent of water in the compound.

19. The molecular formula of morphine, a pain-killing narcotic, is $C_{17}H_{19}NO_3$.

a. What is the molar mass?

b. What percent of atoms in morphine is accounted for by carbon?

c. Which element contributes least to the molar mass?

The Mole Concept

20. Calculate the number of moles of the following: (Show work)

a. 42.8 g of KNO_3

b. 155.7 L of CO_2 at STP

c. 9.25×10^{26} molecules of $CaCl_2$

21. Determine the number of molecules present in 4.50 mol of nitrogen dioxide.

22. How many grams of methane (CH_4) are present in 10.0 moles of methane gas?

23. Calculate the mass in grams of 3.01×10^{23} formula units of BaI_2 .

Empirical and Molecular Formulas

24. The compound adrenaline contains 56.7% C, 6.56% H, 28.37% O, and 8.28% N by mass. What is the empirical formula for adrenaline?

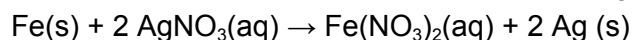
25. Arsenic reacts with chlorine to form a chloride. If 1.587 g of arsenic reacts with 3.755 g of chlorine, what is the simplest formula of the chloride?

26. Determine the empirical and molecular formula of Ibuprofen, a headache remedy that contains 75.6% C, 8.80% H, and 15.5% O by mass and has a molar mass of 206 g/mol.

27. A sample (3.585g) contains 1.388g of C, 0.345g of H, 1.850g of O, and its molar mass is 62g. What is the molecular formula of this substance?

Stoichiometry

28. What mass of Iron is required to replace silver from 8.00 g of silver nitrate dissolved in water?



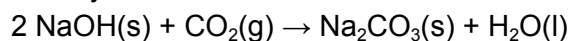
29. Using the following equation: $2 \text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow 2 \text{H}_2\text{O} + \text{Na}_2\text{SO}_4$

How many grams of sodium sulfate will be formed if you start with 200.0 grams of sodium hydroxide and you have an excess of sulfuric acid?

30. Using the following equation: $\text{Pb}(\text{SO}_4)_2 + 4 \text{LiNO}_3 \rightarrow \text{Pb}(\text{NO}_3)_4 + 2 \text{Li}_2\text{SO}_4$
How many grams of lithium nitrate will be needed to make 250.0 grams of lithium sulfate, assuming that you have an adequate amount of lead (IV) sulfate to do the reaction?

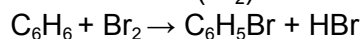
Limiting Reactants and Percent Yield

31. Sodium hydroxide reacts with carbon dioxide as follows:



- Which reagent is the limiting reactant when 1.85 mol of sodium hydroxide and 1.00 mol of carbon dioxide are allowed to react?
- How many moles of sodium carbonate can be produced?
- How many moles of the excess reactant remain after the completion of the reaction?

32. When benzene (C_6H_6) reacts with bromine (Br_2) bromobenzene ($\text{C}_6\text{H}_5\text{Br}$) is obtained:



- What is the theoretical yield of bromobenzene in this reaction when 30.0g of benzene reacts with 65.0 g of bromine?
- If the actual yield of bromobenzene was 56.7 g, what was the percentage yield?

Worksheet 2- Practice Naming Compounds

1. Provide names for the following ionic compounds:

- a. AlF_3 _____
- b. $\text{Fe}(\text{OH})_2$ _____
- c. $\text{Cu}(\text{NO}_3)_2$ _____
- d. $\text{Ba}(\text{ClO}_4)_2$ _____
- e. Li_3PO_4 _____
- f. Hg_2S _____
- g. $\text{Cr}_2(\text{CO}_3)_3$ _____
- h. $(\text{NH}_4)_2\text{SO}_4$ _____

2. Write the chemical formulas for the following compounds:

- a. Copper(I) oxide _____
- b. Potassium peroxide _____
- c. Iron(III) carbonate _____
- d. Zinc nitrate _____
- e. Sodium hypobromite _____
- f. Aluminum hydroxide _____

3. Give the name or chemical formula for each of the following molecular substances:

- a. SF_6 _____
- b. XeO_3 _____
- c. Dinitrogen tetroxide _____
- d. Hydrogen cyanide _____
- e. IF_5 _____
- f. Dihydrogen monoxide _____
- g. Tetraphosphorous hexasulfide _____

4. Give the name or chemical formula for the following compounds:

- a. Ammonium oxalate _____
- b. Manganese(III) dichromate _____
- c. $\text{Ti}(\text{OH})_4$ _____
- d. $\text{Ni}(\text{ClO}_2)_3$ _____
- e. Dinitrogen pentoxide _____
- f. Aluminum oxide _____
- g. Fe_2S_3 _____

5. Name the following acids

- a. $\text{H}_2\text{C}_2\text{O}_4$ _____
- b. HBrO_3 _____
- c. HBr _____
- d. HNO_2 _____
- e. H_2SO_4 _____
- f. HClO _____

6. Write formulas for the following acids.

- a. hydrochloric acid _____
- b. sulfuric acid _____
- c. nitric acid _____
- d. phosphoric acid _____
- e. carbonic acid _____
- f. acetic acid _____

Worksheet 3- Composition of Matter

Physical and Chemical Properties and Changes

1. What type of change produces a new substance with its own properties?

2. Are changes of state physical or chemical changes? Explain.

3. Identify the names of the following changes of state:

- a. Solid → Liquid _____
- b. Liquid → Solid _____
- c. Liquid → Gas _____
- d. Gas → Liquid _____
- e. Solid → Gas _____
- f. Gas → Solid _____

4. Classify each of the following mixtures as homogeneous [HO] or heterogeneous [HE].

- | | | | |
|-------------------------------|-------|------------------------|-------|
| a. Black coffee | _____ | e. Milk | _____ |
| b. Lucky Charms | _____ | f. Kool-aid | _____ |
| c. Dirt | _____ | g. Chicken noodle soup | _____ |
| d. Sausage and mushroom pizza | _____ | | |

5. Classify the following as an element [E], a compound [C], or a mixture [M]

- | | | | |
|---------------------|-------|-----------------------|-------|
| a. Gold | _____ | f. Air | _____ |
| b. Water | _____ | g. Carbon Dioxide | _____ |
| c. Seawater | _____ | h. Silver | _____ |
| d. Sugar | _____ | i. Ice | _____ |
| e. Ice Cream Sundae | _____ | j. McDonald's Big Mac | _____ |

6. Classify each of the following properties as physical [P] or Chemical [C].

- | | | | |
|-----------------------------|-------|-----------------------------------|-------|
| a. Color | _____ | e. Reacts violently with chlorine | _____ |
| b. Density | _____ | f. Good conductor of heat | _____ |
| c. Burns easily (flammable) | _____ | g. Melts at 145 °C | _____ |
| d. Boils at 450 °C | _____ | h. Malleable | _____ |

7. Classify each of the following as a physical [P] or chemical [C] change.

- | | | | |
|--------------------------------|-------|-------------------------------|-------|
| a. Grinding chalk into powder | _____ | e. Melting ice | _____ |
| b. Dissolving zinc in acid | _____ | f. Digesting food | _____ |
| c. Tearing a piece of paper | _____ | g. Making hydrogen from water | _____ |
| d. Stretching copper into wire | _____ | h. Burning gasoline | _____ |

8. Classify each of the following as an intensive property [I] or extensive property [E].

- | | | | |
|------------------|-------|-----------|-------|
| a. Mass | _____ | d. Color | _____ |
| b. Density | _____ | e. Volume | _____ |
| c. Melting Point | _____ | f. Length | _____ |

Atomic Structure

9. Give a quick summary of the following scientists' contributions to atomic theory. Name their model, any important experiments performed, their discovery, and/or their contribution to the understanding of the atom.

a. John Dalton

b. JJ. Thomson

c. Ernest Rutherford

d. Neils Bohr

e. Erwin Schrodinger

10. What are the correct representative particles of the following substances (atoms, ions, molecules, or formula units)?

- | | | | | | |
|------------------|-------|---------------------|-------|-----------------------|-------|
| a. Na^+ | _____ | f. NO_2 | _____ | k. F_2 | _____ |
| b. Br_2 | _____ | g. N_2 | _____ | l. F^- | _____ |
| c. P | _____ | h. Au | _____ | m. CO_2 | _____ |
| d. KCl | _____ | i. Fe^{2+} | _____ | n. CO_3^{2-} | _____ |
| e. NaF | _____ | j. MgCl_2 | _____ | o. O^{2-} | _____ |

11. Identify the following as a diatomic element, molecular compound, ionic compound, or atomic element.

- | | | | | | |
|------------------|-------|----------------------------|-------|----------------------------|-------|
| a. F_2 | _____ | f. CO_2 | _____ | k. O_2 | _____ |
| b. Cl_2 | _____ | g. H_2 | _____ | l. I_2 | _____ |
| c. C | _____ | h. Ag | _____ | m. CO | _____ |
| d. NaCl | _____ | i. Fe_2O_3 | _____ | n. K_2CO_3 | _____ |
| e. KF | _____ | j. MgO | _____ | o. N_2O | _____ |

12. Why do we call $\text{Ba}(\text{NO}_3)_2$ barium nitrate, but we call $\text{Fe}(\text{NO}_3)_2$ iron(II) nitrate?

13. What is the difference between:

a. Oxygen atom and oxide ion

b. Magnesium atom and magnesium ion

14. For the following 4 types of reactions, write the general formula in terms of A, B, C, and D.

a. Synthesis

b. Decomposition

c. Single Replacement

d. Double Replacement

15. What species is always present as a reactant in a combustion reaction?
16. What two species are always present as products in the combustion of a hydrocarbon?
17. Which of the following hydrocarbons will produce equimolar quantities (the same number of moles) of carbon dioxide and water when combusted in excess oxygen? (Hint- write balanced equations for the combustion of each hydrocarbon.)
- C_4H_8 or C_6H_6

Accuracy/Precision

- Accuracy: Refers to how close a measurement is to a true, accepted, or target value
- Precision: Refers to the reproducibility of a series of measurements
- Percent Error: A measurement of the discrepancy between an observed and a true, or accepted value

18. The following measurements were made to determine the density of a material whose value was, according to the Handbook of Chemistry and Physics, 1.24 g/mL

Trial #1 1.20 g/mL

Trial #2 1.22 g/mL

Trial #3 1.22 g/mL

a. Make a general comment on the accuracy of these results

b. Make a general comment on the precision of these results

19. The following measurements were made to determine the density of a material whose value was, according to the handbook of Chemistry and Physics, 3.75 g/mL

Trial #1 4.75 g/mL

Trial #2 4.76 g/mL

Trial #3 4.74 g/mL

a. Make a general comment on the accuracy of these results

b. Make a general comment on the precision of these results

20. A student buys a rope at the store. The label on the packaging says that the rope is 2.15 meters in length. The student measures the rope as 1.85m. What is the student's percent error?

21. A 250.0 gram block is placed on a balance. The balance measures the block's mass at 243.9 grams. What is the percent error of the mass of the block?

Chemical Compounds

22. What is meant by the term binary compound?

23. What types of elements are present in ionic compounds?

24. What types of elements are present in covalent/molecular compounds?

Matter

25. Identify the states of matter present in the particle diagrams below.



26. Classify each of the pictures below by placing the correct label in the blanks beneath each picture:

A = Element

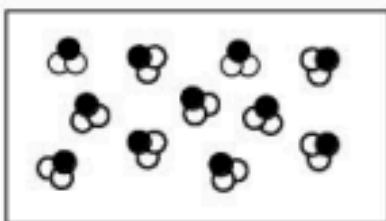
D = Mixture of compounds

B = Compound

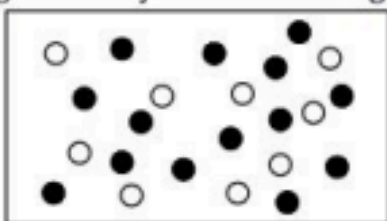
E = Mixture of elements and compounds

C = Mixture of elements

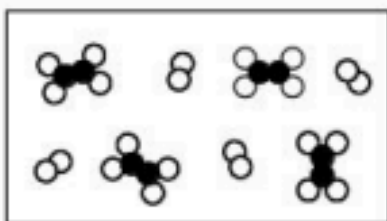
Each circle represents an atom, and each different color represents a different kind of atom. If two atoms are touching, then they are bonded together.



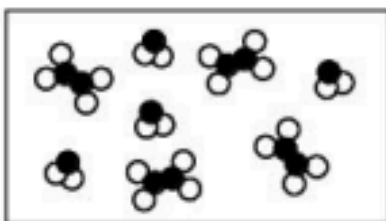
1) _____



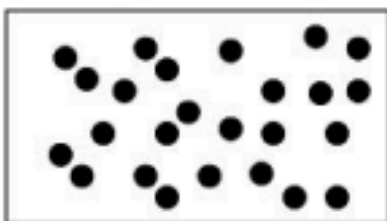
2) _____



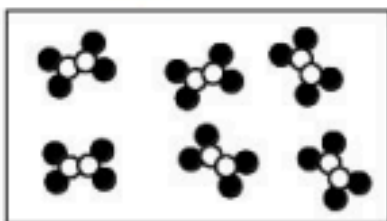
3) _____



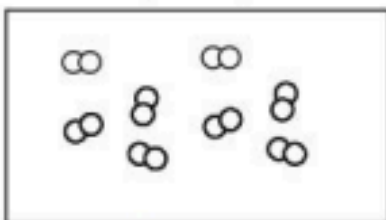
4) _____



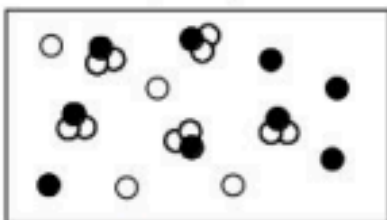
5) _____



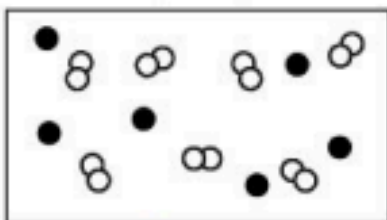
6) _____



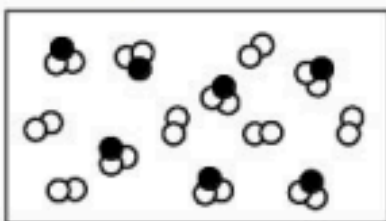
7) _____



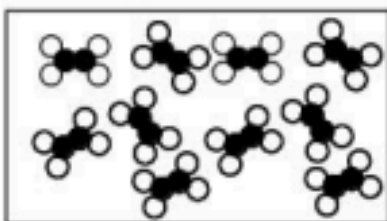
8) _____



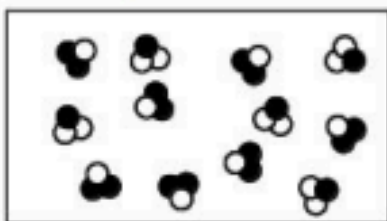
9) _____



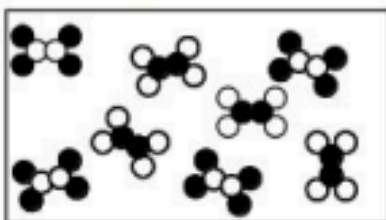
10) _____



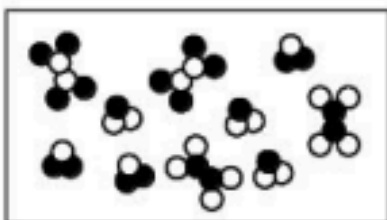
11) _____



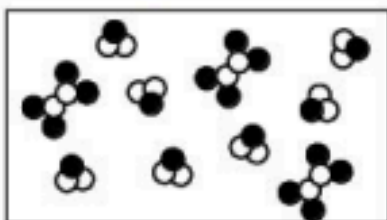
12) _____



13) _____



14) _____



15) _____