AP Chemistry

Summer Packet

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Welcome to AP Chemistry! This course is designed to give you a more complete experience of chemistry that will prepare you for both the AP Chem exam in the spring of next year and for introductory chemistry in college.

The only way to complete all the topics in this course is to move at a very rapid pace. Therefore, it is critical for all students to complete the summer assignment to be ready to get after it in the fall.

**Course Overview:**

The course is taught through a series of lectures and laboratories with homework problems, practice exams, and individual projects. Chapter exams, laboratories and homework assignments comprise the bulk of the grading criteria. Homework is expected to be accomplished within one or two days after assignment. Keeping

**Tips for achieving success in AP Chemistry**:

* Study AP Chem every day and make sure that study time is productive (ask me if you don’t know how to make your time productive…). If there are no formal assignments, you should be using study time to review your class notes, give yourself a practice quiz, etc.
* Choose a study partner that you can also use as a lab partner. **This class is very difficult if done alone.** Pairs are better than larger groups. Get together at regularly scheduled times for study and homework. Avoid “splitting up” the work.
* Avoid getting behind in this course. If you get stuck on a concept or HW set, get help immediately via ParentSquare, Remind, E-mail, or Schoology.
* Attend study sessions regularly. Tutoring hours are held every morning from 7:15-7:40. Clear this time right away with your coach, boss, or parent. During this time we are able to to go over H/W problems, old exam questions, etc.

**The Commitment:**

If you taking this course, you have already enjoyed success in your academic career. Taking a course such as AP Chem will be very different than courses you have taken in the past. It will involve a level of work and commitment that you may not have experienced before. Below is list of realities that you must face:

* Straight-A students often get their first B in AP Chem and other students receive their first C. An A in this course will take tremendous effort.
* Missing class for sports, vacations, activities, etc, will result in falling behind and extreme difficulty in getting caught up. In this course multiple missed days will be very hard to make up.
* You must accept the fact that you will have significant work outside of class and may need to get help on assignments and lab work.

We are going to have an exciting, challenging, and fun year. I look forward to working with you all next year. I hope you have a great summer. If you do have any questions please feel free to email me this summer.

AP CHEM SUMMER ASSIGNMENT

Before you arrive on the first day of class, you will need to have memorized or learned the following items or concepts. **You will be responsible for everything on the pages to follow**.

Make sure you memorize the following items. Know name, formula (or symbol) and charges:

**Common Polyatomic Ions**

| **-1** | **-2** | **-3** |
| --- | --- | --- |
| acetate CH3COO –  chlorate ClO3-  chlorite ClO2-  cyanide CN-  dihydrogen phosphate H2PO4-  hydrogen carbonate HCO3- (bicarbonate)  hydrogen sulfate HSO4-1 (bisulfate)  hydrogen sulfide HS-1 (bisulfide)  hydrogen sulfite HSO3- (bisulfite)  hydroxide OH-  hypochlorite OCl-  iodate IO3-  nitrate NO3-  perchlorate ClO4-  permanganate MnO4-  thiocyanate SCN- | carbonate CO32-  chromate CrO42-  dichromate Cr2O72-  hydrogen phosphate HPO42-  oxalate C2O42-  peroxide O22-  silicate SiO32-  sulfate SO42-  sulfite SO32-  thiosulfate S2O32- | phosphate PO43--  phosphite PO33- |

\*Ammonium NH4+

**THE SOLUBILITY RULES**

\*1. The nitrates, nitrites, chlorates, and acetates of all metals are soluble in water.

\*2. All Group I and ammonium salts are soluble in water.

\*3. The chlorides, bromides, and iodides of all metals except lead, silver, and mercury (I) are soluble in water.

4. The sulfates of all metals except lead, strontium, mercury (I), and barium are soluble in water.

5. The carbonates, phosphates, borates, sulfites, chromates, and arsenates of all metals except sodium,

potassium, and ammonium are insoluble in water.

6. The sulfides of all metals except lithium, barium, calcium, magnesium, potassium, sodium, and

ammonium are insoluble in water.

7. The hydroxides of lithium, sodium, potassium, and ammonium are very soluble in water.

\*These rules in particular are the most common. Focus on these first.

**Naming Review**

If given the name, write the formula and visa versa. I must be able to read your work or I will not grade it. **Make sure you have correct sizing of your letters.**

| 1. AlCl3 | 26. Magnesium silicate |
| --- | --- |
| 2. C2H6 | 27. Carbon monoxide |
| 3. Cu(NO3)2 | 28. Sulfurous acid |
| 4. SI6 | 29. silicon disulfide |
| 5. CF4 | 30. Iron (III) oxide |
| 6. HClO4 | 31. Potassium iodate |
| 7. C8H18 | 32. Sodium thiocyanate |
| 8. K3N | 33. Zinc (II) nitrate |
| 9. HF | 34. Barium phosphite |
| 10. BBr3 | 35. Diphosphorus pentoxide |
| 11. NH4F | 36. Phosphoric acid |
| 12. Sn(CN)4 | 37. Butane |
| 13. Mg(OH)2 | 38. Sodium thiosulfate |
| 14. NaI | 39. Potassium permanganate |
| 15. H2SO4 | 40. Hydrobromic acid |
| 16. PbCO3 | 41. Selenium hexaiodide |
| 17. NH4NO3 | 42. Silver (I) nitrate |
| 18. NaOH | 43. Ammonium dichromate |
| 19. HCl | 44. Dinitrogen tetroxide |
| 20. HNO3 | 45. Hydrosulfuric acid |
| 21. CuO | 46. Arsenic pentafluoride |
| 22. Cu2O | 47. Xenon difluoride |
| 23.H2O2 | 48. Propane |
| 24. Ca(HSO4)2 | 49. Tin (IV) hypoiodite |
| 25. Ag2S | 50. Nitrous acid |

**Unit 1 Review: Units in Measurement**

1.) Use prefixes to express each measurement without any exponents and to the proper number of significant figures. (Ex. 5.3x10-3 m 🡪 5.3 mm)

a. 1.2 x 10-9 m \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. 1.5 x 103 g \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c. 3.24 x 10-6 L \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d. 55.2 x 10-4 s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

e. 2.70 x 10-2 mol \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2.) Use scientific notation to express each quantity with only the base units (no prefixes).

Example: 5,340 ms = 5.34 s.

a. 4.5 ns \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

b. 18 cm \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

c. 128 pm \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

d. 35 µm \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

e. 710. kg \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3.) Complete the table.

| a. 1245 kg | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ g | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mg |
| --- | --- | --- |
| b. 515 km | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ dm | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cm |
| c. 122 s | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ms | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ks |
| d. 3.35 J | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ kJ | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ mJ |

**Significant Figures**

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

1.) 402 m \_\_\_\_\_\_\_\_\_\_\_

2.) 34.20 lbs \_\_\_\_\_\_\_\_\_\_\_

3.) 0.03 sec \_\_\_\_\_\_\_\_\_\_\_

4.) 0.00420 g \_\_\_\_\_\_\_\_\_\_\_

5.) 3,200 liters \_\_\_\_\_\_\_\_\_\_\_

6.) 0.0300 ft. \_\_\_\_\_\_\_\_\_\_\_

7.) 5.1 x 104 kg \_\_\_\_\_\_\_\_\_\_\_

8.) 0.48 m \_\_\_\_\_\_\_\_\_\_\_

9.) 1,400.0 m \_\_\_\_\_\_\_\_\_\_\_

10.) 78,323.01 g \_\_\_\_\_\_\_\_\_\_\_

Carry out the following calculations and round your answer to the proper number of significant figures (no work needs to be shown, just your answer).

1. 9.15 m ÷ 4.970 m = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2. 1.54 m + 0.03060 m + 0.69 m = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3. 27.5 m x 1.82 m ÷ 100.04 m = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

4. (2.290 x 106 m) ÷ (6.7 x 104 m) = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

5. 43.7 m — 2.341 m= \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Unit 2 Review: Classifying Matter**

1. Classify each substance as a pure substance (PM) or mixture (M). If pure substance, classify as an element (E) or compound (C). If mixture, classify as heterogeneous (HT) or homogeneous (HO).

a. sweet tea \_\_\_\_\_\_\_\_\_

b. aluminum \_\_\_\_\_\_\_\_\_

c. carbon dioxide \_\_\_\_\_\_\_\_\_

d. vegetable soup \_\_\_\_\_\_\_\_\_

e. iron \_\_\_\_\_\_\_\_\_

f. fruit salad \_\_\_\_\_\_\_\_\_

g. magnesium oxide \_\_\_\_\_\_\_\_\_

h. apple juice \_\_\_\_\_\_\_\_\_

i. hydrogen peroxide \_\_\_\_\_\_\_\_\_

2. Classify each of the properties of isopropyl alcohol as physical (P) or chemical (C)

a. colorless \_\_\_\_\_\_\_\_\_

b. flammable \_\_\_\_\_\_\_\_\_

c. liquid at room temperature \_\_\_\_\_\_\_\_\_

d. density = 0.79 g/mL \_\_\_\_\_\_\_\_\_

e. mixes with water \_\_\_\_\_\_\_\_\_

3. Classify the following as a physical (P) or chemical (C) change.

a. Liquid propane evaporates \_\_\_\_\_\_\_\_\_

b. Liquid propane burns \_\_\_\_\_\_\_\_\_

c. Iron rusts \_\_\_\_\_\_\_\_\_

d. Sugar dissolves in water \_\_\_\_\_\_\_\_\_

e. Platinum becomes dull from abrasion \_\_\_\_\_\_\_\_\_

**Unit 3 Review:**

**Atomic Structure**

| Name | Symbol | Atomic # | Mass # | Neutrons | Protons | Electrons |
| --- | --- | --- | --- | --- | --- | --- |
| Titanium |  |  |  | 26 |  |  |
|  | C |  | 12 |  |  |  |
| Lithium-7 |  |  |  |  |  |  |

2. Determine the average mass of an element based on data table the isotopic abundance and the mass of each isotope of Neon. Round your answer to two decimal places.

| Isotope | % Abundance |
| --- | --- |
| 20Ne | 90.48 |
| 21Ne | 0.27 |
| 22Ne | 9.25 |

**Unit 4 Review:**

**Write the electron configurations for each of the following using the notation specified:**

**Full Configuration**

1. Na \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. O2- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Ta \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Al3+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Ni \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Noble Gas Notation**

1. Zn \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Si \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. K+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Sn2+ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Bi \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Orbital Notation**

1. S2-

1. Ga

1. Zn2+

1. Fe2+

**Wavelength, Frequency, and Energy**

For each of the following, show all work to receive credit. Every value must have a unit. Round answer to proper sig figs.

1. Calculate the frequency of a wave with a wavelength of 436 nm.

1. Calculate the energy of a wave with a frequency of 6.14x1014 s-1.

1. Calculate the energy of a wave with a wavelength of 685 nm.

**Unit 5 Review: Periodic Trends**

For each of the following, answer in the form of claim, evidence, reasoning (CER). Your reasoning should relate Coulomb’s law to your evidence.

Example of CER: Which atom is larger, Ne or Ar? Claim: Argon is larger. Evidence: Argon has one more principal energy level than neon. Reasoning: The more energy levels, the farther away from the nucleus the valence electrons are, creating a larger atom.

1. Which would have the higher first ionization energy, Na or P? Justify your answer.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Which would have the smaller radius, S or S2-? Justify your answer.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Which would have the lower electron affinity, O or Se? Justify your answer.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Which would have the larger radius, Mg or Mg2+? Justify your answer.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Which would have the higher ionization energy, F or Br? Justify your answer.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Unit 6: Ionic Bonding Review**

Explain the following observations about ionic compounds using Coulomb’s Law and CER format.

1. MgO has a melting point of 2,852°C while NaF has a melting point of 993oC.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. NaF has a melting point of 993oC while NaBr has a melting point of 737oC.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Which of the following would have the higher lattice energy, Al2O3 or Na2O?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Draw the Lewis Dot Diagram for the following compounds. Remember to use brackets and charges on ions.   
4. LiF 5. BeO 6. CaF2

**Unit 7: Covalent Bonding Review**

Draw the Lewis Structure (3D if possible) for each of the following. If polar, label the partial positive and partial negative regions on the molecule. If nonpolar, write nonpolar in the space provided by the formula. Then state the information requested on the lines provided. State the central atom’s hybridization only.

| 1) CH2O  Geometry:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Bond Angle:\_\_\_\_\_\_\_\_\_\_\_\_  Polarity:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Hybridization:\_\_\_\_\_\_\_\_\_\_\_ | 2) CH2Cl2  Geometry:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Bond Angles:\_\_\_\_\_\_\_\_\_\_  Polarity:\_\_\_\_\_\_\_\_\_\_\_  Hybridization:\_\_\_\_\_\_\_\_\_\_\_ |
| --- | --- |
| 3) OF2  Geometry:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Bond Angles:\_\_\_\_\_\_\_\_\_\_  Polarity:\_\_\_\_\_\_\_\_\_\_\_  Hybridization:\_\_\_\_\_\_\_\_\_\_\_ | 4) HCN  Geometry:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  Bond Angles:\_\_\_\_\_\_\_\_\_\_  Polarity:\_\_\_\_\_\_\_\_\_\_\_  Hybridization:\_\_\_\_\_\_\_\_\_\_\_ |

For each of the following, answer in complete sentences.

5. Which would have the longest bond, Si–F or C–F? Explain your answer.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

6. Which would have the stronger bond, N2 or F2? Explain your answer.

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7. Which would have the stronger bond, F2 or Br2? Explain your answer.

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**Unit 8: IMF Review**

State the polarity (polar or nonpolar) and the dominant intermolecular force that is observed in the following molecules:

1. CH2F2   
   Polarity:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
   IMF:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. CH3OH   
   Polarity:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
   IMF:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. NF3  
   Polarity:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
   IMF:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. BF3   
   Polarity:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
   IMF:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Explain the following observations. Your explanation should include the intermolecular forces of both substances.

1. Even though NH3 and CH4 have similar molar masses, NH3 has a much higher boiling point (-33oC) than CH4 (-164oC).

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. At standard temperature (0oC) and pressure (1.00 atm), ethane (C2H6) is a gas whereas hexane (C6H14) is a liquid.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Indicate whether you agree with the statement below or not. Support your answer with a short explanation:

Statement: When water boils, H2O molecules break apart to form hydrogen and oxygen molecules.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Unit 9: Chemical Reactions Review**

Predict the products, state the reaction type (synthesis, single displacement, double displacement, combustion, decomposition), and balance the reaction for each of the following:

| **Balanced Reaction** | **Reaction Type** |
| --- | --- |
| 1.) \_\_\_\_ Na + \_\_\_\_ CuBr3 → |  |
| 2.) \_\_\_\_ NaOH + \_\_\_\_ HCl → |  |
| 3.) \_\_\_\_ C2H6 + \_\_\_\_ O2 → |  |
| 4.) \_\_\_\_\_\_CaCO3 → \_\_\_\_\_CaO + CO2 |  |
| 5.) \_\_\_\_ MgCl2 + \_\_\_\_ AgNO3 → |  |
| 6.) \_\_\_\_ C6H14 + \_\_\_\_\_O2 → |  |
| 7.) \_\_\_\_ HCl + \_\_\_\_ Al → |  |
| 8.) \_\_\_\_ + \_\_\_\_ NiCl2 → |  |
| 9.) \_\_\_\_\_NaBr + \_\_\_\_\_Cl2 → |  |
| 10.) \_\_\_\_\_Mg + \_\_\_\_\_O2 → |  |

For the following reactions, write the balanced, complete ionic, and net ionic equations. Remember to include charges, coefficients, and physical states where applicable.

11.) Solutions of sodium sulfate and calcium chloride react to form a calcium sulfate precipitate and sodium chloride ions

Balanced: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Complete ionic:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Net Ionic:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

12.) Solutions of hydrochloric acid and potassium hydroxide react to form water in a solution of potassium chloride. (Water is NOT aqueous…)

Balanced: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Complete ionic:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Net Ionic:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Unit 10: Analytical Chemistry Review**

For each of the following, you must solve the problem using dimensional analysis (cancellation of units). All values must have a unit and substance labelRound your answer to the proper number of significant figures.

1. How many atoms are in 5.43 g of sodium?

2. How many hydroxide ions are present in 17.1 mol of magnesium hydroxide?

3. What mass of iron can be isolated from 0.765 g of iron (III) oxide?

4. How many moles of potassium chlorate are in 9.12 kg?

5. How many chloride ions are in 3.200 mg of strontium chloride?

6. Glycerol is a thick, sweet liquid obtained as a byproduct of the manufacture of soap. Its percent composition is 39.12% carbon, 8.75% hydrogen, and 52.12% oxygen. The molecular mass is 92.11 g/mol. What are the empirical and molecular formulas for glycerol?

7. A 15.67 g sample of a hydrate of magnesium carbonate was heated to drive off the water. The mass was reduced to 7.58 g. What is the formula of the hydrate?

**Unit 11: Stoichiometry Review**

1. Ammonia reacts with oxygen to produce nitrogen monoxide and water. Write the balanced equation below:

1. What mass of water will be produced when 100.0 g of ammonia is reacted with excess oxygen?

1. If the reaction is done with 25.0 g of each reactant, what mass of nitrogen monoxide can be collected?

2. Sodium sulfide reacts with silver (I) nitrate. Predict the products and balance the reaction.

a. If the reaction is carried out with 50.0 g of sodium sulfide and 35.0 g of silver nitrate, which is the limiting reactant?

b. What mass of the excess reactant remains?

c. What mass of silver (I) sulfide would precipitate?

d. What is the percent yield if only 5.76 g of silver (I) sulfide is collected?