

Honors Chemistry Fall 2015 Review

Name _____

Unit 1: Matter and Math (Chapters 1 -3)

KEY VOCAB TO KNOW:

- Meter
- Liter
- Gram
- Mass
- Weight
- Volume
- Density
- Conversion Factor
- Substance
- Physical Property
- Chemical Property
- Physical change
- Chemical Change
- Element
- Compound
- Precipitate
- Reactant
- Product
- Law of Conservation of Mass

1. Metric conversions: Be able to convert between kilo, centi, milli, micro and nano.
 - a. How many meters are in 5 km?
 - b. How many ng are in 15 cg?
2. Convert the following into scientific notation: 0.000057 g ; Convert the following to standard decimal form:
 5.2×10^{-3} mL.
3. How many significant figures are in the following? Which value has the most significant figures?
 - a. 3.25 mL vs. 3.250 mL
 - b. 0.056 g vs. 5.6×10^{-2} g
4. Round each measurement to the number of significant figures indicated in the parentheses.
 - a. 56.55 g (2)
 - b. 4.007×10^3 mg (3)
5. Use dimensional analysis to solve the following:
 - a. How many centimeters are in 36 feet? (1 in = 2.54 cm)
 - b. Convert the speed of light (3×10^8 m/s) to miles/hour. How many miles can light travel in a year? (This is a light year)
6. Of the states of matter (solid, liquid or gas) which is compressible and takes the shape and volume of its container? Describe the other two states as far as their compressibility and definite (or indefinite), shape and definite (or indefinite) volume.

7. What is the density of a substance that has a mass of 2.0g and a volume of 0.7 mL? Would this object sink or float?
8. What is the mass of an object if its density is 12.00 g/mL and its volume is 3.0 mL?
9. What must occur in a chemical change? Is a phase change chemical change? What about burning a piece of paper?

Unit 2: Atomic Structure (Chapters 4 and 5)

KEY VOCAB TO KNOW:

- Nucleus
- Proton
- Neutron
- Electron
- Atomic number
- Mass number
- Isotope
- Atomic Mass
- Weighted average
- Quantum mechanical model
- Atomic orbital
- Electron configuration
- Principle energy level
- Aufbau principle
- Hund's rule
- Pauli exclusion principle
- Wavelength
- Photon
- Electromagnetic radiation
- Frequency
- Hertz
- Ground state
- Excited state
- Atomic emission spectrum

12. Describe the model of the atom that Rutherford proposed after his gold foil experiment. In particular, what was the atom mostly made of? Where was most of the mass and positive charge? What subatomic particle is outside the nucleus?
13. For nuclear symbols, where is the mass number located? The atomic number?
14. What is the number of electrons ,protons and neutrons for the following:
 - a. ${}_{22}^{48}\text{Ti}$
 - b. ${}_{14}^{28}\text{Si}$
 - c. ${}_{80}^{200}\text{Hg}$
 - d. ${}_{55}^{133}\text{Cs}$
15. How are isotopes of the same elements similar? How are they different?
16. Why are atomic masses calculated with a weighted average?
17. Element X has two natural isotopes. The isotope with a mass of 10 amu has a relative abundance of 19.91%. The isotope with a mass of 11 amu has a relative abundance of 80.09%. Calculate the atomic mass of this isotope and identify the element.

18. Explain the difference between Rutherford's atomic model and the Bohr model. What is the difference between the Bohr model and the quantum mechanical model?
19. How can you tell what the highest principle energy level of an atom is by looking at the periodic table?
20. Write the electron configuration for the following:
 - a. Germanium
 - b. Nitrogen
 - c. Potassium
21. What happens to the wavelength of light as the frequency increases?
22. A beam of electromagnetic radiation has a wavelength of 500 nm.
 - a. What is this wavelength in m?
 - b. What is the frequency and the energy of the light?
 - c. In what region of the spectrum is this?
23. An element has an atomic emission spectra with lines at 464 nm and 652 nm. Which line represents more energy being lost from the electron?
24. Which transition would lead to an electron releasing more energy?
 - a. $n=7$ to $n=2$
 - b. $n=5$ to $n=2$

Unit 3: Periodicity and Bonding (Chapters 6-9)

KEY VOCAB TO KNOW:

- | | |
|----------------------------|----------------------------------|
| • Period | • Ionization energy and PT trend |
| • Group | • Electronegativity and PT trend |
| • Metal | • Ion |
| • Metalloid | • Cation |
| • Nonmetals | • Anion |
| • Alkali Metals | • Ionic Compound |
| • Alkaline Earth Metals | • Monatomic Ion |
| • Halogens | • Polyatomic ion |
| • Noble Gases | • Valence Electron |
| • Transition Metals | • Covalent Compound |
| • Representative elements | • Polar covalent bond |
| • Atomic Size and PT trend | • Nonpolar covalent bond |

25. What do elements in the same group have in common?
26. What two ways are metals different from nonmetals (as far as their general properties)?
27. Why do cations and anions attract one another?
28. List the following in order of increasing ionization energy: Be, Mg, Sr
29. Which element has the higher electronegativity: Cl or F?

30. List the following in order of increasing atomic radius: S, Cl, Na

31. Name the following groups:

- a. Group 1A
- b. Group 2A
- c. Group 7A
- d. Group 8A
- e. Elements in the B groups.

32. Complete this table with the formulas and names of the compounds.

	K^+	Mg^{2+}	Al^{3+}
Br^-	Formula _____ Name _____	Formula _____ Name _____	Formula _____ Name _____
CO_3^{2-}	Formula _____ Name _____	Formula _____ Name _____	Formula _____ Name _____

33. How are the physical properties of ionic compounds different from those of covalent compounds?

34. If a compound name has numerical prefixes, it is not _____. If the compound name has a metal or ammonium in the name, it is _____.

35. Name these compounds:

- a. N_2O_5
- b. $Al_2(SO_3)_3$
- c. SO_3
- d. Dinitrogen tetroxide
- e. Boron tribromide

36. Draw the Lewis dot structures of the following substances and give their shape. For the neutral compounds, label as polar or nonpolar.

- a. CO_2
- b. CO_3^{2-}
- c. OF_2
- d. PCl_5
- e. SO_4^{2-}
- f. NO_2^{1-}

37. The C-O bond is polar, but CO_2 is not a polar molecule. Why is this true?

38. Which bond is more polar: H-Cl vs H-F? Why?

39. List the three types of intermolecular forces. Describe what types of molecules would have each one as the strongest intermolecular force and give an example.