Chemistry Term 1 Study Guide

Topics:

- Scientific method
- Scientific notation
- Significant figures
- Unit conversions and dimensional analysis
- Elements
- Compounds
- Heterogeneous mixtures
- Homogeneous mixtures
- Distillation
- Filtration
- Density
- Physical and chemical changes
- Physical and chemical properties
- Old dead white guys
- Protons, neutrons, electrons
- Atomic number, mass number
- Isotopes
- Ions and charges
- Nuclear chemistry equations
- Alpha, beta, gamma, positron emission
- Electron capture
- Half-life problems
- Electron configurations
- Noble gas shortcut
- Electron rules: Aufbau, Pauli, Hund
- Valence electrons
- Periodic table groups
- Atomic radius trends
- Ionization energy trends
- Electronegativity trends
- Anions and cations
- Law of conservation of mass

Questions:

1. What is the difference between precision and accuracy? Give examples of each.
2. Your beaker has a mass of 120.6 g. Determine the mass in kg.
3. Convert 75 miles/hour into meters/s. (1 mile = 1.61 km)
4. The density of tungsten is 19.25 g/mL. If you have a piece of tungsten that has a mass of 4.45×10^{-2} kg, what is the volume of the sample in mL?
5. Convert your answer in #4 to m^3.
6. You want to determine if a piece of metal is tungsten. The mass is 56.84 g. You place metal in a graduated cylinder that contains 45.5 mL of water. The volume rises to 49.1 mL. Is the metal tungsten?
7. Give 2 examples each for elements, compounds, heterogeneous mixtures, and homogeneous mixtures.
8. How would you separate a mixture of rocks, sand, sugar, oil, and water?
9. What is a physical change? Give 2 examples.
10. What is a chemical change? Give 2 examples.
11. What is a physical property? Give 2 examples.
12. What is a chemical property? Give 2 examples.
13. What is the law of conservation of mass? Explain an example.
14. Magnesium reacts with nitrogen to create magnesium nitride. What mass of nitrogen is required to produce 100.90 g of magnesium nitride if you start with 72.90 g of magnesium?

15. Consider each state of matter (solid, liquid, and gas).
    a. Does each state have a definite or indefinite volume?
    b. Does each state have a definite or indefinite shape?
    c. Describe what the particles (atoms or molecules) are doing in each state.
16. Write the full electron configuration for iodine.
17. Write the shortcut electron configuration for erbium.
18. Complete the following chart:

Symbol	Protons	Neutrons	Electrons	Charge	Atomic #	Mass #
		44	36	-2		
$^{138}Ba^{+2}$						
	77			0		192

19. There are five naturally occurring isotopes of the element zinc. The relative abundance and mass of each are as follows:

    Zinc-64 = 48.89%, 63.929 amu Zinc-66 = 27.81%, 65.926 amu
    Zinc-67 = 4.11%, 66.927 amu Zinc-68 = 18.57%, 67.925 amu
    Zinc-70 = 0.62%, 69.925 amu

    Calculate the average atomic mass of zinc.
20. Define isotope and ion.
21. Write the equations for the alpha decay of ^{256}Lr and ^{211}Fr.
22. Write the equations for the beta decay of ^{90}Sr and ^{52}Fe.
23. Write the equations for the positron emission of ^{50}Mn and ^{8}B.
24. Write the equations for the electron capture of ^{239}Cm and ^{73}As.
25. Thallium-201 has a half-life of 73.0 hours. If 4.0 g of thallium-201 decays over a period of 146 hours, how many grams of thallium-201 will remain?
26. After 24.0 days, 2.00 mg of an original 128.0 mg sample remain. What is the half-life of the sample?
27. Os-182 has a half-life of 21.5 hours. If 1.25 g remain after 64.5 hours, what was the mass of the original sample?
28. What happens to atomic radius as you go across a period on the periodic table? Explain.
29. What happens to atomic radius as you go down a column on the periodic table? Explain.
30. What is ionization energy? Describe the trends. How is ionization energy related to atomic size?
31. What is electronegativity? Describe the trends. How is electronegativity related to atomic size?
32. Put the following elements in order of increasing atomic size: Niobium, barium arsenic, nitrogen, radium, neon
33. Now put the elements in order of increasing ionization energy.