

Honors Chemistry- First Semester review Topics (*Not completely comprehensive*)

Can You....

1. Classify matter as an element or compound; mixtures as homogeneous or heterogeneous.
2. Lists the signs of a chemical reaction and differentiate between a physical change and chemical change.
3. Give examples chemical changes.
4. Give examples of physical changes.
5. Determine the number of protons, electrons, and neutrons given the following chemical symbol: ${}^{37}_{17}\text{Cl}^-$
6. Determine the charge of the Zr cation in the compound ZrBr_4 .
7. Combine cations and anions to form neutral ionic compounds (salts).
8. Classify a compound either as ionic or molecular.
9. Name ionic and molecular compounds.
10. Write the formula of an ionic or molecular compound given its name.
11. Identify polyatomic ions.
12. Identify the aqueous ions present in a given aqueous salt solution - what cations and anions are present in: $\text{Na}_3\text{PO}_4(\text{aq})$
13. Identify an unknown substance given its physical properties and a reference table.
14. Balance an equation.
15. Write mole ratios given a balanced equation.
16. Determine the molar mass of a compound given its formula.
17. Describe a "mole"
18. Convert moles into grams, grams into moles.
19. Solve stoichiometric and limiting reagent problems.
20. Determine the elemental % (by mass) of a compound.
21. Determine the empirical formula a compound using percent composition data or experimental data
22. Given the empirical formula and the molar mass of the molecular formula (molecular weight) of a compound find its molecular formula.
23. Determine number of protons in a silver dollar weighing 28.0 g.
24. Given a chemical reaction, tell if it is a double displacement, single displacement, acid-base, decomposition, or synthesis reaction.
25. Describe what is going at the molecular level in an oxidation-reduction reaction.
26. Use an activity series to determine whether or not two species will react.
27. Write molecular, ionic, and the net ionic equations for double and single displacement reactions.
28. Describe the structure of an atom.
29. Account for how atoms can emit light.
30. Describe an atomic orbital.
31. Write the electronic configuration for any element or ion.
32. Predict what ion an element tends to form given its position in the periodic table.
33. Describe an ionic bond.
34. Describe a covalent bond.
35. Using terms like ionization energy and electron affinity describe what happens when a metal encounters a nonmetal.
36. Draw Lewis structures.
37. Use the kinetic molecular theory to account for the properties of gases.
38. Use the combined gas equation to find a new pressure, or volume, or temperature of a gas having changed the conditions at which the gas is stored.
39. Define STP conditions.
40. Determine the number of moles of a gas by knowing its volume when stored at STP.
41. Apply Dalton's law of partial pressures to gas mixtures.
42. Determine the molar mass of a gas by manipulating experimental data.
43. Use the Ideal Gas equation.
44. Differentiate between an ideal and real gas.
45. Solve gas Stoichiometry problems.
46. Determine the density of a gas.
47. Apply this equation: $M = n/V$ to aqueous solutions.
48. Make a 0.1 M NaOH solution starting with solid NaOH.
49. Prepare a dilute solution starting with a concentrated solution.
50. Review all experiments and demonstrations.
51. Review all class notes.
52. Review all quizzes.

Honors Chemistry – First Semester Review Questions

A 2.0g sample of Al metal is added to 100mL of an aqueous solution at 20°C containing 3.15g of nitric acid.

- a) What is the formula of nitric acid, knowing that it is a combination of hydrogen with the nitrate ion?
- b) Will a reaction occur? How can you tell? Is this a physical or chemical change? What type of reaction is this?
- c) What is the percent composition of nitric acid? What is its structural formula?
- d) What products are formed? What are their formulas? Write a set of balanced equations for this reaction (including ionic and net ionic), indicating the reactants' and products' physical states.
- e) Classify each of the products individually, and the products collectively, as elements, compounds, or mixtures.
- f) One of the products is ionic, the other is molecular. Which is which? For the ionic compound, what is the cation, and what is the anion? What are their charges? Why?
- g) What type of element is Al? Which group is it in? Which family? If its most abundant isotope has 14 neutrons, write the isotope symbol for Al.
- h) What is the molarity of the nitric acid solution?
- i) How many grams of hydrogen are produced? What is the limiting reagent? How many moles of excess reagent will remain?
- j) What volume would the hydrogen gas occupy if collected at 20°C and 100kPa?
- k) What volume would the hydrogen gas occupy at STP?
- l) In another experiment, a 2.0g sample of Cu is used instead. Step by step, how would the results change?