

- 1a. Round this number to 3 significant digits:  $8.9090 \times 10^{-4}$
- 1b. Round this number to 5 significant digits:  $8.9090 \times 10^{-4}$
- 2a. Provide the answer to the correct number of significant digits:  $8.16\text{cm}^3 / 3.25\text{cm}$
- 2b. Provide the answer to the correct number of significant figures:  $4.64\text{cm}^3 / 4.64\text{cm}^2$
- 3a. Express this number in scientific notation 7,944,000,000,000
- 3b. Express this scientific notation number in decimal notation  $3.49 \times 10^8$
- 4a. Express this number in scientific notation 0.0000000657
- 4b. Express this scientific notation number in decimal notation:  $9.62 \times 10^{-7}$
- 5a. Given that 1 kg = 2.20 pounds, convert this measurement to pounds: 142.1 kg
- 5b. Given that 1 kg = 2.20 pounds, convert this measurement to pounds 8505 g
- 6a. Calculate the volume in milliliters for 10.593g of a liquid substance with a density of 13.924 g/mL.
- 6b. Calculate the mass in grams for 31.20mL of a liquid substance with a density of 0.798 g/mL.
- 7a. Calculate the molar concentration (molarity) of a solution of 37.102 g of anhydrous  $\text{MgCl}_2$  (molar mass = 95.211g/mol) in 250 mL of solution.
- 7b. How many grams of anhydrous  $\text{MgCl}_2$  (molar mass = 95.211g/mol) are needed to make 500.0 mL of a 3.00M solution?
- 8a. Calculate the mass percent of 19.278 g of magnesium sulfate in 250.013 g of water.
- 8b. Calculate the mass percent of 19.278 g of magnesium sulfate in 250.013 g of solution.
- 9a. Provide the final molar concentration when 250mL of an 18.0M sulfuric acid solution is diluted to a total volume of 3.00L.
- 9b. Provide the number of milliliters of concentrated 12.0M hydrochloric acid needed to prepare 1.50L of solution that is 3.00 M.
- 10a. Provide the oxidation number for manganese in potassium permanganate,  $\text{KMnO}_4$ .
- 10b. Provide the oxidation number for carbon in oxalate anion  $\text{C}_2\text{O}_4^{2-}$ .
- 11a. Provide the expected oxidation number for an ion of magnesium.
- 11b. Provide the expected oxidation number for an ion of sulfur.
- 11c. Provide the expected oxidation number for an atom of krypton.
- 12a. Indicate which substances are oxidized and which are reduced in the following reaction:  $\text{Br}_2(\text{l}) + 2 \text{O}_2(\text{g}) \rightarrow 2 \text{BrO}_2(\text{g})$
- 12b. Explain how to tell that a substance is oxidized in a chemical reaction.
- 13a. Balance this equation:  
 $\underline{\hspace{1cm}} \text{Fe}(\text{s}) + \underline{\hspace{1cm}} \text{CuCrO}_4(\text{s}) \rightarrow \underline{\hspace{1cm}} \text{Fe}_2(\text{CrO}_4)_3(\text{s}) + \underline{\hspace{1cm}} \text{Cu}(\text{s})$
- 13b. Balance this equation:  
 $\underline{\hspace{1cm}} \text{CaCl}_2(\text{aq}) + \underline{\hspace{1cm}} \text{AgNO}_3(\text{aq}) \rightarrow \underline{\hspace{1cm}} \text{Ca}(\text{NO}_3)_2(\text{aq}) + \underline{\hspace{1cm}} \text{AgCl}(\text{s})$
- 14a. Calculate the molar mass of glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ )
- 14b. Calculate the amount in moles represented by 18.0g of glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ )
- 15a. Explain how you could tell which instrument is the most precise.
- 15b. Explain how you could tell which instrument is the most accurate.
- 16a. Give three processes that are examples of chemical change
- 16b. Give three processes that are examples of physical change
- 17a. Describe in your own words the meaning of the word 'isotope'.
- 17b. What particles are located in the nucleus of an atom?

- 17c. What is the electron configuration of a magnesium atom?
- 17d. What atom has the electron configuration  $1s^2 2s^2 2p^6 3s^2 3p^3$ ?
- 17e. What element has the same electron configuration as an ion of potassium?
18. Write the an R-group representation, and the pattern to match for each of the following organic compounds: aldehyde, carboxylic acid, ether, amine, alcohol, ketone, amide, ester, and phenol. Label your work
18. Provide the general chemical makeup of these groups protein, carbohydrates, lipids, triglycerides, polysaccharides, and DNA.
20. Provide an example of a monatomic cation, a monatomic anion, a polyatomic cation, and a polyatomic anion. Label your work.
- 21a. Convert  $3.0 \times 10^{24}$  atoms of carbon to moles of carbon.
- 21b. Convert  $4.0 \times 10^{24}$  atoms of silicon to grams of silicon.
- 22a. State three types of natural radiation emitted from a radioactive nucleus.
- 22b. Explain why radiation has harmful effects on living organisms.
- 22c. What shielding material would be needed to stop each of the three types of natural radiation emitted from a radioactive nucleus? Label your work!
- 23a. Provide the common name endings (suffix) and give an example of the name of a compound that contains an alcohol functional group.
- 23b. Provide the common name ending (suffix) and give an example of the name of a compound that contains an ether functional group.
- 23c. Provide the common name ending (suffix) and give an example of the name of a compound that contains an aldehyde functional group.
- 23d. Provide the common name ending (suffix) and give an example of the name of a compound that contains an amine functional group.
- 24a. A patient is ordered 75 mg of amoxicillin trihydrate orally. The concentrated syrup solution contains 375 mg/mL. What volume of concentrated syrup is needed to provide 10 doses?
- 24b. To avoid irritation, 15 mL of concentrated syrup, concentration 375 mg/mL, must be diluted with deionized water to a concentration of 10. mg/mL. Calculate the total volume of the diluted solution.
- 24c. What volume of 15 mg/mL diluted syrup will you recommend to be administered to a patient that is to receive a 75 mg dose?
- 25a. Which atom in the list would have the largest atomic radius and which would have the smallest radius: Na, K, Li.
- 25b. Which atom in the list would have the largest atomic radius and which would have the smallest radius: B, N, Ne.
- 26a. Which atom in the list would have the most metallic character and which would have the least: Na, K, Li.
- 26b. Which atom in the list would have the most metallic character and which would have the least: B, N, Ne.
- 27a. Which atom in the list would have the highest ionization energy and which would have the least: Na, K, Li.
- 27b. Which atom in the list would have the highest ionization energy and which would have the least: B, N, Ne.
28. Compute the following to the correct number of significant figures and units.  
 $(2.1 \text{ m} + 0.0332 \text{ m})/9.553 \text{ s}^2$

29. What is the molar concentration of a solution containing 35.0 g of NaCl in 750 ml of solution?
30. Balance the following equation: barium chlorate  $\rightarrow$  barium chloride plus oxygen
31. What is the correct chemical name for  $P_2S_5$ ?
32. To what class of organic molecules does  $CH_3(CH_2)_3COOH$  belong?
33. Express 0.0045988 to 2 significant figures.
34. Express 0.0003847000 in proper scientific notation
35. Indicate the number of protons, neutrons, and electrons in  $^{238}U^{+3}$
36. Given that 1 mile = 1.609 km, how many miles is 56.00 km?
37. Calculate the density in grams per milliliter of 5.36 g of material that has a volume of 4.77 ml.
38. The mass percent of 65.0 g of salt in 175 g of water is?
39. What is the oxidation number of sulfur in sodium sulfite?
40. What is the oxidation number of an ion of phosphorous
41. What is the reducing agent in the following reaction?  
 $2Al(s) + N_2(g) \rightarrow 2AlN(s)$
42. A solute doesn't conduct electricity. That solute is considered a/an \_\_\_\_\_?
43. Which measurement is more precise?  
 $\pm 0.05$  mL,  $\pm 0.1$  mL,  $\pm 0.02$  mL,  $\pm 20$  mL
44. Label the following as chemical or physical
  - a. deposition
  - b. crystallization
  - c. oxidation
  - d. sublimation
  - e. precipitation
  - f. neutralization
  - g. evaporation
  - h. dissolving
  - i. burning
  - j. decomposing
45. Define the following:
  - a. nucleon
  - b. proton
  - c. electron
  - d. neutron
  - e. isotope
  - f. ion
  - g. cation
  - h. anion
  - i. carbohydrate
  - j. lipid
  - k. nucleic acid
  - l. protein
  - m. polyatomic
  - n. monatomic

- o. dipeptide
  - p. disaccharide
  - q. mono-peptide
  - r. monosaccharide
  - s. enzyme
  - t. ionic bond
  - u. polar covalent bond
  - v. nonpolar covalent bond
  - w. metallic bond
  - x. hydrogen bond
46. Draw the structure of the following organic functional groups:
- a. alcohol
  - b. amine
  - c. ketone
  - d. carboxylic acid
  - e. ether
  - f. amide
  - g. ester
  - h. aldehyde
  - i. phenol
  - j. alkyl halide
47. List the following forms of emitted radiation from least to greatest mass
- a. gamma ray
  - b. alpha particle
  - c. beta ray
  - d. positron
  - e. proton
  - f. neutron
48. Give the ending of the name of the following organic functional groups:
- a. alcohol
  - b. amine
  - c. ketone
  - d. carboxylic acid
  - e. ether
  - f. amide
  - g. ester
  - h. aldehyde
  - i. phenyl
  - j. alkyl halide
49. Give four properties of acidic solutions.
50. Give four properties of basic solutions.
51. A doctor orders 25 mg of ibuprofen. A solution contains 225 mg /10.0 mL. What volume of syrup do you obtain?
52. Given the following balanced chemical reaction:  $\text{N}_2(\text{g}) + 3\text{H}_2(\text{g}) \rightarrow 2\text{NH}_3(\text{g})$
- a. How many grams of  $\text{NH}_3$  can be obtained from 2.500 moles of  $\text{H}_2$ ?
  - b. How many grams of  $\text{N}_2$  are needed to react with 15.0 grams of  $\text{H}_2$ ?

53. Name the following compounds:
- $(\text{NH}_4)_2\text{SO}_4$
  - $\text{P}_2\text{O}_5$
  - $\text{Cu}_3(\text{PO}_4)_2$  (stock system)
  - $\text{H}_2\text{S}$  (acid)
  - $\text{H}_2\text{CO}_3$  (acid)
  - $\text{HNO}_2$  (acid)
54. What type of bonding occurs in the previous molecules?
55. Describe the following changes of state:
- condensation
  - evaporation
  - deposition
  - melting
  - freezing
  - sublimation
56. List the order that electrons fill orbitals up to the 5s orbital.
57. What is the electron configuration for Cl?
58. Locate the following on the periodic table:
- metals
  - nonmetals
  - metalloids
  - halogens
  - transition elements
  - noble gases
59. List the how the trends of the following occur on the periodic table:
- electronegativity
  - ionization
  - atomic radius
60. List the 7 elements that exist as diatomic molecules.