

Chemistry 1 Midterm Review**Measurements and Calculations**

1. Give the steps of the scientific method along with a description of each.
2. Give the SI units of measurement.
3. Know the prefixes used to make measurement units smaller and larger ex: kilo, centi, deci etc.
4. Convert 145 g to
 - a. mg
 - b. cg
 - c. kg
 - d. μg
5. Define mass.
6. Describe and define density and the units it is measured in.
7. Calculate the density of an object with a mass of 10.5 g and a volume of 9.2 g.
8. Diamond has a mass of 3.26 g/cm^3 . What is the mass of a diamond with volume 0.351 cm^3 ?
9. If a student measures the length of a lab bench 5 times and always gets results very close to 2.50 meters, yet the actual length of the lab bench is 3.20 meters, are his measurements precise, accurate, both, or none of these?
10. What is the student's percent error in the question 5?
11. How many significant figures in:
 - a. 345 000
 - b. 2.41099
12. Round to three significant figures:
 - a. 0.00036105
 - b. 5.236×10^9
 - c. 5999000
13. Calculate the following and round to the correct number of digits:
 - a. $32.1 + 45.009$
 - b. 6.27×10 .
14. Convert the following to scientific notation:
 - a. 345 000
 - b. 0.0034 028
15. Multiply 10^7 by 10^{-3}
16. Know the definitions for directly and inversely proportional and know how each relationship looks when graphed.

Matter and Change

17. Define: Physical properties, chemical properties, physical changes, chemical changes, matter, substance, element, compound, heterogeneous mixture, homogeneous mixture.
18. Give examples of: extensive and intensive properties, quantitative and qualitative data.
19. Define the four states of matter and describe their properties.
20. Are the following elements, compounds, homogeneous mixtures, or heterogeneous mixtures?
 - a. vegetable soup
 - b. tap water
 - c. bleach
 - d. magnesium
21. Are the following physical properties, chemical properties, physical changes, or chemical changes?
 - a. the burning of paper
 - b. the crumpling of paper
 - c. the flammability of paper
 - d. the color of paper

Solutions

22. Define solution, solute, solvent, colloid, suspension.

States of Matter**Kinetic Molecular Theory**

23. Describe solids, liquids and gases in terms of kinetic molecular theory.

Changes of State

24. Define evaporation, vaporization, condensation, melting, freezing, sublimation, and deposition.

Atoms: The Building Blocks of Matter.

25. Describe the Laws of conservation of mass and energy.
26. What were the major contributions to atomic theory of the following scientists?

Dalton	Rutherford	Bohr	Heisenberg
Thomson	Planck	DeBroglie	
27. Give the definitions of an atom
28. Give the mass, charge, and location of protons, electrons and neutrons.

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29. Define atomic number, mass number, and atomic mass.
30. How many protons, electrons and neutrons in the following?
- a) carbon-13 b) $^{36}_{17}\text{Cl}^-$ c) $^{25}_{12}\text{Mg}^{2+}$ d) neon-20
31. Define ion and isotope.
32. Silicon has 3 naturally occurring isotopes: Si-28 has a relative abundance of 92.21% and a mass of 27.977 amu, Si-29 has an abundance of 4.70% and a mass of 28.976 amu, and Si-30 has an abundance of 3.09% and a mass of 29.974 amu. What is the average atomic mass of silicon?
33. What is the average atomic mass unit based on?

Nuclear Chemistry

34. Which elements are radioactive and what causes them to be radioactive?
35. Give the symbol, definitions, and properties of alpha, beta, and gamma radiation.
36. Write nuclear equations for a) the alpha decay of uranium-238 b) the beta decay of carbon-14
37. Define half-life.
38. How many grams of a 5.2 g sample of a radioactive isotope will remain after 39 seconds if its half-life is 13 seconds?
39. What is the half-life of a radioactive isotope if it decays from 12.0 grams to 0.75 grams after 10 years?
40. List some of the problems associated with the disposal of radioactive waste.
41. Define fusion and fission. Which takes place in nuclear power plants and which provides the sun's energy?
42. Know some of the applications of nuclear reactions such as the use of radioactive tracers, how a power plant uses nuclear reactions etc.

Arrangement of Electrons in Atoms.

43. What is meant by the *dual nature of light*?
44. Give the properties of electromagnetic waves and the relationship between them.
45. What is the difference between a continuous spectrum and a bright line spectrum.
46. Briefly explain Bohr's model of the hydrogen atom. Know the difference between ground state and excited state and how an electron moves from one to the other.
47. Explain the following rules for electron configurations:
- a) Pauli's exclusion principle b) The Aufbau rule c) Hund's rule
48. What are the maximum number of electrons that can occupy each of the first 5 principle energy levels?
49. What are the maximum number of electrons that can occupy the following sublevels: s, p, d, and f?
50. Give orbital diagrams, electron configurations, and abbreviated noble gas configurations for the following:
- a) Li b) Mn c) Ne d) Cu e) Pb f) Cr g) Fe^{2+} h) Fe^{3+} h) Cl^-
- How many unpaired electrons does each have?

The Periodic Law.

51. Describe Mendeleev's periodic table.
52. How is the modern periodic table arranged?
53. Give the properties of metals, non-metals and semi-metals and know where they are found in the periodic table.
54. What is a family/ group?
55. What is a period?
56. Define valence shell.
57. For the elements whose outer electron configurations are given, give the period and family to which they belong: a) $4s^2$ b) $4p^4$ c) $6p^2$ d) $5s^1$ e) $2p^3$
58. Know the trends for ionization energy, electronegativity, atomic radius, and ionic radius.
59. Which one of each pair has the highest electronegativity?
- a) Na or Cs b) Al or Cl
60. Which one of each pair has the largest radius?
- a) Si or Cl b) Mg or Ba c) Ca or Ca^{2+} d) F or F^-
61. What causes atomic radius to increase down a group and decrease across a period?
62. What are the locations and major characteristics of the following groups/ families?
- a) alkaline metals b) alkaline earth metals c) transition elements d) inner transition elements e) halogens

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f) noble gases.

63. Where are the most reactive metals found?

64. Where are the most reactive non-metals found?

Chemical Bonding.

65. What is the octet rule?

66. Define cation and anion.

67. For the following elements, give their group number, say whether they gain or lose electrons, and give the symbol of the most common ion formed:

a) Ca b) F c) Al d) N e) S f) K

68. In what ways do covalent and ionic compounds differ? What is a polar covalent bond?

69. Give the correct formula for:

a. lead (II) nitrate b. magnesium chloride c. dinitrogen pentoxide d. nitric acid

70. Give the correct name for

a. CO_2 b. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ c. FePO_4 d. MgO