Exam 1

# Part 1: Multiple Choice (2 points each)

## Directions: Please circle the *best* answer for each of the following questions.

1. Carbon has two naturally occurring isotopes: C-12 (98.93% abundance, mass = 12.000 amu) and C-13 (1.07% abundance, mass = 13.0034 amu). Without doing any calculations, determine which mass is closes to the atomic mass of carbon.
2. 1.0034 amu
3. 12.00 amu
4. 12.50 amu
5. 13.00 amu
6. 15.0034 amu
7. The modern periodic table has the elements arranged in order of increasing \_\_\_\_\_.
8. mass number
9. atomic size
10. stability
11. atomic weight
12. atomic number
13. Molecules can be described as
    1. mixtures of two or more pure substance.
    2. mixtures of two or more elements that has a specific ratio between components.
    3. two or more atoms chemically joined together.
    4. heterogeneous mixtures.
    5. homogeneous mixtures.
14. Which of the following represents a valid hypothesis?
    1. Neon does not react with oxygen.
    2. Sodium metal reacts violently with water.
    3. Lead is soft and malleable.
    4. Oxygen is a gas at room temperature.
    5. Metals tend to lose electrons.
15. Which of the following statements is false according to Dalton’s Atomic Theory?
    1. Atoms combine in simple whole number ratios to form compounds.
    2. All atoms of chlorine have identical properties that distinguish them from other elements.
    3. One carbon atom will combine with one oxygen atom to form a molecule of carbon monoxide.
    4. Atoms of sodium do not change into another element during chemical reaction with chlorine.
    5. An atom of nitrogen can be broken down into smaller particles that will still have the unique properties of nitrogen.
16. How many protons and neutrons are in an atom of strontium-90?
    1. 38 protons, 52 neutrons
    2. 38 protons, 90 neutrons
    3. 52 protons, 38 neutrons
    4. 90 protons, 38 neutrons
    5. 64 protons, 64 neutrons
17. Which of the following mixtures could be separated by use of filtration?
    1. Sugar and water
    2. Ball bearings and tennis balls
    3. Ball bearings and vinegar
    4. Sand and salt
    5. c and d
18. What is the relationship between the principal energy level, n, value and the total number of orbitals?
    1. Number of orbitals = n
    2. Number of orbitals = 2n
    3. Number of orbitals = n2
    4. Number of orbitals = 2
    5. none of the above
19. Which of the following is a binary compound?
    1. Barium fluoride, BaF2
    2. Manganese(II) nitrate, Mn(NO3)2
    3. Carbon dioxide, CO2
    4. Magnesium sulfate heptahydrate, MgSO4 · 7 H2O
    5. a and c
20. Which of the following rules about lab safety is true?
    1. You should always add acid to water.
    2. If you spill chemical on your hand, you should wash it with water for 15 minutes unless the substance is reactive with water.
    3. At a minimum closed toed shoe should be worn in the lab.
    4. all of the above
    5. none of the above

# Part 2: Short Answer

## Directions: Answer each of the following questions. Be sure to use complete sentences where appropriate. For full credit be sure to show all of your work.

1. A student working for Stop and Shop is packing eggs into cartons that contain a dozen eggs. Show, using dimensional analysis, how many eggs the student would need in order to pack 39 cartons (4 points).
2. In the winter, a heated home in the Northeast might be maintained at a temperature of 75 °F.
   1. What is this temperature in degrees Celsius (6 points)?

* 1. What is the temperature in Kelvin?

1. The liquid propyl cyanide has a density of 0.794 g/mL at 20 °C. If a 142 gram sample of this compound is needed, what volume of the liquid at 20 °C must be provided (4 points)?
2. Explain how the results of the gold foil experiment led Rutherford to dismiss the plum pudding model of the atom and create his own model based on a nucleus surrounded by electrons (3 points).
3. Select the best of the three choices (4 points):
   1. largest atomic radius As O Ba
   2. smallest first ionization energy N F As
   3. greatest metallic character Br Cs Se
   4. lowest electronegativity value Cl S Li
4. Classify each of the following changes as endothermic or exothermic with respect to the underlined substance (3 points):
   1. Boiling water \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. Hard boiling an egg \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Burning leaves \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. Complete the following table (12 points)

|  |  |
| --- | --- |
| Name | Formula |
|  | IF7 |
| Tetraphosphorus hexaoxide |  |
| Hydrochloric acid |  |
| Copper(II) phosphide |  |
| Zinc nitride |  |
|  | KH |

1. What is the complete and condensed ground state electron configuration for the following atoms (8 points):
   1. Nitrogen \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* 1. Titanium \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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* 1. Oxide \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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1. An isotope of lanthanum is found to have an atomic mass that is 11.4922 times the atomic mass of carbon-12. What is the atomic mass of this isotope (3 points)?
2. Decide if the following statements are true or false (2 points):

|  |  |
| --- | --- |
| 1. For electrons in atoms, the electron energies are quantized in the ground state, but not in excited states. |  |
| 1. Daylight from the sun produces a line spectrum when passed through a prism. |  |

1. The recommended intravenous dose for “DOPRAM”, a respiratory stimulant, is 0.75 mg/kg body weight. DOPRAM is sold as a solution that contains 20.0 mg per mL of solution. How many mL of DOPRAM solution are required to provide an adequate dose to a 145 lb person (12 points)?
2. A student experimentally determines that the boiling point of a particular compound is 178.5 °C. What is the percent error in the student’s measurement, given that the accepted value for the boiling point of the compound is 165.9 °C (6 points)?
3. The CRC Handbook, a large reference book of chemical and physical data, lists two isotopes of silver (Z = 47). The atomic mass of 51.839% silver-107 is 106.9051 u. Through a typographical oversight, the atomic mass of the second isotope, silver-109, is not printed (13 points).
   1. Calculate that atomic mass, taking the tabulated atomic mass of silver of 107.8682 u.
   2. Identify the number of protons, neutrons, and electron in silver-109. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_