Exam 1

# Part 1: Multiple Choice (2 points each)

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

1. Which of the following is one of the five traditional branches of Chemistry?
   1. Inorganic
   2. Organic
   3. Biochemistry
   4. Physical Chemistry
   5. all of the above
2. To how many significant figures should each answer be rounded?
   1. 1 significant figure
   2. 2 significant figures
   3. 3 significant figures
   4. 4 significant figures
   5. 5 significant figures
3. Select the best definition for frequency.
4. The rate at which electromagnetic waves oscillate.
5. The height of an oscillating electromagnetic wave.
6. The oscillations of electric and magnetic fields.
7. The distance between two crests of an electromagnetic wave.
8. The energy of the wave.
9. An orbital may hold
   1. 0 electrons
   2. 1 electron
   3. 2 electrons
   4. none of the above
   5. all of the above
10. Which of the following is a chemical property of chlorine?
    1. It has a sharp suffocating odor.
    2. It combines with sodium to form sodium chloride.
    3. It is a yellowish-green gas.
    4. It boils at -34.6 °C.
    5. all of the above
11. Which of the following statements is true? The quantum mechanical model of the atom includes
    1. all of the Bohr model.
    2. part of the Bohr model.
    3. no part of the Bohr model.
    4. all of the above
    5. none of the above
12. Epsom salt has the formula MgSO4 · 7 H2O. How many water molecules are associated with one formula units of MgSO4?
    1. 1
    2. 2
    3. 7
    4. 14
    5. Magnesium sulfate heptahydrate
13. The electron configuration for Pb2+ is
    1. 1s2 2s22p6 3s23p6 4s23d104p6 5s24d105p6 6s05d104f146p2
    2. 1s2 2s22p6 3s23p6 4s23d104p6 5s24d105p6 5d104f146p2
    3. [Xe] 6s05d104f146p2
    4. [Xe] 5d104f146p2
    5. all of the above
14. How many sublevels are there in the n = 2 level?
    1. 1
    2. 2
    3. 3
    4. 9
    5. 18
15. Which is a scientific observation?
    1. Freezing and boiling are called physical changes.
    2. Water freezes at 0 °C.
    3. If a substance has a density of 1.00 g/mL it must be water.
    4. When a substance freezes its molecule lose potential energy.
    5. none of the above
16. In order to avoid exposure to your eyes in a chemistry lab you should wear eye protection
    1. only when working with corrosive chemicals.
    2. only when your instructor requires it.
    3. only when there are other students working nearby who might do something stupid.
    4. never, they are not necessary.
    5. whenever anyone is working with chemicals or flames.
17. What color is sulfur?
    1. Yellow
    2. White
    3. Brown
    4. Orange
    5. Purple

# 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. If a car is traveling 65 mi/hr, how fast is the car going in km/s (10 points)?
2. Explain how an ocean of water and a cup of the same ocean water can have the same temperature, but contain different amounts of heat (4 points).
3. What kind of light would atoms emit if the electron energy were not quantized (4 points)?
4. One of the successes of the Bohr model of the atom was its explanation of the lines in atomic spectra. Does the quantum mechanical model also have a satisfactory explanation for these lines? Justify your answer (4 points).
5. Account for the chemical similarities among chlorine, bromine, and iodine in terms of their electron configurations (4 points).

|  |  |
| --- | --- |
| Metal | Density (g/mL) |
| Gold | 19.3 |
| Silver | 10.5 |
| Copper | 8.96 |
| Lead | 11.3 |

1. You buy an ingot of gold off of the internet. Given the current price of gold you want to make sure that it is real. You decide to determine the density use the method of water displacement of the gold ingot and compare it to the density of gold. The ingot has a mass of 466.3 g. The initial volume of the water is 45.0 mL and after the ingot was added the volume is 89.4 mL. The density of some metals are given (8 points).
   1. What is the volume of the ingot?
   2. What is the density of the ingot?
   3. Predict the identity. \_\_\_\_\_\_\_\_\_\_\_\_
2. 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 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Identify the principal type of energy (kinetic or potential) exhibited by each of the following (5 points):
   1. A car parked on a hill. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. A car traveling at 60 miles per hour. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. Chemical energy. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   4. A falling rock. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   5. Compressed air in a tank. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Complete the following table (24 points):

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Name | Cation | Anion | Formula |
|  | Sodium chloride |  |  |  |
|  |  | Al3+ | PO43- |  |
|  |  |  |  | KBrO3 |
|  | Zinc sulfate |  |  |  |
|  | Calcium nitride |  |  |  |
|  |  |  |  | Ba(NO2)2 |
|  | Lithium iodide |  |  |  |
|  |  |  |  | H2O |

1. Bromine has two isotopes. Bromine-79, the most abundant isotope at 50.69%, has a mass of 78.9183 u. What is the mass of bromine-81 (10 points)?