Exam 1

Part I: Multiple Choice (2 points each)

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

Question 1. How many nanograms of a liquid are present in a 2.5 megagram sample of the liquid?

1. 2.5 x 103 ng
2. 2.5 x 10-3 ng
3. 2.5 x 1015 ng
4. 2.5 x 10-15 ng
5. none of the above

Question 2. Which comparison of the size of the degree on the major temperature scales are correct?

1. A Kelvin is larger than a °C.
2. A °F is larger than a Kelvin.
3. A °F and a °C are the same size.
4. more than one correct response.
5. none of the above

Question 3. Which of the following concepts applies to both scientific hypotheses and non-scientific hypotheses?

1. Can be tested using experimental methods.
2. Pertains only to substances that can be seen.
3. Offers an explanation for several observations.
4. more than one correct response.
5. none of the above

Question 4. Which of the following statements is correct for potassium-40?

1. Contains more protons than neutrons.
2. Contains more electrons than protons.
3. Contains more neutrons than electrons.
4. Contains fewer protons than electrons.
5. none of the above

Question 5. If object A has a mass of 24 g and a volume of 2.0 mL and object B has a mass of 36 g and a volume of 6.0 mL, then

1. B is more dense than A.
2. A is twice as dense as B.
3. B has a density of one-third that of A.
4. A and B have equal densities because the given units are the same.
5. none of the above

Question 6. What of the following statements concerning the significance of zeros in measured numbers is correct?

1. Leading zeros are always significant.
2. Confined zeros are always significant.
3. Trailing zeros are never significant.
4. all of the above
5. none of the above

Question 7. Which of the following is a property of both the liquid and the solid state?

1. A definite volume.
2. A definite shape.
3. An indefinite shape.
4. An indefinite shape and definite volume.
5. A definite shape and an indefinite volume.

Question 8. Which of the following is an incorrect element classification?

1. Element 11 is an alkali metal.
2. Element 9 is a halogen.
3. Element 2 is a noble gas.
4. Element 22 is an inner transition metal.
5. Element 14 is a metalloid.

Question 9. How long do you need to rinse if you get acid in your eyes?

1. 15 minutes
2. 5 minutes
3. 2 minutes
4. Until they stop hurting
5. 1 hour

Question 10. Which piece of equipment was used in “Glass Working and Significant Figures”?

1. quad-beam balance
2. beaker
3. scoopula
4. Bunsen burner
5. all of the above

Part II: 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.

Question 1. Water has a density of 1.0 g/mL at room temperature. State whether each of the following will sink or float when dropped in water (2 points).

1. paraffin wax (d = 0.90 g/cm3) \_\_\_\_\_\_\_\_\_\_\_\_
2. limestone (d = 2.8 g/cm3) \_\_\_\_\_\_\_\_\_\_\_\_

Question 2. The cost of manufacturing a pain-killing drug is calculated to be 75 cents per gram. What is the cost, in dollars and cents of 3.75 cg of the drug (6 points)?

Question 3. 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 (5 points)?

Question 4. What are the name and symbol of the element whose average atoms have a mass (8 points)

* 1. close to four times the mass of an average nitrogen atom? \_\_\_\_\_\_\_\_\_\_
  2. that is 81.2% of the mass of an average silver atom? \_\_\_\_\_\_\_\_\_\_

1. that is three times the atomic number of lithium? \_\_\_\_\_\_\_\_\_\_
2. close to one-fifth the mass of an average neon atom? \_\_\_\_\_\_\_\_\_\_

Question 5. What is the difference in meaning between the times 3.3 seconds and 3.30 seconds (3 points)?

Question 6. Characterize each of the following pairs of atoms as containing (1) the same number of neutrons, (2) the same number of electrons, or (3) the same total number of subatomic particles (4 points).

* 1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Question 7. Assume that you have four pennies with unknown mint dates and four hypotheses concerning these dates: (1) all dates are the same; (2) two different dates are present; (3) three different dates are present; (4) all dates are different. Which of the listed scientific hypothesis could be eliminated by determining that (6 points)

1. two pennies have the same date? \_\_\_\_\_\_
2. two pennies have different dates? \_\_\_\_\_\_
3. two of three pennies have the same date? \_\_\_\_\_\_
4. three pennies have different dates? \_\_\_\_\_\_

Question 8. Specify the physical state of a pure substance at each of the following conditions, or indicate that the state determination is not possible from the information given (4 points).

1. 10 °C below its freezing point \_\_\_\_\_\_\_\_\_\_\_\_
2. 30 °C above its melting point \_\_\_\_\_\_\_\_\_\_\_\_
3. After sublimation has taken place \_\_\_\_\_\_\_\_\_\_\_\_
4. At its boiling point \_\_\_\_\_\_\_\_\_\_\_\_

Question 9. An automobile gasoline tank holds 13.0 gal when full. How many pounds of gasoline will it hold, if the gasoline has a density of 0.56 g/mL (10 points)?

Question 10. Fill in the blanks in the following table of chemical formulas and compound names (20 points).

|  |  |  |  |
| --- | --- | --- | --- |
| Formula of Cation | Formula of anion | Compound Formula | Compound Name |
| Ca2+ | Cl- | CaCl2 | Calcium chloride |
|  |  | Al2O3 |  |
|  |  |  | Copper(I) nitrate |
|  |  |  | Hydrocyanic acid |
|  |  | H3PO3 (aq) |  |
| ----------------------- | --------------------- | S4N2 |  |
|  |  | MgSO4 • 6 H2O |  |
|  |  |  | Ammonium chlorate |

Question 11. Indicate whether each of the following samples of matter is a heterogeneous mixture, a homogeneous mixture, a compound, or an element (4 points).

1. A colorless singe-phase liquid that when boiled away (evaporated) leaves behind a solid white residue.
2. A uniform red liquid with a boiling point of 50 °C that cannot be broken down into simpler substances using chemical means.
3. A non-uniform, white crystalline substance, part of which dissolves in water and part of which does not.
4. A colorless single-phase liquid that completely evaporates without decomposition when heated and produces a gas that can be separated into simpler components using physical means.

Question 12. A recommended temperature setting for household hot water heaters is 60.00 °C (8 points).

1. What is the temperature in °F?
2. What is the Kelvin temperature?