Exam 1

Part I: Multiple Choice (2 points each)

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

Question 1. The letters N-P-K on a fertilizer label stand for the nutrients \_\_\_\_\_, \_\_\_\_\_, and \_\_\_\_\_.

1. nitrogen , phosphorus, potassium
2. nitrogen, potassium, argon
3. nickel, potassium, krypton
4. niobium, phosphorus, potassium
5. nitrogen, carbon, sulfur

Question 2. Measured values are written to the correct number of significant figures

1. to match the significant figures used by your instructor.
2. to demonstrate the precision of the measurement.
3. to keep numbers smaller and easier to work with.
4. for no particular reason.
5. to confuse students.

Question 3. 1 kilometer = ? meters?

1. 1,000,000 m
2. 1,000,000,000 m
3. 100 m
4. 1,000 m
5. 10 m

Question 4. The specific heat of a substance is

1. the heat level at the melting point.
2. the amount of heat required to change the temperature of 1 g of that substance by 1 °C.
3. the heat held in a 100 g sample of the substance.
4. the heat required to convert 1 g of a solid to a liquid.
5. the energy required to heat the object to its boiling point.

Question 5. The elements in column 1A of the periodic table are also known

1. as halogens.
2. as transition metals.
3. as noble gases.
4. as alkali metals.
5. as alkaline earth metals.

Question 6. Which statement of Dalton’s model of the atom does this series of compounds represent: CH4, C2H2, C2H6, C3H8, C2H4?

1. Elements are composed of minute, indivisible particles called atoms.
2. Atoms of the same element are alike in mass and size.
3. Atoms combine to form compounds in simple numerical ratios, such as one to one, one to two, and so on.
4. Atoms of different elements have different masses and sizes.
5. Atoms of two elements may combine in different ratios to form more than one compound.

Question 7. The charge on a proton is \_\_\_\_\_.

1. 0
2. -2
3. -1
4. +1
5. +2

Question 8. A \_\_\_\_\_ is highly compressible.

1. gas
2. solid
3. plasma
4. liquid
5. all of the above

Question 9. Which of the following are isotopes?

1. Chlorine-35 and gold-197
2. $ and $
3. $ and $
4. O-16 and N-16
5. none of the above

Question 10. Which piece of equipment was used in the mass, volume, density experiment?

1. Graduated cylinder
2. Rubber stopper
3. Balance
4. Watch glass
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. Salts or ionic compounds generally have very high melting points. Sodium chloride melts at 801 °C (8 points).

* 1. What is its melting temperature in degrees Fahrenheit (°F)?

$$℉=\frac{9}{5}℃+32=\frac{9}{5}\left(801\right)+32=1441.8+32=1473.8 ℉=1470 ℉ $$

* 1. What is its melting temperature in Kelvin (K)?

$$K=℃+273.15=801+273.15=1074.15 K≈1074 K$$

Question 2. Is each of the following statements true or false (4 points)?

1. A proton is attracted to an electron. \_\_\_\_\_true\_\_\_\_\_
2. A neutron has twice the mass of a proton. \_\_\_\_\_false\_\_\_\_\_
3. Neutrons repel each other. \_\_\_\_\_false\_\_\_\_\_
4. Electrons and neutrons have opposite charges. \_\_\_\_\_false\_\_\_\_\_

Question 3. Write the following numbers in scientific or standard notation (6 points).

1. Write 4352 mm in scientific notation. \_\_\_\_4.352 x 103 mm\_\_\_\_\_\_\_
2. Write 0.0004032 kg in scientific notation. \_\_\_\_4.032 x 10-4 kg\_\_\_\_\_\_
3. Write 3.24 x 102 mL in standard notation.\_\_\_\_324 mL\_\_\_\_\_\_\_\_\_\_\_\_

Question 4. A car you are thinking of buying is 16.5 feet long. If your garage is about 6 meters long, will the new car fit in your garage (6 points)?

$$16.5 ft×\frac{12 in}{1 ft}×\frac{2.54 cm}{1 in}×\frac{1 m}{100 cm}=5.0292 m ≈5.03 m$$

or

$$6 m×\frac{100 cm}{1 m}×\frac{1 in}{2.54 cm}×\frac{1 ft}{12 in}=19.68503937 ft≈20 ft=2×10^{1} ft$$

Yes, the new car will fit in the garage.

Question 5. Explain the proper procedure for obtaining a solid from a reagent bottle (3 points).

 With goggles on bring a beaker to the reagent area, then remove the cap from the reagent bottle; be sure to keep it in between your fingers, pour out approximately how much you require. Remember to pour the reagent out of the bottle away from the label.

Question 6. Identify whether each of the following is a pure substance or a mixture (6

 points):

1. dirt \_\_\_\_\_mixture\_\_\_\_\_\_\_\_\_\_
2. salad dressing \_\_\_mixture\_\_\_\_\_\_\_\_\_\_
3. tungsten \_\_\_\_\_pure substance\_\_\_\_\_
4. dinitrogen monoxide \_\_\_\_\_pure substance
5. brass \_\_\_\_\_mixture\_\_\_\_\_\_\_\_\_
6. egg \_\_\_\_\_mixture\_\_\_\_\_\_

Question 7. Identify each of the following as atoms, anions, or cations (4 points):

1. Al3+ \_\_\_\_\_cation\_\_\_\_\_
2. SO42- \_\_\_\_\_anion\_\_\_\_\_
3. Ne \_\_\_\_\_atom\_\_\_\_\_
4. NH4+ \_\_\_\_\_cation\_\_\_\_\_

Question 8. A particular element exists in two stable isotopic forms. One isotope has a mass of 34.9689 amu (75.77% abundance). The other isotope has a mass of 36.9659 amu (12 points).

1. Calculate the average mass of the element.

$$atomic mass=\left(mass 1\right)\left(\frac{\%abundance 1}{100}\right)+\left(mass 2\right)\left(\frac{\%abundance 2}{100}\right)$$

$$atomic mass=\left(34.9689 amu\right)\left(\frac{75.77\%}{100}\right)+(36.9659 amu)\left(\frac{100-75.77}{100}\right)$$

$$atomic mass=26.49593553 amu+(36.9659 amu)\left(\frac{24.23}{100}\right)$$

$$atomic mass=26.49593553 amu+8.9563757 amu$$

$$atmoic mass=35.4527731 amu≈35.45 amu$$

1. Write the symbol for the element. \_\_\_\_\_Cl\_\_\_\_\_
2. Write the name for the element. \_\_\_\_\_chlorine\_\_\_\_\_\_

Question 9. Igniting a 1.000 g magnesium flare produces 1.658 g of magnesium oxide smoke. What is the mass of oxygen in the air that reacted with the magnesium metal (5 points)?

1.000 g + x = 1.658 g

x = 0.658 g

Question 10. Some solids have a crystalline structure, while others have an amorphous structure. For each of the following statements, determine whether it refers to a crystalline solid or an amorphous solid (4 points).

1. It has a regular repeating pattern. \_\_\_\_\_crystalline solid\_\_\_\_\_\_
2. Plastic \_\_\_\_\_\_amorphous solid\_\_\_\_
3. It melts over a long range of temperature. \_\_\_\_amorphous solid\_\_\_\_\_
4. Gold \_\_\_\_\_crystalline solid\_\_\_\_\_\_

Question 11. Complete the following table (10 points):

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Symbol | Z | A | #p | #e- | #n | Charge |
| Na | 11 | 23 | 11 | 11 | 12 | 0 |
| Se2- | 34 | 79 | 34 | 36 | 45 | 2- |
| P | 15 | 31 | 15 | 15 | 16 | 0 |

Question 12. Carbon monoxide is a colorless, odorless gas that it toxic to humans. It combines with the metal nickel to form nickel carbonyl, a colorless liquid that boils at 43 °C (6 points).

1. List all physical properties of substances found in the preceding narrative.

Colorless gas, odorless gas, solid metal nickel, colorless liquid, boils at 43° C

1. List all chemical properties of substances found in the preceding narrative.

Toxic to humans, Ni reacts with CO

Question 13. Describe the scientific method in words or pictorially. Be sure to clearly define what each part means and how to apply them (6 points).

 The scientific method is a systematic investigation that involves performing an experiment (a scientific procedure for collecting data and recording observations under controlled conditions), proposing a hypothesis (an initial, tentative proposal of a scientific principle that attempts to explain the meaning of a set of data collected in an experiment), testing the hypothesis, and finally, stating a theory (an extensively tested proposal of a scientific principle that explains the behavior of nature) or law (an extensively tested proposal of a scientific principle that states a measurable relationship under different experimental conditions) that explains a scientific principle.