Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Density Practice Problems**

**Worksheet**

1. Base your answer to the following question on the information below and your knowledge of chemistry.

A student used a balance and a graduated cylinder to collect the following data.

|  |  |
| --- | --- |
| Sample mass | 12.74 g |
| Volume of water | 25.0 mL |
| Volume of water and sample | 32.3 mL |

1. Calculate the density of the element. Show your work. Include the appropriate number of significant figures and proper units.
2. What error is introduced if the volume of the sample is determined before the mass?
3. Base your answer to the following questions on the information below and your knowledge of chemistry.

Archimedes (287 – 212 BC), a Greek inventor and mathematician, made several discoveries important to science today. According to a legend, Hiero, the king of Syracuse, commanded Archimedes to find out if the royal crown was made of gold, only. The king suspected that the crown consisted of a mixture of gold, tin, and copper.

Archimedes measured the mass of the crown and the total amount of water displaced by the crown when it was completely submerged. He repeated the procedure using individual samples, one of gold, one of tin, and one of copper. Archimedes was able to determine that the crown was not made entirely of gold without damaging it.

1. Identify one physical property that Archimedes used in his comparison of the metal samples.
2. Determine the volume of a 75-gram sample of gold at STP.
3. The mass of an unknown solid is 10.04 grams and the volume if 8.21 cm3. What is the density to the correct significant figures?

|  |  |  |  |
| --- | --- | --- | --- |
| 1. 1.2 g/cm3
 | 1. 1.22 g/cm3
 | 1. 1.222 g/cm3
 | 1. 0.82 g/cm3
 |

1. A 10.0 gram sample of which element has the smallest volume at STP?

|  |  |  |  |
| --- | --- | --- | --- |
| 1. aluminum
 | 1. magnesium
 | 1. titanium
 | 1. zinc
 |

1. Base your answer to question 5 using the information below and your knowledge of chemistry.

The decomposition of sodium azide, NaN3(s), is used to inflate airbags. On impact, the NaN3(s) is ignited by an electrical spark, producing N2(g) and Na(s). The N2(g) inflates the airbag.

An inflated airbag has a volume of 5.00 $×$ 104 cm3 at STP. The density of N2(g) at STP is 0.00125 g/cm3. What is the total number of grams of N2(g) in the airbag?

1. Base your answer to question 6 on the table below and your knowledge of chemistry.

|  |
| --- |
| **Physical Properties of Four Gases** |
| **Name of Gas** | hydrogen | hydrogen chloride | hydrogen bromide | hydrogen iodide |
| **Molecular Structure** | H – H | H – Cl | H – Br | H – I |
| **Boiling Point (K) at 1 Atm** | 20. | 188 | 207 | 237 |
| **Density (g/L) at STP** | 0.0899 | 1.64 | ? | 5.66 |

The volume of 1.00 mole of hydrogen bromide at STP is 22.4 liters. The gram-formula mass of hydrogen bromide is 80.9 grams per mole. What is the density of hydrogen bromide at STP?