**Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_pd\_\_**

**Percent Composition**

***Why?***

Percentage is also a useful tool in chemistry. The percent composition by mass of a compound represents the percent that each element in a compound contributes to the total mass of the compound. A chemist often compares the percent composition of an unknown compound with the percent composition calculated from the formula of a known compound. If the percentages agree it may confirm the identity of the unknown.

***Learning Objectives***

* Understand what is meant by percent composition by mass of a compound.
* Ability to determine the percent composition by mass of a compound.

***Success Criteria***

* Calculate the percent composition by mass of the elements in a variety of chemical compounds.
* Explain the procedure used to determine the percent composition of a compound.
* Use percent composition to arrive at conclusions regarding compounds.

***Task 1***

Using the students present in class today, complete the data table in Model 1. [Note that Percent = (part/total) x 100.]

***Model 1***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item** | **Total # of Students** | **Total # of students wearing blue** | **Total # of students wearing green** | **% blue** | **% green** |
| **Students** |  |  |  |  |  |

***Key Questions***

1. Describe how one could calculate the percent of students wearing green using the data in the chart.

2. What is the percent of students wearing green today, based on the data in the chart?

***Task 2***

When you chew a piece of gum, mass is lost as the sugar dissolves. After the sweetness is gone, only the ‘gum’ remains. Given a piece of gum to chew, each student will collect data to complete the data table in Model 2.

As a team, propose and describe below an experimental procedure that will permit you to collect the data needed to determine the percent of sugar in the gum. Write your procedure below.

Get your procedure checked by Mrs. Roskin. Use the space below to write your data that you get from Mrs. Roskin.

***Model 2***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Item | Total Mass | Mass of sugar | Mass of gum | Percent sugar | Percent gum |
| Chewing Gum |  |  |  |  |  |

***Key Questions***

1. Show the set-up used to determine the percent by mass of sugar in the chewing gum.

2. What is the percent of sugar in the chewing gum?

3. At the end of this experiment the gum is wet with saliva. How does the presence of the saliva influence the percentage reported in Question 2?

4. What method could be used to eliminate the error introduced by the presence of the saliva?

***Model 3***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Item** | **Total Mass** | **Mass of carbon** | **Mass of hydrogen** | **Percent carbon** | **Percent hydrogen** |
| CH4, methane | 16.0 g | 12.0 g | 4.0 g | 75.0% | 25.0% |

***Key Question***

1. What is the mass of carbon in16.0 g of methane?
2. Show the set-up that would be used to determine the percent by mass of carbon in methane in order to arrive at the answer shown in the Model 3 table.
3. What information do you need in order to determine the percent composition by mass of sodium in sodium chloride?

**Show set-up used to solve each exercise. Round atomic masses to the nearest hundredths.**

1. Write the general mathematical formula that can be used to calculate the percent composition by mass of any substance?

2. Use the atomic masses of the elements to determine the percent composition by mass of sodium and chlorine in sodium chloride.

* 1. Use the atomic masses of the elements to find the percent composition of hydrogen in H2O.
  2. Determine the percent composition of oxygen in potassium chlorate, KClO3

1. Determine the percent composition of phosphorus in calcium phosphate, Ca3(PO4)2.
2. The percent of oxygen in a colorless liquid is determined to be 94.1%. Is this liquid water or hydrogen peroxide (H2O2)?
3. What is the percent composition of a compound that contains 8.1 grams of nickel and 2.2 grams of oxygen in a 10.3-gram sample?
4. Nicotine, the highly-addictive drug in cigarettes and vape pens, contains 74.0% carbon, 8.6% hydrogen, and 17.3% nitrogen. What mass of each element can be recovered from a 55.0- gram sample of nicotine?