Name: _____ Date: _____

Chemistry activity: Counting particles by mass and converting to Moles

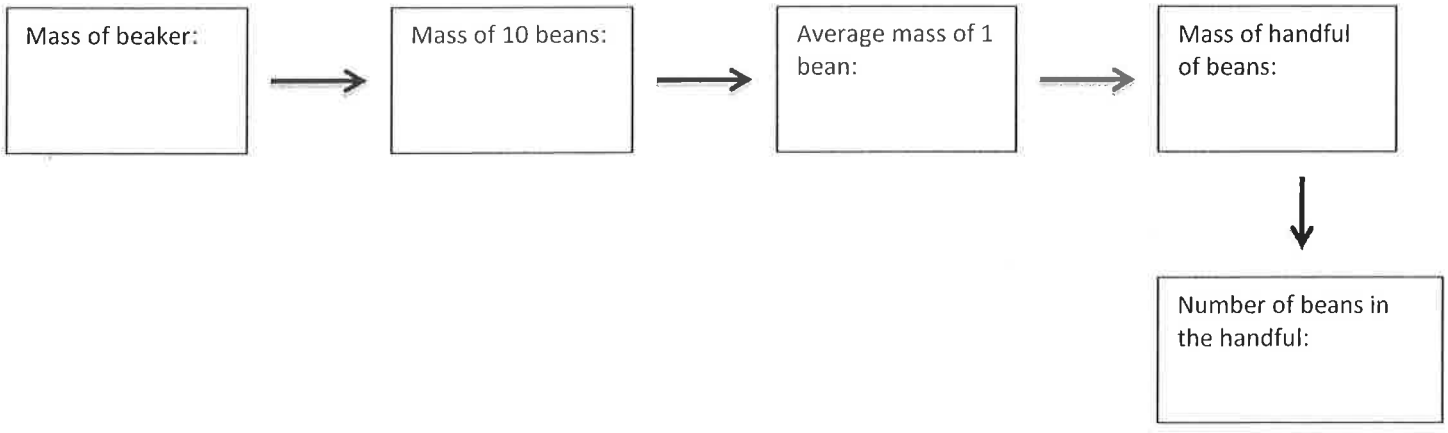
Chemists are not able to see individual atoms, yet they know how many particles, molecules and ions make up these atoms. How do they know how many particles make up a carbon atom? They are able to use the mass of the sample to find out how many particles make up the sample. In this activity you will use the mass of a sample of beans and rice to determine how many pieces you had in the random sample.

Materials you need:
250mL beaker
beans
rice
balance

Instructions:

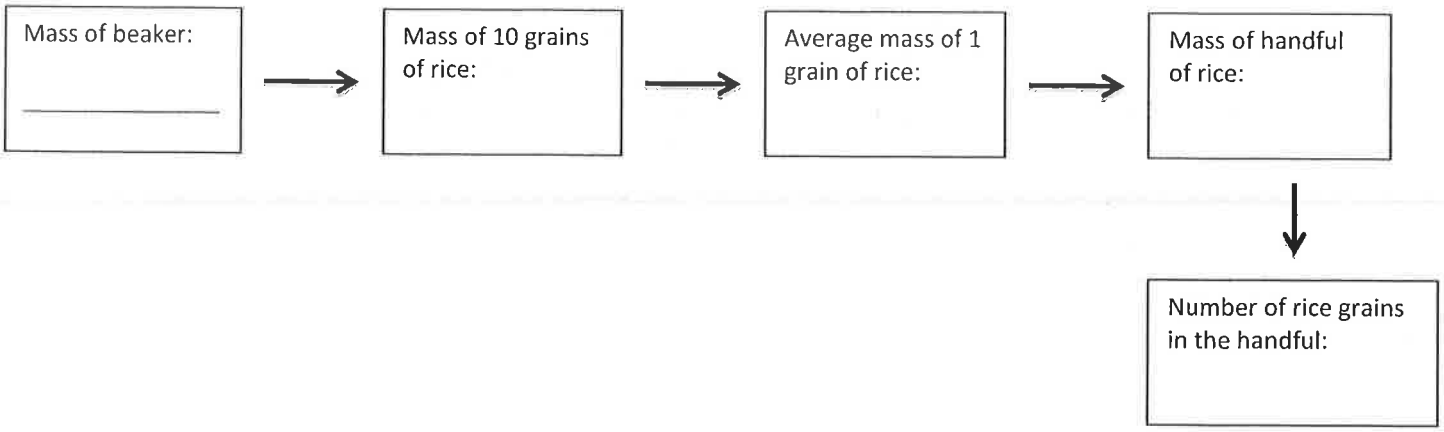
1. Weigh a clean, dry beaker on the balance and record the mass of the balance in the flowchart below
2. Count out 10 beans and place them in the beaker and weigh them. Record the mass of the beans in the flowchart
3. Calculate the average mass of **one** bean and record in the flowchart
4. Take a random handful of beans without counting them out and weigh and record the mass
5. Using the average mass of one, calculate how many beans you had in your handful
6. Now count your beans and see if your calculations match
7. Repeat these steps using rice grains instead

*Determining the number of **beans** in an unknown sample:*



Name: _____ **Date:** _____

*Determining the number of **rice grains** in an unknown sample:*



Questions to be answered:

1. When you estimated the number of beans or rice grains in your random handful, after doing the calculations, did the numbers match up/were they close?

2. Now that you have the mass of one bean, calculate the expected mass of you were to have 15 beans and 15 rice grains:

   Mass of 15 beans: _____

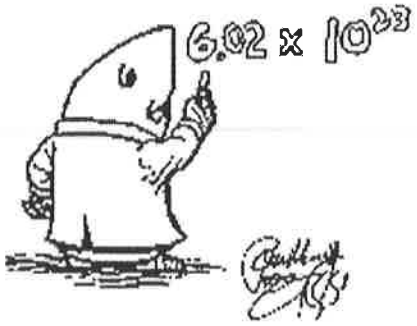
   Mass of 15 rice grains: _____

3. How are these masses the same and how are they different? Explain your answer.

4. Why did you go about determining the average mass of one bean instead of measuring out the mass of one bean right away?

Name: _____ Date: _____

Introduction to the "Mole"



The 'mole', in chemical terms, is a unit of measurement used to describe the number of particles found within a substance. There are many examples of units of measurement such as a ***dozen*** of eggs, a ***pair*** of shoes etc. This activity will help you understand a new unit of measurement called a ***mole***. The amount of items found in one mole is 6.02 x 10^{23} items (602,000,000,000,000,000,000,000 items!!!!). Let's come up with our own "new unit of measurement", this should help you understand the concept of the mole.

1. Obtain 4 jellybeans. We will call this number of jellybeans a ***HAMSTER*** of jellybeans.

   Questions:

   A ***HAMSTER*** of oranges will have _____ oranges

   A ***HAMSTER*** of grapes will have _____ grapes

   A ***HAMSTER*** of skittles will have _____ skittles

   A ***HAMSTER*** of molecules of water will have _____ molecules of water

   A ***HAMSTER*** of atoms of oxygen will have _____ atoms of oxygen

   Now that you have an understanding of what a ***HAMSTER*** of items is, answer the following:

   a. how many jellybeans are found in 2 ***HAMSTERS?*** _____

   b. how many skittles are found in 10 ***HAMSTERS?*** _____

   c. how many chocolate bars are in 200 ***HAMSTERS***? _____

   d. how many candies are in 0.5 ***HAMSTERS***? _____

   e. how many balls are found in 3.5 ***HAMSTERS***? _____

We just learnt that one ***HAMSTER*** is the unit of measurement of *anything* that contains 4 items.

Name: _____ Date: _____

In chemistry there is a unit of measurement call the ***mole***. A mole is the unit of measurement of *anything* that contains 6.02×10^{23} items (602,000,000,000,000,000,000,000 items). This number is known as ***Avogadro's number***. Now lets do some more questions using the ***mole*** instead of the ***HAMSTER***.

Questions:

A ***mole*** of oranges will have _____ oranges

A ***mole*** of grapes will have _____ grapes

A ***mole*** of skittles will have _____ skittles

A ***mole*** of molecules of water will have _____ molecules of water

A ***mole*** of atoms of oxygen will have _____ atoms of oxygen

Now that you have an understanding of what a ***mole*** of items is, answer the following:

f. how many jellybeans are found in 2 ***moles?*** _____

g. how many skittles are found in 10 ***moles?*** _____

h. how many chocolate bars are in 200 ***moles***? _____

i. how many candies are in 0.5 ***moles*****?** _____

j. how many balls are found in 3.5 ***moles***? _____

Let's do some conversion factors (Answer the best option and show your work)

Remember: $\frac{6.02 \times 10^{23} \text{ particles}}{1 \text{ mole}}$ **OR** $\frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ particles}}$

1. Number of atoms in 0.500 mole of Al
   a) 500 Al atoms
   b) 6.02×10^{23} Al atoms
   c) 3.01×10^{23} Alatoms

2. Number of moles of S in 1.8×10^{24} S atoms
   a) 1.0 mole S atoms
   b) 3.0 mole S atoms
   c) 1.1×10^{48} mole S atoms

3. Why do you think it is important that chemists use this universal language for communicating quantities in chemical reactions