

ACTIVITY 23: AVERAGE ATOMIC MASS SIMULATION

QUESTION

How is the average atomic mass of an element calculated?

SAFETY

Dispose of the rice or beans when finished with this lab. Do not eat them. Use only clean water in your syringe. Clean up any spills immediately. Do not work near electrical appliances or outlets.

MATERIALS

100 small objects such as rice, dried beans, or popcorn kernels; homemade balance

PROCEDURE

Single atoms are much too small to weigh individually. To combat this, scientists can weigh large numbers of atoms at a time and then divide the weight by the number of atoms to find the average mass of a single atom. You may think all atoms of a certain element are the same, but they are not. For example, there are helium atoms that have two protons and one neutron (helium-3 mass = 3 amu) and two protons and two neutrons (helium-4 mass = 4 amu). So when the mass of helium is reported on the periodic table as 4.00260, it is the average of all the isotopes of helium. (Because electrons are so incredibly light compared to protons and neutrons, they are not even included in the calculation of atomic mass.) If you were actually able to hold one helium atom in your hand, it could not have a mass of 4.00260. But if you held a lot of helium atoms, they would have an average mass of 4.00260. In this lab, you will try to determine the average mass of a grain of rice in the same way.

1. Count out 50 grains of rice and find their mass using your balance. Record your result. If you do not have rice, you can use dried beans or popcorn kernels.
2. Add another 50 grains of rice and find their mass on your balance. Record your result.
3. Calculate the average mass of the rice and record your results.

Data

Mass of 50 grains of rice _____ g Average mass of 1 grain _____ g

Mass of 100 grains of rice _____ g Average mass of 1 grain _____ g

Post-Lab Questions

1. Were your two average masses exactly the same? Explain.
2. If you could find the mass of a single grain, do you think it would equal either of your averages?
3. Which of your averages do you think is the more accurate answer, if you had to choose one? Explain.