Name _____ **Date** _____ **Period** _____

THE MOLE LAB U7-10

PURPOSE Students will measure the mass and volume of substances (elements and compounds) using appropriate lab equipment and procedures. They will then calculate the number of moles, grams, and particles of these substances using dimensional analysis (bridges).

SAFETY Wear safety goggles and aprons. Secure long hair, loose clothing, and jewelry. Do not contaminate substances. **DO NOT MOVE THE BALANCES!** ***Balances do not come to you; you go to the balances.***

MATERIALS

At each station: copper sample, aluminum sample, weigh boat, water in beaker, graduated cylinder, one (1) blue SOLO cup

To share: sodium chloride in beakers with spoons, electronic balances

PRE-LAB QUESTIONS

1. Identify the conversion factor as an equivalency that involves representative particles and moles.
   _____ = _____
2. List the four types of representative particles.

3. Using magnesium chloride ($MgCl_2$), write the two fractions for the conversion factor in #1.

4. Identify the conversion factor as an equivalency that involves grams and moles.
   _____ = _____
5. How is the number of grams for the conversion factor in #5 determined?

6. Using iron (Fe) as the substance, write the two fractions for the conversion factor in #5.

7. Identify the mole ratio as an equivalency that compares an element to its compound.
   _____ = _____
8. Using sulfuric acid (H_2SO_4) as the substance, write the mole ratio in its two fraction forms comparing the amount of hydrogen to the amount of sulfuric acid.

PROCEDURES, DATA, AND CALCULATIONS

Directions*: Show all work for calculations in order to receive credit. Write units for every number, and express final answers to the correct number of significant figures.*

Activity A

1. Measure the mass of the copper sample at your station. _____
2. Calculate the number of moles in your copper sample. _____

3. What type of particle is present in your copper sample? _____
4. Using the **mass** (#1 above) of your copper sample as the given, calculate the number of representative particles in your copper sample. _____

Activity B

1. Measure the mass of the aluminum sample at your station. _____
2. Calculate the number of moles in your aluminum sample. _____

3. What type of particle is present in your aluminum sample? _____
4. Using the **mass** (#1 above) of your aluminum sample as the given, calculate the number of representative particles in your aluminum sample. _____

Activity C

1. Calculate the mass of 1.00 mole of sodium chloride (NaCl). _____

2. Place 1.00 mole of sodium chloride in the blue SOLO cup at your lab station.
   a. Place the empty cup on the analytical balance and zero the balance.
   b. Add enough NaCl to your empty beaker to equal 1.00 mole of sodium chloride.
3. Show your 1.00 mole of NaCl to the teacher and have this lab handout initialed here: _____
4. After obtaining teacher initials, return the sodium chloride to the original supply beaker for reuse.
5. What type of particle is present in sodium chloride? _____
6. How many particles are present in your sample of NaCl? _____

Activity D

1. Using a graduated cylinder, measure the volume (in mL) of the water sample at your lab station. _____
2. Using dimensional analysis, convert the volume (mL) of water to mass (g) of water. DO **NOT** USE A BALANCE TO MASS THE WATER! _____
   New conversion factor → Water has a density of 1 g/mL (1 g H_2O = 1 mL H_2O).

3. What type of particle is present in water? _____
4. How many particles are present in your sample of H_2O? _____

POST-LAB QUESTIONS

1. How many moons would equal the mass of 1 mole of elephants? _____
   Conversion factors: 1 moon = 7.45×10^{22} kg; 1 elephant = 27,000 lbs; 1 kg = 2.2 lbs

$$\text{moons} = \frac{6.02 \times 10^{23} \text{ elephants}}{} \quad \frac{}{} \quad \frac{}{} \quad \frac{1 \text{ moon}}{\text{kg}}$$

2. How many times would a mole of Twinkies stretch from the Sun to Pluto? _____
   Conversion factors: 1 Twinkie = 9.4 cm; 1 trip from Sun to Pluto = 5,900,000,000 km

$$\text{trips} = \frac{6.02 \times 10^{23} \text{ Twinkies}}{} \quad \frac{}{} \quad \frac{}{} \quad \frac{1 \text{ trip to Pluto}}{\text{km}}$$