Name _____

COUNTING BY WEIGHING

INQUIRY

How can we determine numbers of items in a very large sample?

MATERIALS

- Water
- Balance (readability: 0.0lg)
- Thin stem pipet
- 3-oz cup

BACKGROUND

- It would be impossible to individually count the number of atoms in any sample that is big enough to see. We use a word like 'dozen' to represent a certain number of items (12 items). We use another term, the mole, to represent a certain number of the particles that make up all matter.

- One dozen of anything = 12
- One mole of anything= 6.02×10^{23}

PROCEDURE

1. Find the mass of one drop of water. Record the mass in Table 1.
2. Find the mass of 10 particles. Record the mass in Table 1.
3. Use the mass of 10 particles to make a conversion factor. Use your conversion factor to calculate and record the average mass of one particle.
4. Find the mass of a 3-oz. cup. Record the mass in Table 1.
5. Fill the cup to the top with water. Record the mass in Table 1.
6. Use the mass of the cup to calculate and record the mass of the water in the cup.

Table 1 – Particle data

Item	Mass
Mass of one water drop	
Mass of ten water drops	
Average mass of one water drop	
Mass of cup	
Mass of cup + water	
Mass of water	

Analysis

1. Develop a method using conversion factors for finding the number of water drops in the cup without counting them. Describe your method and use it to calculate the number of drops in the cup. Show your work for your calculation. Be sure and use the Q formula.

2. Calculate the mass of 100,000 water drops. Show your work using your conversion factor (Q formula).

3. You have a 50.0 kg container of water drops. How many drops are in the container? Show your work using conversion factors (Q formula).

4. Calculate the mass of one mole of water drops. Show your work using conversion factors (Q formula).

5. How many 3-oz cups would you need to hold one mole of water drops? Show your work using conversion factors (Q formula).