**Review concepts Grade 11 Chemistry Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. **Mole Conversion problems**

**There are three mole equalities. They are:**

1 mol = 6.02 x 1023 particles

1 mol = g-formula-mass (periodic table)

1 mol = 22.4 L for a gas at STP

**Each equality can be written as a set of two conversion factors. They are:**

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**Mole-Particle Conversions**

1. How many moles of magnesium is 3.01 x 1022 atoms of magnesium?

**3.01 x 1022 atoms  =** 5 x 10-2 moles

2. How many molecules are there in 4.00 moles of glucose, C6H12O6?

3. How many moles are 1.20 x 1025 atoms of phosphorous?

# Mole-Mass Conversions

1. How many moles in 28 grams of CO2 ?

**Gram-formula-mass of CO2** 64.00 g/mol

**28 g CO2  =** 0.64 moles CO2

1. What is the mass of 5 moles of Fe2O3 ?
2. Find the number of moles of argon in 452 g of argon.
3. Find the grams in 1.26 x 10-4 mol of HC2H3O2.
4. Find the mass in 2.6 mol of lithium bromide.

# Mole-Volume Conversions

1. Determine the volume, in liters, occupied by 0.030 moles of a gas at STP.

0.030 mol ** =**  0.67 L

2. How many moles of argon atoms are present in 11.2 L of argon gas at STP?

3. What is the volume of 0.05 mol of neon gas at STP?

# Mixed Mole Conversions Given unit → Moles → Desired unit

1. How many oxygen molecules are in 3.36 L of oxygen gas at STP?

3.36 L** =** 9.03 x 1022 molecules

2. Find the mass in grams of 2.00 x 1023 molecules of F2. ( ans. ) 12.624 g

3. Determine the volume in liters occupied by 14 g of nitrogen gas at STP. **Ans. 11.2 L**

4. Find the mass, in grams, of 1.00 x 1023 molecules of N2. Ans. 4.65 g

5. How many particles are there in 1.43 g of a molecular compound with a gram molecular mass of 233 g? **Ans. 3.69 x 1021**

6. Aspartame is an artificial sweetener that is 160 times sweeter than sucrose (table sugar) when dissolved in water. It is marketed by G.D. Searle as *Nutra Sweet*. The molecular formula of aspartame is C14H18N2O5 .

a) Calculate the gram-formula-mass of aspartame. **294 g/mol**

b) How many moles of molecules are in 10 g of aspartame? **3.4 x 10-2 moles**

c) What is the mass in grams of 1.56 moles of aspartame? **458.64 grams**

d) How many molecules are in 5 **mg** of aspartame? **1.0238 x 1019**

e) How many atoms of nitrogen are in 1.2 grams of aspartame? **4.9143 x 1021**

1. **Molarity - Calculate the molarity of the following solutions**
2. 2.3 moles of NaCl in .45 L of water
3. 1.2 moles of Calcium carbonate in 1.22 L of water
4. 0.09 moles of sodium sulfate in 12 mL of water
5. 120 grams of calcium nitrate in 240 ml of water
6. 1.2 grams of hydrochloric acid in 25 ml of water.
7. **Stoichiometry Problems – answer the questions below**
8. Hydrogen peroxide (H2O2) decomposes to produce water and oxygen. Write a balanced chemical reaction for this reaction, and determine ALL the possible mole ratios.
9. Methane (CH4) and sulfur react to produce carbon disulfide (CS2), a liquid often used in the production of cellophane.

**CH4(g) + S8(s) → CS2(l) + H2S(g)**

1. Balance the equation.
2. Calculate the moles of CS2 produced when 1.50mol S8 is used.
3. How many moles of H2S is produced?
4. Titanium is a transition metal used in many alloys because it is extremely strong and lightweight. Titanium tetrachloride (TiCl4) is extracted from titanium oxide (TiO2) using chlorine and coke (carbon).

**TiO2(s) + C(s) + 2Cl2(g) → TiCl4(s) + CO2(g)**

1. What mass of Cl2 gas needed to react with 1.25mol of TiO2?
2. What mass of C is needed to react with 1.25mol of TiO2?
3. What is the mass of all the products formed by reaction with 1.25mol of TiO2?