Mole Conversions Worksheet

**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?

**4.00 moles  =** 2.41 x 1024 molecules

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

4. How many atoms are in 0.750 moles of zinc?

5. How many molecules are in 0.400 moles of N2O5?

# Mole-Mass Conversions

1. How many moles in 28 grams of CO2 ?

**Gram-formula-mass of CO2** 1 C = 1 x 12.01 g = 12.01 g

 2 O = 2 x 16.00 g = 32.00 g

 64.00 g/mol

**28 g CO2  =** 0.64 moles CO2

1. What is the mass of 5 moles of Fe2O3 ?

**Gram-formula-mass Fe2O3** 2 Fe = 2 x 55.6 g = 111.2 g

 3 O = 3 x 16.0 g = 48.0 g

 159.2 g/mol

**5 moles Fe2O3 =** 800 grams Fe2O3

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

# More Mole Conversions

**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

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

0.030 mol ** =**  0.67 L N2

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

11.2 L Ar ** = 0.500 moles Ar**

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

4. What is the volume of 1.2 moles of water vapor 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.

**Gram-formula-mass** 2 F = 2 x 19 g = 38 g/mol

2.00 x 1023 molecules**= 12.6 g**

3. Determine the volume in liters occupied by 14.0 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, rounding to two decimal places.

**294.34 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?

**459 grams**

d) How many molecules are in 5.0 **mg** of aspartame?

**1.0 x 1019**

e) How many atoms of nitrogen are in 1.2 grams of aspartame?

**4.9 x 1021**