Aim: How do chemists work with moles?

1) 1 mole of H₂ contains 6.02 x 10^{23} molecules of H₂

1 mole of O_2 contains 6.02 x 10^{23} molecules of O_2

1 mole of H_2O contains 6.02 x 10^{23} molecules of H_2O

2) You can't count 1 mole of molecules, but you could weigh them.

How much would **1mole** of H₂O weigh? 18 grams

Sound familiar? 18 amu = "formula mass" of H_2O

So, 18 g/mole is called the "gram formula mass"

H₂O 2+16= 18 amu → 18 g/mole

This means that 6.02×10^{23} molecules of water weighs 18 grams.

Supermarket	Quantity	Chem Lab
1 dozen apples	number	mole 6.02 x 10 ²³
4 pounds apples	weight	grams
1 basket apples	volume	liters

b) What is the gram formula mass of NaCl?

23 + 35 = 58 g/mole

c) What is the gram formula mass of CO₂ weigh?

12 + 2(16) = 44g/mole

So, 1 mole of H_2O weighs 18 g and 1 mole of CO_2 weighs 44 grams. That is, the **number** of molecules is the **same**, but the **masses are different**. It's just like a dozen cherries doesn't weigh the same as a dozen apples.

2a) What is the gfm of Na₂CO₃? 2(23) + 12 + 3(16) = 106 g/mole b) How many moles are in 265g of Na₂CO₃?

Refer to REF TABLE T

$$#moles = \frac{265g}{106 \text{ g/mole}} = 2.5 \text{ mole}$$

$$# \text{ moles} = \frac{\text{given mass}}{106 \text{ g/mole}}$$
/hat is the mass of 0.75 mole Na₂CO₃?

$$# \text{ moles} = \frac{\text{given mass}}{\text{gfm}}$$

$$0.75 \text{ mole} = \frac{X}{106 \text{ g/mole}}$$
DON'T FORGET THE UNITS!!

c) W

$$gfm$$

$$0.75 \text{ mole} = \frac{X}{106 \text{ g/mole}}$$

$$0.75 \text{ mole} \cdot 106 \underline{g} = 79.5 \text{ g}$$

3) How much does 2.0 mole of C₆H₁₂O₆ weigh? 6 (12)+12(1)+6(16)= 180g/mole

$$2.0 \text{ mole} = \frac{X}{180 \text{ g/mole}}$$

2.0 mole • 180 g/mole = 360g

4) How many moles are in 330g CaCl₂? / 40 + 2(35) = 110 g/mole $X = \frac{330 \text{ g}}{110 \text{ g/mole}} \qquad X = 3 \text{ mole}$

5) Given: 1 mole NH_3 and 0.5 mole NO_2

a) Which quantity has the greatest # molecules?

1 mole NH ₃	5	0.5 mole NO ₂		
<mark>6.02 x 10²³</mark>	molecules	0.5 (6.02 x 10 ²³	$() = 3.01 \times 10^{23}$	molecules

b) Which quantity has the greatest mass?

NH ₃ = 17g/mole	$NO_2 = 46g/mole$
1 mole x 17 g/mole = 17 g	0.5 mole x 46g/mole = 23 g