

# Molecular Weight / Molar Mass

- ▶ Molar Mass also applies to molecules and compounds.
- ▶ We know the atomic weight of elements, what **one atom weighs in amu** and what **one mole of atoms weigh in grams**.
- ▶ We can use that information to figure out for compounds what **one molecule weighs** or **one mole of molecules weigh**.

What is the molecular weight of CO<sub>2</sub>? (in amu)

$$\begin{array}{r}
 1 \text{ C atom } 12.01 \text{ amu} \\
 2 \text{ O atom } 32.00 \text{ amu } (2 \times 16.00 \text{ amu}) \\
 \hline
 1 \text{ CO}_2 = 44.01 \text{ amu}
 \end{array}$$

What is the molar mass of CO<sub>2</sub>? (in grams)

$$\begin{array}{r}
 1 \text{ mol C } 12.01 \text{ grams} \\
 2 \text{ mol O } 32.00 \text{ grams } (2 \times 16.00 \text{ g}) \\
 \hline
 1 \text{ mol CO}_2 = 44.01 \text{ grams}
 \end{array}$$

What does 2.57 mol of CO<sub>2</sub> weigh?

$$2.57 \text{ mol CO}_2 \cdot \frac{44.01 \text{ g}}{1 \text{ mol CO}_2} = 113.1057 \text{ g}$$

3 st.                      4 st.                       $\boxed{113 \text{ g CO}_2} \text{ (3 st.)}$

How many moles of CO<sub>2</sub> are in 53.256 grams?

$$53.256 \text{ g CO}_2 \cdot \frac{1 \text{ mol CO}_2}{44.01 \text{ g}} = 1.2100886 \text{ mol}$$

5 st.                      4 st.                       $\boxed{1.210 \text{ mol CO}_2} \text{ (4 st.)}$

1A 1 H	2A 2 He																	3A 13 B	4A 14 C	5A 15 N	6A 16 O	7A 17 F	8A 18 Ne																														
2 3 Li	4 4 Be											8B 9 Sc	10 10 Ti	11B 11 Cu	12B 12 Zn	13 13 Al	14 14 Si	15 15 P	16 16 S	17 17 Cl	18 18 Ar																																
3 11 Na	12 12 Mg	3B 3 Al	4B 4 Ga	5B 5 In	6B 6 Tl	7B 7 Zn	8 8 Fe	9 9 Co	10 10 Ni	11 11 Cu	12 12 Zn	13 13 Al	14 14 Si	15 15 P	16 16 S	17 17 Cl	18 18 Ar	19 19 K	20 20 Ca	21 21 Sc	22 22 Ti	23 23 V	24 24 Cr	25 25 Mn	26 26 Fe	27 27 Co	28 28 Ni	29 29 Cu	30 30 Zn	31 31 Ga	32 32 Ge	33 33 As	34 34 Se	35 35 Br	36 36 Kr																		
4 19 K	20 20 Ca	37 37 Rb	38 38 Sr	39 39 Y	40 40 Zr	41 41 Nb	42 42 Mo	43 43 Tc	44 44 Ru	45 45 Rh	46 46 Pd	47 47 Ag	48 48 Cd	49 49 In	50 50 Sn	51 51 Sb	52 52 Te	53 53 I	54 54 Xe	55 55 Cs	56 56 Ba	71 71 Lu	72 72 Hf	73 73 Ta	74 74 W	75 75 Re	76 76 Os	77 77 Ir	78 78 Pt	79 79 Au	80 80 Hg	81 81 Tl	82 82 Pb	83 83 Bi	84 84 Po	85 85 At	86 86 Rn																
5 37 Rb	38 38 Sr	39 39 Y	40 40 Zr	41 41 Nb	42 42 Mo	43 43 Tc	44 44 Ru	45 45 Rh	46 46 Pd	47 47 Ag	48 48 Cd	49 49 In	50 50 Sn	51 51 Sb	52 52 Te	53 53 I	54 54 Xe	55 55 Cs	56 56 Ba	71 71 Lu	72 72 Hf	73 73 Ta	74 74 W	75 75 Re	76 76 Os	77 77 Ir	78 78 Pt	79 79 Au	80 80 Hg	81 81 Tl	82 82 Pb	83 83 Bi	84 84 Po	85 85 At	86 86 Rn	87 87 Fr	88 88 Ra	103 103 Lr	104 104 Rf	105 105 Db	106 106 Sg	107 107 Bh	108 108 Hs	109 109 Mt	110 110 Ds	111 111 Rg	112 112 Cn	113 113 Nh	114 114 Fl	115 115 Mc	116 116 Lv	117 117 Ts	118 118 Og
6 55 Cs	56 56 Ba	71 71 Lu	72 72 Hf	73 73 Ta	74 74 W	75 75 Re	76 76 Os	77 77 Ir	78 78 Pt	79 79 Au	80 80 Hg	81 81 Tl	82 82 Pb	83 83 Bi	84 84 Po	85 85 At	86 86 Rn	87 87 Fr	88 88 Ra	103 103 Lr	104 104 Rf	105 105 Db	106 106 Sg	107 107 Bh	108 108 Hs	109 109 Mt	110 110 Ds	111 111 Rg	112 112 Cn	113 113 Nh	114 114 Fl	115 115 Mc	116 116 Lv	117 117 Ts	118 118 Og	119 119 Uu	120 120 Uu	121 121 Uu	122 122 Uu	123 123 Uu	124 124 Uu	125 125 Uu	126 126 Uu										
7 87 Fr	88 88 Ra	103 103 Lr	104 104 Rf	105 105 Db	106 106 Sg	107 107 Bh	108 108 Hs	109 109 Mt	110 110 Ds	111 111 Rg	112 112 Cn	113 113 Nh	114 114 Fl	115 115 Mc	116 116 Lv	117 117 Ts	118 118 Og	119 119 Uu	120 120 Uu	121 121 Uu	122 122 Uu	123 123 Uu	124 124 Uu	125 125 Uu	126 126 Uu	127 127 Uu	128 128 Uu	129 129 Uu	130 130 Uu	131 131 Uu	132 132 Uu	133 133 Uu	134 134 Uu	135 135 Uu	136 136 Uu	137 137 Uu	138 138 Uu	139 139 Uu	140 140 Uu	141 141 Uu	142 142 Uu												

1 O = 16.00 amu  
1 mol O = 16.00 g  
1 C = 12.01 amu  
1 mol C = 12.01 g

