



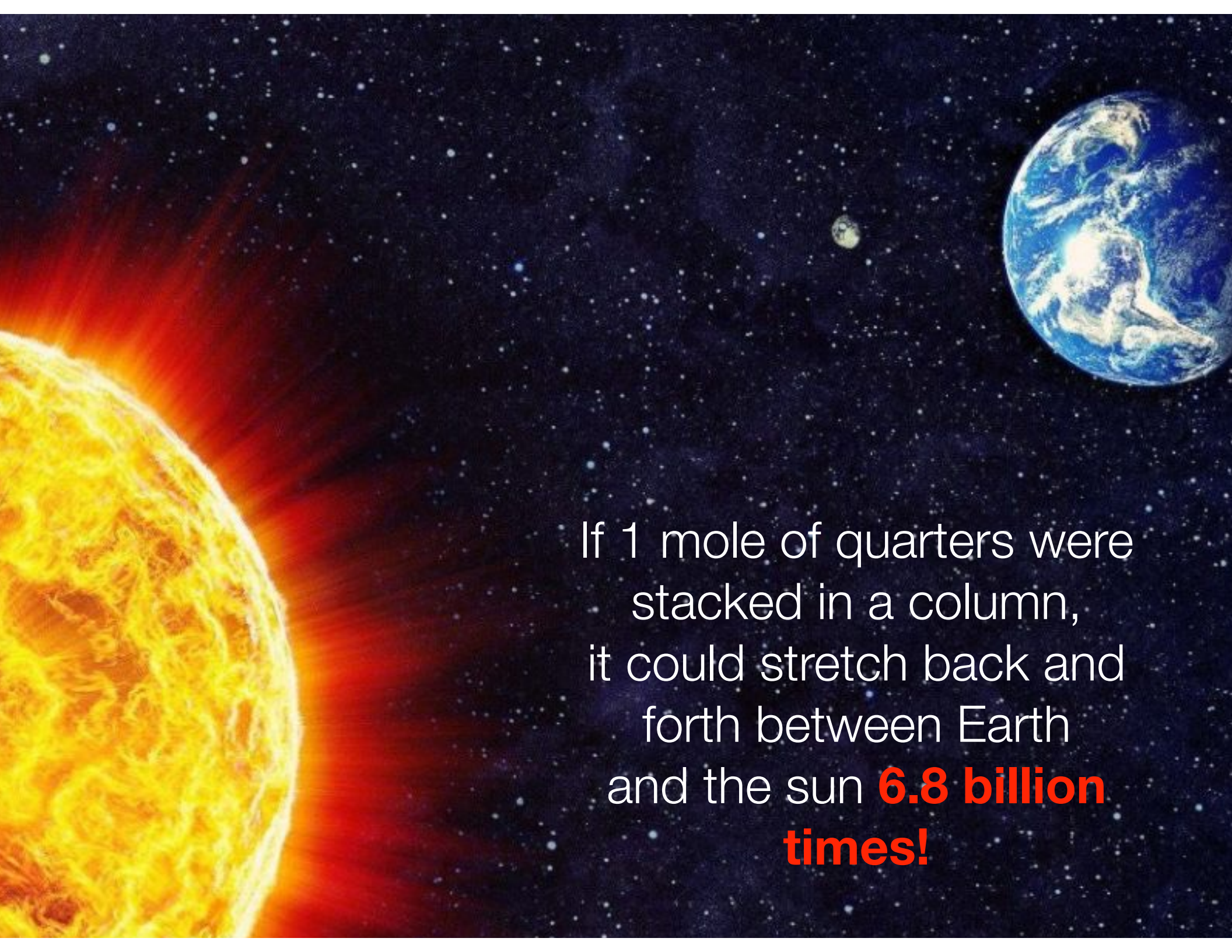
Module 8

Brad Ashburn, PhD
BIOC 141

The Mole (Section 6.1)



A **mole** is a quantity that contains 6.02×10^{23} items

A composite image of the Sun, Earth, and Moon in space. The Sun is on the left, glowing brightly with a red and orange aura. The Earth is on the right, showing blue oceans and white clouds. The Moon is in the center, appearing as a small, dark sphere. The background is a dark blue space filled with numerous small white stars.

If 1 mole of quarters were stacked in a column, it could stretch back and forth between Earth and the sun **6.8 billion times!**

Examples

How many molecules are in 3.00 moles of CO₂?

How many moles are 8.7×10^{24} molecules of CO₂?

Concept Review (Section 6.1)

CONCEPT REVIEW EXERCISE

1. What is a mole?

Practice Problems: 1-12

Molar Mass (Section 6.2)

The **molar mass** is the mass (**in grams**) of **one mole** of any substance

Molar mass comes from the Periodic Table

Molar Mass => Periodic Table

1A 1																	8A 18
1 H Hydrogen 1.00794																	2 He Helium 4.00260
3 Li Lithium 6.941	4 Be Beryllium 9.01218											5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.0067	8 O Oxygen 15.9994	9 F Fluorine 18.998403	10 Ne Neon 20.1797
11 Na Sodium 22.98977	12 Mg Magnesium 24.305	3B 3	4B 4	5B 5	6B 6	7B 7	8B 8 9 10			1B 11	2B 12	13 Al Aluminum 26.98154	14 Si Silicon 28.0855	15 P Phosphorus 30.97376	16 S Sulfur 32.066	17 Cl Chlorine 35.4527	18 Ar Argon 39.948
19 K Potassium 39.0983	20 Ca Calcium 40.078	21 Sc Scandium 44.9559	22 Ti Titanium 47.88	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.9380	26 Fe Iron 55.847	27 Co Cobalt 58.9332	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.39	31 Ga Gallium 69.723	32 Ge Germanium 72.61	33 As Arsenic 74.9216	34 Se Selenium 78.96	35 Br Bromine 79.904	36 Kr Krypton 83.80
37 Rb Rubidium 85.4678	38 Sr Strontium 87.62	39 Y Yttrium 88.9059	40 Zr Zirconium 91.224	41 Nb Niobium 92.9064	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.9055	46 Pd Palladium 106.42	47 Ag Silver 107.8682	48 Cd Cadmium 112.411	49 In Indium 114.82	50 Sn Tin 118.710	51 Sb Antimony 121.757	52 Te Tellurium 127.60	53 I Iodine 126.9045	54 Xe Xenon 131.29
55 Cs Cesium 132.9054	56 Ba Barium 137.327	57 *La Lanthanum 138.9055	72 Hf Hafnium 178.49	73 Ta Tantalum 180.9479	74 W Tungsten 183.85	75 Re Rhenium 186.207	76 Os Osmium 190.2	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.9665	80 Hg Mercury 200.59	81 Tl Thallium 204.3833	82 Pb Lead 207.2	83 Bi Bismuth 208.9804	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)
87 Fr Francium (223)	88 Ra Radium 226.0254	89 †Ac Actinium 227.0278	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (263)	107 Bh Bohrium (262)	108 Hs Hassium (265)	109 Mt Meitnerium (268)	110 (269)	111 (272)	112 (277)						

*Lanthanide Series	58 Ce Cerium 140.115	59 Pr Praseodymium 140.9077	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.965	64 Gd Gadolinium 157.25	65 Tb Terbium 158.9254	66 Dy Dysprosium 162.50	67 Ho Holmium 164.9303	68 Er Erbium 167.26	69 Tm Thulium 168.9342	70 Yb Ytterbium 173.04	71 Lu Lutetium 174.967
† Actinide Series	90 Th Thorium 232.0381	91 Pa Protactinium 231.0359	92 U Uranium 238.0289	93 Np Neptunium 237.048	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (260)

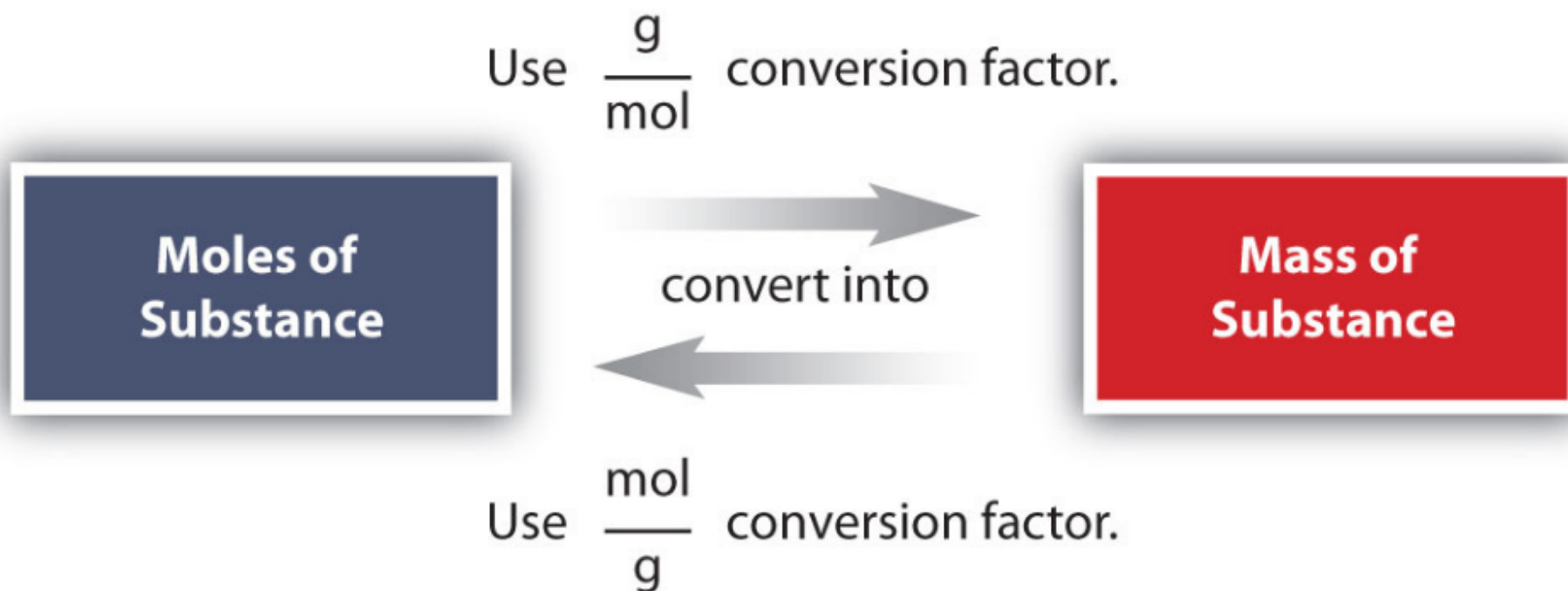
Concept Review (Section 6.2)

CONCEPT REVIEW EXERCISES

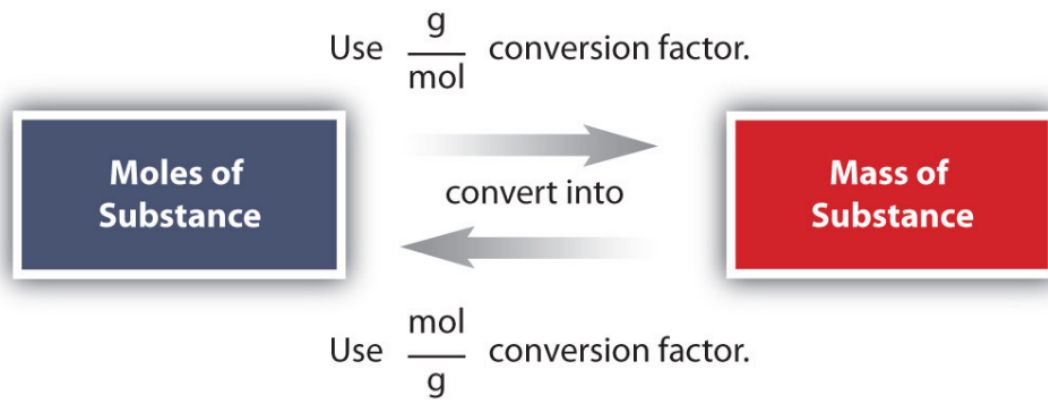
1. How are molar masses of the elements determined?
2. How are molar masses of compounds determined?

Practice Problems: 1-10

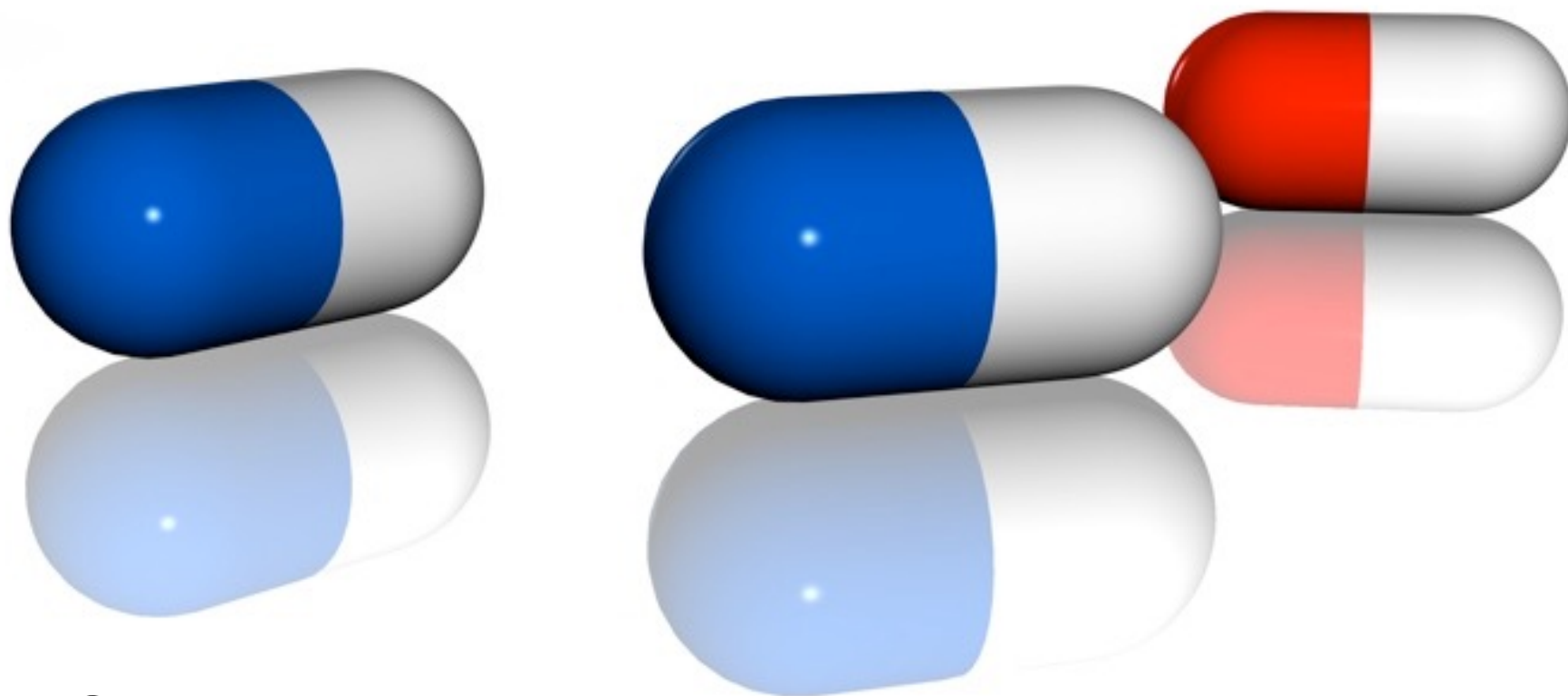
Mole-Mass Conversion (Section 6.3)



Mole-Mass Conversion (Section 6.3)



Mole-Mass Conversion



Calculate the number of moles present in 152.6 g of the anti-depressant Li_2CO_3 .

Concept Review (Section 6.3)

CONCEPT REVIEW EXERCISES

1. What relationship is needed to perform mole-mass conversions?
2. What information determines which conversion factor is used in a mole-mass conversion?

Practice Problems: 1-10