

Unit 3B - The Mole

Moles and Particles

- the mole is amount

$$1 \text{ mole} = 6.02 \times 10^{23} \text{ particles}$$

Avogadro's Number

What are particles?

element → atoms

ions → ions

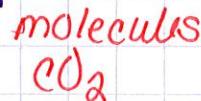
covalent compound → molecules

ionic compound → formula units
(f.u.)

(Ex) 1. How many molecules are in 4.50 moles of carbon dioxide?

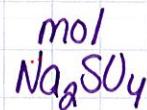
Given

$$\frac{4.50 \text{ mol}}{\dots} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} = 2.71 \times 10^{24} \text{ molecules}$$



2. How many moles are in 1.806×10^{22} f.u. of sodium sulfate?

$$\frac{1.806 \times 10^{22} \text{ f.u.}}{\dots} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ f.u.}} = .03000 \text{ mol}$$

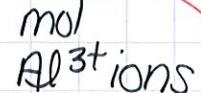


3. How many atoms are in .233 moles of tungsten?

$$\frac{.233 \text{ mol}}{1 \text{ mol}} \times 6.02 \times 10^{23} \text{ atoms} = 1.40 \times 10^{23} \text{ atoms}$$

4. How many moles are in 1.421×10^{24} ions of Al^{3+} ?

$$\frac{1.421 \times 10^{24} \text{ ions}}{6.02 \times 10^{23} \text{ ions}} = 2.360 \text{ mol}$$



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Avogadro's number

$$1 \text{ mole} = 6.02 \times 10^{23} \text{ particles}$$

What are the particles?

element \rightarrow atoms

ion \rightarrow ions

covalent compound \rightarrow molecules

ionic compound \rightarrow formula units
(f.u.)

(Ex)

1. How many molecules are in 4.50 moles of carbon dioxide? GIVEN

$$\frac{4.50 \text{ mol}}{\cancel{1 \text{ mol}}} \times \frac{6.02 \times 10^{23} \text{ molecules}}{\cancel{1 \text{ mol}}} = (2.71 \times 10^{24}) \text{ molecules CO}_2$$

$$4.50 \text{ mol} \times \left(\frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} \right)$$

2. How many moles are in 1.806×10^{22} formula units of sodium sulfate? GIVEN

$$\frac{1.806 \times 10^{22} \text{ f.u.}}{\cancel{6.02 \times 10^{23} \text{ f.u.}}} \times \frac{1 \text{ mol}}{\cancel{1 \text{ mol}}} = 0.03000 \text{ mol Na}_2\text{SO}_4$$

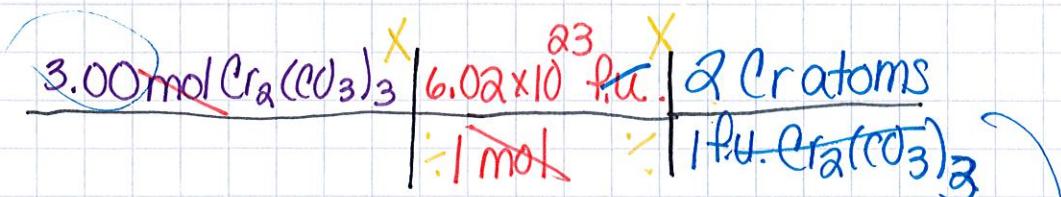
3. How many atoms are in 0.233 moles of tungsten? GIVEN

$$\frac{0.233 \text{ mol}}{\cancel{1 \text{ mol}}} \times \frac{6.02 \times 10^{23} \text{ atoms}}{\cancel{1 \text{ mol}}} = (1.40 \times 10^{23}) \text{ atoms W}$$

4. How many moles of Al^{3+} ions are in 1.4×10^{24} ions? GIVEN

$$\frac{1.4 \times 10^{24} \text{ ions}}{6.02 \times 10^{23} \text{ ions}} = 2.3 \text{ mol Al}^{3+}$$

5. How many Cr atoms are in chromium (III) carbonate? 3.00 mol of
GIVEN



$$1 \text{ f.u. } \text{Cr}_2(\text{CO}_3)_3 = 2 \text{ Cr atoms}$$

$$= 3.61 \times 10^{24} \text{ atoms Cr}$$