

Cornell Notes

Name: _____ Date: _____ Block: _____

Topic: The Mole

Essential Question: What is a mole and how do we convert between moles, grams, and atoms?

How many seconds are in 6 hours?

$$6 \text{ hrs} \times 60 \times 60 = \boxed{21,600 \text{ s}}$$

How many seconds are in 6 hours?

The Dimensional Analysis Way

$$6 \cancel{\text{hrs}} \times \frac{60 \cancel{\text{mins}}}{1 \cancel{\text{hrs}}} \times \frac{60 \text{ s}}{1 \cancel{\text{mins}}} = \boxed{21600 \text{ s}}$$

How many grams of S are in 2.57×10^8 moles of S?

$2.57 \times 10^8 \text{ mole S}$

32.07 g S
1 mole S

1 mole S
32.07 g S

How many grams of Cu are in 6.50 moles of Cu?

6.50 mole Cu	63.5 g Cu
	1 mole Cu
2	1

1 mole Cu	
63.5g Cu	3

How many atoms of Na are in 4.00 g of Na?

4.00 g Na	1 mole Na	6.02 x 10 ²³ atoms Na
	23.00 g Na	1 mole Na
3	5	4

1 mole Na	
6.02 x 10 ²³ atoms Na	2

23.00 g Na	
1 mole Na	1

How many grams of Au are in 2.01×10^{23} atoms of Au?

2.01×10^{23} atom Au	1 mole Au	196.97 g Au
	6.02×10^{23} atoms Au	1 mole Au

4
3
2

6.02×10^{23} atoms Au
1 mole Au

5

1 mole Au
196.97 g Au

1

meet the MOLE



Mole is a unit

1 mole = 6.02×10^{23} atoms

Avogadro's #



Mole is a unit

1 mole = molar mass (g)



Mole is a unit



B1) What is the mass in grams of 2.25 mol of the element iron, Fe?
given: 2.25 mol Fe
want: ? g Fe

$$2.25 \text{ mol Fe} \times \frac{55.85 \text{ g Fe}}{1 \text{ mol Fe}} = 125.6625 \text{ g Fe}$$

$= \boxed{126 \text{ g Fe}}$

B2) What is the mass in grams of 0.375 mol of the element potassium, K?

B3) What is the mass in [?] grams of 0.0135 mol of the element sodium, Na? 3 SF'S

given: 0.0135 mol Na

want: ? g Na

$$\cancel{0.0135 \text{ mol Na}} \times \frac{22.99 \text{ g Na}}{\cancel{1 \text{ mol Na}}} = 0.310365 \text{ g Na}$$

↓

$$= \boxed{0.310 \text{ g Na}}$$

B4) What is the mass in grams of 16.3 mol of the element nickel, Ni?

C1) How many [?] moles of calcium, Ca, are in 5.00 g of calcium? ^{3 SF's}

given: 5.00 g Ca

want: ? mol Ca

$$\cancel{5.00 \text{ g Ca}} \times \frac{1 \text{ mol Ca}}{\cancel{40.08 \text{ g Ca}}} = 0.\underline{\underline{12475}} \text{ mol Ca}$$

↙

$$= \boxed{0.125 \text{ mol Ca}}$$

C2) How many moles of gold, Au, are in 3.60×10^{-5} g of gold?

C3) How many moles of zinc, Zn, are in 0.535 g of zinc?

?
3 SF's
D1) How many moles of lead, Pb are in 1.50×10^{12} atoms of lead?
given: 1.50×10^{12} atoms Pb
want: ? mol Pb

$$1.50 \times 10^{12} \text{ atoms Pb} \times \frac{1 \text{ mol Pb}}{6.02 \times 10^{23} \text{ atoms Pb}} = 2.49169 \times 10^{-12} \text{ mol Pb}$$
$$= 2.49 \times 10^{-12} \text{ mol Pb}$$

D2) How many moles of tin, Sn, are in 2500 atoms of tin?

D3) How many atoms of aluminum, Al, are in 2.75 mol of aluminum? 3 SFs

given: 2.75 mol Al

want: ? atoms Al

$$\begin{aligned} \cancel{2.75 \text{ mol Al}} \times \frac{6.02 \times 10^{23} \text{ atoms Al}}{\cancel{1 \text{ mol Al}}} &= 1.6555 \times 10^{24} \text{ atoms Al} \\ &= \boxed{1.66 \times 10^{24} \text{ atoms Al}} \end{aligned}$$

E1) What is the mass in grams of 7.5×10^{15} atoms of nickel, Ni? 2 SFs

given: 7.5×10^{15} atoms Ni

want: ? g Ni

$$\begin{aligned} \cancel{7.5 \times 10^{15} \text{ atoms Ni}} \times \frac{\cancel{1 \text{ mol Ni}}}{\cancel{6.02 \times 10^{23} \text{ atoms Ni}}} \times \frac{58.69 \text{ g Ni}}{\cancel{1 \text{ mol Ni}}} &= 7.311877 \times 10^{-7} \text{ g Ni} \\ &= \boxed{7.3 \times 10^{-7} \text{ g Ni}} \end{aligned}$$

E2) How many [?] atoms of sulfur, S are in 4.00 g of sulfur? 3 SF'S

given: 4.00 g S

want: ? atoms S

$$4.00 \text{ g S} \times \frac{1 \text{ mol S}}{32.07 \text{ g S}} \times \frac{6.02 \times 10^{23} \text{ atoms S}}{1 \text{ mol S}}$$

$$= 7.50857 \times 10^{22} \text{ atoms S}$$

$$= \boxed{7.51 \times 10^{22} \text{ atoms S}}$$

E3) What mass of gold, Au, contains the same number of atoms as 9.0 g of aluminum, Al?