

Calculating Moles, Mass and M_r

Gold



A **mole** is just a word for the number 602000000000000000000000 or 6.02×10^{23} . You are able to hold a mole of LiCl in your hands because molecules and atoms are so small.

To calculate the number of moles, the mass or the relative formula mass (M_r) of a compound, you need to use a formula triangle.

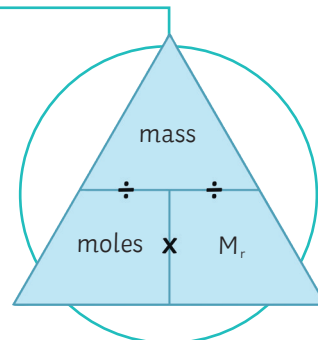
For example, calculate the number of moles in 26g of LiF.

Firstly, find the M_r for LiF. $7 + 19 = 26$

We know the mass of the compound as this is stated in the question.

moles = mass \div M_r

$26 \div 26 = 1$ mole



Have a go at calculating the moles, mass or M_r for each of the compounds below. You will need a periodic table to help you.

		Calculate the M_r of the compound.	Use this space to show your working out.	Write your answer in the box below.
1	Calculate the number of moles in 244g of $\text{Sr}(\text{OH})_2$.			
2	Calculate the number of moles in 548g of SrCO_3 .			
3	Calculate the number of moles in 323g of Na_2SeO_3 .			



4	Calculate the number of moles in 222g of Na ₂ MnO ₄ .			
5	Calculate the number of moles in 821g of Cu(N ₃) ₂ .			
6	Calculate the number of moles in 199g of NaHCO ₃ .			
7	Calculate the number of moles in 476g of Na ₄ Fe(CN) ₆ .			
8	Calculate the number of moles in 312g of Ag ₂ SO ₄ .			
9	Calculate the number of moles in 601g of Sc(NO ₃) ₃ .			



10	Calculate the number of moles in 330g of K ₂ S.			
11	Calculate the mass of 0.9 moles of Fe(NO ₃) ₃ (H ₂ O) ₉ .			
12	Calculate the mass of 1.1 moles of Fe(SCN) ₃ .			
13	Calculate the mass of 2.3 moles of Pb ₃ (PO ₄) ₂ .			
14	Calculate the mass of 0.75 moles of MnSO ₄ H ₂ O.			
15	Calculate the mass of 5.5 moles of H ₂ SO ₄ .			



Answer the following challenge questions:

1. How many moles are there in 28g of water?

2. Calculate the mass in 8.65 moles of lithium fluoride.

3. How many molecules are in 30.0 moles of oxygen?

4. How many moles are there in 10g of sodium chloride?

5. Calculate the mass in 2.5 moles of ammonia.



Calculating Moles, Mass and M_r Answers

		Calculate the M_r of the compound.	Use this space to show your working out.	Write your answer in the box below.
1	Calculate the number of moles in 244g of $\text{Sr}(\text{OH})_2$.	$(16 + 1) \times 2 = 34$ $88 + 34 = 122$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 244 \div 122 = 2$ moles	2 moles
2	Calculate the number of moles in 548g of SrCO_3 .	$88 + 12 + (16 \times 3) = 148$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 548 \div 148 = 3.70$ moles	3.70 moles
3	Calculate the number of moles in 323g of Na_2SeO_3 .	$(23 \times 2) + 79 + (16 \times 3) = 173$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 323 \div 173 = 1.87$ moles	1.87 moles
4	Calculate the number of moles in 222g of Na_2MnO_4 .	$(23 \times 2) + 55 + (16 \times 4) = 165$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 222 \div 165 = 1.35$ moles	1.35 moles
5	Calculate the number of moles in 821g of $\text{Cu}(\text{N}_3)_2$.	$14 \times 3 = 42$ $42 \times 2 = 84$ $63.5 + 84 = 147.5$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 821 \div 147.5 = 5.57$ moles	5.57 moles
6	Calculate the number of moles in 199g of NaHCO_3 .	$23 + 1 + 12 + (16 \times 3) = 84$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 199 \div 84 = 2.37$ moles	2.37 moles
7	Calculate the number of moles in 476g of $\text{Na}_4\text{Fe}(\text{CN})_6$.	$12 + 14 = 26$ $26 \times 6 = 156$ $(23 \times 4) + 56 + 156 = 304$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 476 \div 304 = 1.57$ moles	1.57 moles
8	Calculate the number of moles in 312g of Ag_2SO_4 .	$(108 \times 2) + 32 + (16 \times 4) = 312$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 312 \div 312 = 1$ mole	1 mole
9	Calculate the number of moles in 601g of $\text{Sc}(\text{NO}_3)_3$.	$(16 \times 3) + 14 = 62$ $62 \times 3 = 186$ $45 + 186 = 231$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 601 \div 231 = 2.60$ moles	2.60 moles
10	Calculate the number of moles in 330g of K_2S .	$(39 \times 2) + 32 = 110$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 330 \div 110 = 3$ moles	3 moles



11	Calculate the mass of 0.9 moles of $\text{Fe}(\text{NO}_3)_3 (\text{H}_2\text{O})_9$.	$(16 \times 3) + 14 = 62$ $62 \times 3 = 186$ $(1 \times 2) + 16 = 18$ $18 \times 9 = 162$ $56 + 186 + 162 = 404$	$\text{mass} = \text{moles} \times M_r$ $\text{mass} = 0.9 \times 404 = 363.6\text{g}$	363.6g
12	Calculate the mass of 1.1 moles of $\text{Fe}(\text{SCN})_3$.	$32 + 12 + 14 = 58$ $58 \times 3 = 174$ $56 + 174 = 230$	$\text{mass} = \text{moles} \times M_r$ $\text{mass} = 1.1 \times 230 = 253\text{g}$	253g
13	Calculate the mass of 2.3 moles of $\text{Pb}_3(\text{PO}_4)_2$.	$16 \times 4 = 64$ $31 + 64 = 95$ $95 \times 2 = 190$ $(207 \times 3) + 190 = 811$	$\text{mass} = \text{moles} \times M_r$ $\text{mass} = 2.3 \times 811 = 1865.3\text{g or } 1.87\text{kg}$	1865.3g or 1.87kg
14	Calculate the mass of 0.75 moles of $\text{MnSO}_4 \cdot \text{H}_2\text{O}$.	$55 + 32 + (16 \times 4) + (1 \times 2) + 16 = 169$	$\text{mass} = \text{moles} \times M_r$ $\text{mass} = 0.75 \times 169 = 126.8\text{g}$	126.8g
15	Calculate the mass of 5.5 moles of H_2SO_4 .	$(1 \times 2) + 32 + (16 \times 4) = 98$	$\text{mass} = \text{moles} \times M_r$ $\text{mass} = 5.5 \times 98 = 539\text{g}$	539g

Answer the following challenge questions:

1. How many moles are there in 28g of water?

calculate the M_r of $\text{H}_2\text{O} = (2 \times 1) + 16 = 18$

$\text{moles} = \text{mass} \div M_r$

$\text{moles} = 28.0 \div 18 = 1.56 \text{ moles}$

2. Calculate the mass in 8.65 moles of lithium fluoride.

calculate the M_r of $\text{LiF} = 7 + 19 = 26$

$\text{mass} = \text{moles} \times M_r$

$\text{mass} = 8.65 \times 26 = 224.9\text{g}$

3. How many molecules are in 30.0 moles of oxygen?

1 mole of oxygen molecules = 6.02×10^{23}

oxygen molecules

$6.02 \times 10^{23} \times 30 = 1.806 \times 10^{25}$

4. How many moles are there in 10g of sodium chloride?

calculate the M_r of $\text{NaCl} = 23 + 35.5 = 58.5$

$\text{moles} = \text{mass} \div M_r$

$\text{moles} = 10 \div 58.5 = 0.17 \text{ moles}$

5. Calculate the mass in 2.5 moles of ammonia.

calculate the M_r of $\text{NH}_3 = (1 \times 3) + 14 = 17$

$\text{mass} = \text{moles} \times M_r$

$\text{mass} = 2.5 \times 17 = 42.5\text{g}$

