

# Calculating Moles, Mass and $M_r$

Silver



A **mole** is just a word for the number 602000000000000000000000 or  $6.02 \times 10^{23}$ . 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.

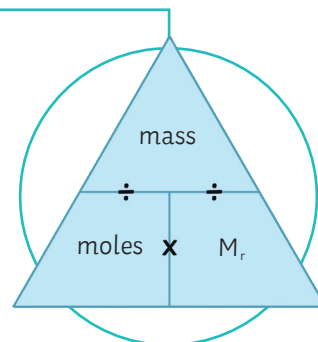
For example, calculate the number of moles in 26g of LiF.

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. Remember when calculating the  $M_r$ , you need to use the mass number for each element.

		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 220g of CO <sub>2</sub> .	$12 + (16 \times 2) = 44$	moles = mass $\div$ $M_r$ moles = $220 \div 44$ moles = 5	5 moles
2	Calculate the number of moles in 472g of ClO <sub>2</sub> .		moles = mass $\div$ $M_r$	
3	Calculate the number of moles in 1kg of CrO <sub>3</sub> .			



4	Calculate the number of moles in 351g of $\text{CoSO}_4$ .			
5	Calculate the number of moles in 566g of $\text{Cu}(\text{N}_3)_2$ .			
6	Calculate the number of moles in 315g of $\text{GeO}_2$ .			
7	Calculate the number of moles in 981g of $\text{AuCl}_3$ .			
8	Calculate the number of moles in 139g of $\text{HCl}$ .			
9	Calculate the number of moles in 477g of $\text{HBr}$ .			
10	Calculate the number of moles in 750g of $\text{H}_3\text{PO}_2$ .			



11	Calculate the mass of 0.8 moles of $\text{Fe}(\text{NO}_3)_3 \cdot (\text{H}_2\text{O})_9$ .		$\text{mass} = \text{moles} \times M_r$ $\text{mass} = 0.8 \times 404 =$	
12	Calculate the mass of 0.36 moles of $\text{Fe}(\text{SCN})_3$ .			
13	Calculate the mass of 0.56 moles of $\text{Pb}_3(\text{PO}_4)_2$ .			
14	Calculate the mass of 3.2 moles of $\text{MnSO}_4 \cdot \text{H}_2\text{O}$ .			
15	Calculate the mass of 6.5 moles of $\text{H}_2\text{SO}_4$ .			
16	Calculate the mass of 0.55 moles of $\text{NH}_4\text{Cl}$ .			
17	Calculate the mass of 0.65 moles of $\text{K}_2\text{SO}_4$ .			
18	Calculate the mass of 0.72 moles of $\text{TlF}$ .			
19	Calculate the mass of 2 moles of $\text{TiCl}_4$ .			
20	Calculate the mass of 4.4 moles of $\text{Zn}(\text{CN})_2$ .			



# 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 220g of $\text{CO}_2$ .	$12 + (16 \times 2) = 44$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 220 \div 44$ $\text{moles} = 5$	5 moles
2	Calculate the number of moles in 472g of $\text{ClO}_2$ .	$35.5 + (16 \times 2) = 67.5$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 472 \div 67.5 =$ 6.99 moles	6.99 moles
3	Calculate the number of moles in 1kg of $\text{CrO}_3$ .	$52 + (16 \times 3) = 100$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 1000 \div 100 = 10$ moles	10 moles
4	Calculate the number of moles in 351g of $\text{CoSO}_4$ .	$59 + 32 + (16 \times 4) = 155$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 351 \div 155 =$ 2.26 moles	2.26 moles
5	Calculate the number of moles in 566g of $\text{Cu}(\text{N}_3)_2$ .	$14 \times 3 = 42$ $42 \times 2 = 84$ $63.5 + 84 = 147.5$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 566 \div 147.5 =$ 3.84 moles	3.84 moles
6	Calculate the number of moles in 315g of $\text{GeO}_2$ .	$73 + (16 \times 2) = 105$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 315 \div 105 = 3$ moles	3 moles
7	Calculate the number of moles in 981g of $\text{AuCl}_3$ .	$197 + (35.5 \times 3) = 303.5$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 981 \div 303.5 =$ 3.23 moles	3.23 moles
8	Calculate the number of moles in 139g of $\text{HCl}$ .	$1 + 35.5 = 36.5$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 139 \div 36.5 =$ 3.81 moles	3.81 moles
9	Calculate the number of moles in 477g of $\text{HBr}$ .	$1 + 80 = 81$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 477 \div 81 =$ 5.89 moles	5.89 moles
10	Calculate the number of moles in 750g of $\text{H}_3\text{PO}_2$ .	$(1 \times 3) + 31 + (16 \times 2) = 66$	$\text{moles} = \text{mass} \div M_r$ $\text{moles} = 750 \div 66 =$ 11.36 moles	11.36 moles



11	Calculate the mass of 0.8 moles of $\text{Fe}(\text{NO}_3)_3 (\text{H}_2\text{O})_9$ .	$(16 \times 3) + 14 = 62$ $62 \times 3 = 186$ $(1 \times 2) + 16 = 18$ $18 \times 9 = 162$ $56 + 186 + 162 = 404$	$\text{mass} = \text{moles} \times M_r$ $\text{mass} = 0.8 \times 404 = 323.2\text{g}$	323.2g
12	Calculate the mass of 0.36 moles of $\text{Fe}(\text{SCN})_3$ .	$32 + 12 + 14 = 58$ $58 \times 3 = 174$ $56 + 174 = 230$	$\text{mass} = \text{moles} \times M_r$ $\text{mass} = 0.36 \times 230 = 82.8\text{g}$	82.8g
13	Calculate the mass of 0.56 moles of $\text{Pb}_3(\text{PO}_4)_2$ .	$16 \times 4 = 64$ $31 + 64 = 95$ $95 \times 2 = 190$ $(207 \times 3) + 190 = 811$	$\text{mass} = \text{moles} \times M_r$ $\text{mass} = 0.56 \times 811 = 454.16$	454.16
14	Calculate the mass of 3.2 moles of $\text{MnSO}_4 \cdot \text{H}_2\text{O}$ .	$55 + 32 + (16 \times 4) + (1 \times 2) + 16 = 169$	$\text{mass} = \text{moles} \times M_r$ $\text{mass} = 3.2 \times 169 = 540.8\text{g}$	540.8g
15	Calculate the mass of 6.5 moles of $\text{H}_2\text{SO}_4$ .	$(1 \times 2) + 32 + (16 \times 4) = 98$	$\text{mass} = \text{moles} \times M_r$ $\text{mass} = 6.5 \times 98 = 637\text{g}$	637g
16	Calculate the mass of 0.55 moles of $\text{NH}_4\text{Cl}$ .	$14 + (1 \times 4) + 35.5 = 53.5$	$\text{mass} = \text{moles} \times M_r$ $\text{mass} = 0.55 \times 53.5 = 29.43\text{g}$	29.43g
17	Calculate the mass of 0.65 moles of $\text{K}_2\text{SO}_4$ .	$(39 \times 2) + 32 + (16 \times 4) = 174$	$\text{mass} = \text{moles} \times M_r$ $\text{mass} = 0.65 \times 174 = 113.1\text{g}$	113.1g
18	Calculate the mass of 0.72 moles of $\text{TlF}$ .	$204 + 19 = 223$	$\text{mass} = \text{moles} \times M_r$ $\text{mass} = 0.72 \times 223 = 160.56\text{g or } 160.6\text{g}$	160.6g
19	Calculate the mass of 2 moles of $\text{TiCl}_4$ .	$48 + (35.5 \times 4) = 190$	$\text{mass} = \text{moles} \times M_r$ $\text{mass} = 2 \times 190 = 380\text{g}$	380g
20	Calculate the mass of 4.4 moles of $\text{Zn}(\text{CN})_2$ .	$12 + 14 = 26$ $26 \times 2 = 52$ $65 + 52 = 117$	$\text{mass} = \text{moles} \times M_r$ $\text{mass} = 4.4 \times 117 = 514.8\text{g}$	514.8g

