

GCSE Chemistry (9 – 1)

Mole Calculations - Easy

Name:

Group:

Instructions

- Read each question carefully before you begin to answer it.
- Use black ink or black ball-point pen for your answers.
- Fill in the boxes at the top of this page with your name and group.
- Attempt to answer every question in the booklet.
- Answer the questions in the spaces provided – there may be more space than you need in some answer spaces.
- Calculators may be used for this booklet.
- For any calculations, you **must** show all your working.
- Any and all drawings or graphs should be completed in pencil.



For markers use	
Question	Mark
Task 1	/23
Task 2	/15
Task 3	/5
Task 4	/4
Task 5	/5
Total	/52
%	
Grade	

Information

- The maximum mark for this paper is 50 marks.
- The marks for each question are shown in brackets.
- Please be aware that good English and clear presentation are required in your answers.



Calculating moles and working with moles is a vital key skill in chemistry.

One of the key elements in mole calculations is being able to correctly determine the molecular mass of a substance this is normally written as Mr.

Skill 1: calculating the molecular mass (Mr)

Example 1: calculate the Mr for a molecule of sulphuric acid, H_2SO_4 .

Solution: there are seven atoms present in one molecule of sulphuric acid. Two hydrogen atoms, one sulphur and four oxygen atoms. We will add the mass numbers of these together to find the Mr.

$$\text{Mr} = 2(1) + 32 + 4(16)$$

$$\text{Mr} = 98$$

Task 1: calculating the molecular mass (Mr)

Calculate the Mr of the following molecules. Each problem is worth 1 mark.

H_2O	HNO_3
LiOH	NaCl
NH_4NO_3	H_2SO_4
MgO	NH_3
$\text{Ca}(\text{OH})_2$	MgCl_2
NH_4NO_3	CaSO_4
Al_2O_3	$(\text{NH}_4)_3\text{PO}_4$
$\text{Fe}(\text{OH})_3$	K_2SO_4
NaHCO_3	$\text{C}_2\text{H}_5\text{Br}$
$\text{C}_6\text{H}_{12}\text{O}_6$	$\text{C}_2\text{H}_5\text{OH}$
Ti_2CO_3	C_5H_{12}
$\text{Na}_2\text{CO}_3 \cdot 7\text{H}_2\text{O}$	

Skill 2: calculating the moles of a substance

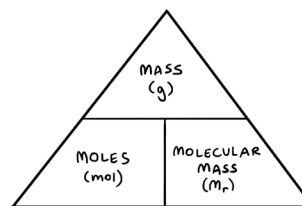
The moles of a substance can be calculated by dividing the mass of the substance by its Mr.

Example 2: calculate the number of moles in 81.90 g of NaCl.

$$\text{Moles} = \text{mass} \div \text{Mr}$$

$$\text{Moles of NaCl} = 81.90 \text{ g} \div 58.5$$

$$\text{Moles of NaCl} = 1.40 \text{ mol}$$



Task 2: calculating the moles of a substance from its mass

Calculate the number of moles of each for the following substances.

Give your answers to **3** significant figures.

72 g of H ₂ O	56.40 g of K ₂ O
.....	
.....	
15.9 g of CuO	9.8 g of H ₂ SO ₄
.....	
.....	
50 g of Fe ₂ (SO ₄) ₃	8 g of NaOH
.....	
.....	
426 g of Al(NO ₃) ₃	61.75 g of CuCO ₃
.....	
.....	
26.5 g of sodium carbonate	16.5 g of iron (III) oxide
.....	
.....	
28 g of ethanol	150 g of sulphur dioxide
.....	
.....	
17 g of sodium nitrate	10.65 g of iron (III) chloride
.....	
.....	
1280 g of ammonium sulphate	
.....	
.....	

Skill 3: calculating the mass of a substance

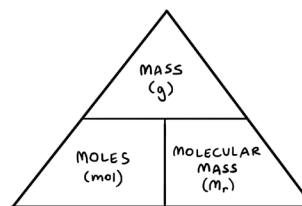
The mass of a substance can be calculated by multiplying the mols of the substance by its Mr.

Example 3: calculate the mass of 0.8 mol of calcium carbonate.

$$\text{Mass} = \text{mols} \times \text{Mr}$$

$$\text{Mass of CaCO}_3 = 0.8 \text{ mol} \times 100$$

$$\text{Mass of CaCO}_3 = 80 \text{ g}$$



Task 3: calculating the mass of a substance from its mols

Calculate the mass of each for the following substances. Give your answers to **3** significant figures.

0.75 mol of $\text{Mg}(\text{HCO}_3)_2$	1.25 mol of ZnCl_2
0.45 mol of SiO_2	0.62 mol of MnSO_4
0.2 mol of beryllium nitrate	

Skill 4: calculating the Mr of a substance

The Mr of a substance can be calculated by dividing the mass of the substance by its mols.

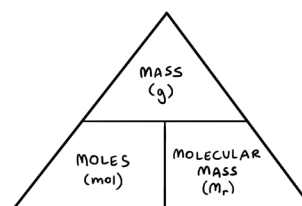
Example 4: A student has 5 mols of aluminium oxide with a mass of 510 g.

What is the Mr of aluminium oxide?

$$\text{Mr} = \text{mass} \div \text{mols}$$

$$\text{Mr of Al}_2\text{O}_3 = 510 \div 5$$

$$\text{Mr of Al}_2\text{O}_3 = 102$$



Task 4: calculating the mass of a substance from its mols

Calculate the Mr of each for the following substances. Give your answers to **3** significant figures.

3 mols and 132 g of substance	2 mols of 92 g of substance
3 mols and 175.5 g of substance	50 mols of 3.975 kg of substance

Skill 5: calculating the number of atoms in a given mass

The number of atoms present in a given mass can be calculated by multiplying its mols by Avogadro's constant, 6.02×10^{23} .

Example 5: using Avogadro's constant, calculate the number of atoms in 336 g of iron.

$$\text{Mols of Fe} = \text{mass} \div \text{Mr}$$

$$\text{Mols of Fe} = 336 \div 56$$

$$\text{Mols of Fe} = 6 \text{ mols}$$

Number of atoms = mols $\times$ Avogadro's constant

$$\text{Number of atoms} = 6 \times 6.02 \times 10^{23}$$

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

Example 6: using Avogadro's constant, calculate the number of atoms in 23.52g of NaHCO_3 .
In this case we must multiply our answer by 5 as each molecule has 5 atoms in it.

$$\text{Mols of NaHCO}_3 = \text{mass} \div \text{Mr}$$

$$\text{Mols of NaHCO}_3 = 23.52 \div 84$$

$$\text{Mols of NaHCO}_3 = 0.28$$

Number of atoms = mols $\times$ Avogadro's constant

$$\text{Number of atoms} = 0.28 \times 6.02 \times 10^{23}$$

$$\text{Number of atoms} = 1.6856 \times 10^{23}$$

$$\text{Number of atoms} = 5 \times 1.6856 \times 10^{23}$$

$$\text{Number of atoms} = 8.43 \times 10^{23}$$

Task 5: calculating the number of atoms in a given mass

Calculate the number of atoms in each of the following substances. Give your answers to 3 significant figures.

48 g of magnesium	0.4 mol of oxygen
1.25 mol of ZnCl_2	0.80 mol of Na_2O
The formula of calcium acetate is $\text{Ca}(\text{C}_2\text{H}_3\text{O}_2)_2$. Calculate the number of atoms that combine together to form 39.50 g of calcium acetate.	