

GCSE Chemistry (9 – 1)

Mole Calculations - Moderate

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.

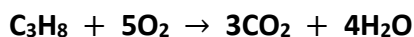
Information

- 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.

For markers use	
Question	Mark
1	/2
2	/2
3	/5
4	/5
5	/3
6	/5
7	/3
8	/10
9	/5
10	/10
Total	/50
%	
Grade	



1. The equation for a combustion reaction between propane and oxygen is shown below.



Calculate the number of moles present in 132 g of propane.

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.....

Moles of propane = ...

(2 marks)

(Total for Question 1 is 2 marks)

2. Calculate the number of moles present in 494 g of copper carbonate, CuCO_3 .

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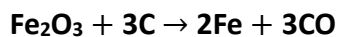
Moles of copper carbonate = ...

(2 marks)

(Total for Question 2 is 2 marks)

3. A student is doing a practical to extract iron from iron oxide using a displacement reaction with carbon.

The equation for the reaction is:



- a) The student uses 50 grams of iron oxide. Calculate the number of moles in 50 grams of iron oxide.

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.....

Moles of iron oxide = ...

(2 marks)

- b) What is the ratio of the number of moles of iron oxide to the moles of iron?

Ratio of moles = ...

(1 mark)

- c) What is the mass of iron that can be produced from 50 g of iron oxide?

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.....
.....

Mass of iron produced = ...

(2 marks)

(Total for Question 3 is 5 marks)

4. A student was doing an electrolysis practical to separate aluminium oxide into aluminium metal and oxygen gas. The student has 153 g of aluminium oxide for this practical. The equation for the reaction is:



- a) Calculate the number of moles in 153 g of aluminium oxide.

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.....

Moles of aluminium oxide = ...
(2 marks)

- b) What is the ratio of the number of moles of aluminium oxide to the moles of aluminium?

Ratio of moles = ...
(1 mark)

- c) Calculate the mass of aluminium that can be formed from 153 g of aluminium oxide.

.....

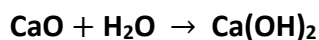
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Mass of aluminium produced = ...
(2 marks)

(Total for Question 4 is 5 marks)

5. Calcium oxide reacts with water to produce calcium hydroxide.
The equation for the reaction is shown below:



What mass of calcium hydroxide is made from 14 g of calcium oxide?

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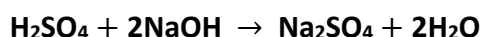
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Mass = ...
(3 marks)

(Total for Question 5 is 3 marks)

6. A student was preparing a sample of sodium sulphate. To produce sodium sulphate the student reacted sulphuric acid with sodium hydroxide. The equation for that reaction is shown below:



- a) Calculate the number of moles in 24.5 g of sulphuric acid.

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.....
.....

Moles of sulphuric acid = ...

(2 marks)

- b) What is the ratio of the number of moles of sulphuric acid to the moles of sodium hydroxide?

Ratio of moles = ...

(1 mark)

- c) Calculate the mass of sodium hydroxide that is needed to neutralise 24.5 g of sulphuric acid.

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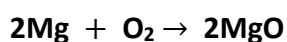
Mass of sodium hydroxide = ...

(2 marks)

(Total for Question 6 is 5 marks)

7. Magnesium metal reacts with oxygen gas to produce magnesium oxide.

The equation for the reaction is:



Calculate the mass of oxygen needed to react 48 g of magnesium to form magnesium oxide.

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Mass = ...

(3 marks)

(Total for Question 7 is 3 marks)

8. Magnesium nitrate decomposes when heated to form magnesium oxide, nitrogen dioxide and oxygen gas.

- a) Write the balanced symbol equation for the decomposition of solid magnesium nitrate.
Include **all** state symbols.

.....
(3 marks)

- b) Calculate the mass of magnesium oxide produced when 0.90 moles of magnesium nitrate decomposes.

.....
.....
.....
Mass of magnesium oxide = ...
(2 marks)

- c) Calculate the mass of oxygen gas produced when 0.90 moles of magnesium nitrate decomposes.

.....
.....
.....
Mass of oxygen = ...
(2 marks)

- d) Calculate how many molecules of nitrogen dioxide, NO₂, are produced from the 0.90 moles of magnesium nitrate.

Avogadro's constant is 6.02×10^{23} . Give your answer to 3 significant figures.

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.....
Number of molecules of NO₂ = ...
(3 marks)

(Total for Question 8 is 10 marks)

9. Sodium reacts with chlorine gas to form sodium chloride.

a) Write the balanced symbol equation for this reaction. Include **all** state symbols.

.....
(2 marks)

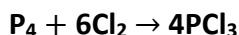
b) Calculate the maximum mass of sodium chloride that could be formed by reacting 9.20 g of sodium with excess chlorine.

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.....
.....

Mass of sodium chloride = ...
(3 marks)

(Total for Question 9 is 5 marks)

10. Phosphorus can exist as tetraphosphorus (P_4) molecules, where four phosphorus atoms are covalently bonded together. Phosphorus trichloride, PCl_3 , is made in the reaction of tetraphosphorus (P_4), and chlorine as shown in the equation.



A scientist starts the reaction with 2.0 mol of phosphorus, P_4 .

a) Calculate the mass of 2.0 mol of phosphorus.

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.....
.....
(3 marks)

b) Calculate the mass of phosphorus trichloride, PCl_3 , that could be made from 2.0 mol of phosphorus, P_4 .

.....
.....
.....
(3 marks)

c) The scientist reacts the 2.0 mol of phosphorus, P_4 , with 866.2 g of chlorine, Cl_2 .
Which is the limiting reactant? Explain your answer.

Limiting reactant:

Explanation:

.....
.....
.....
(4 marks)

(Total for Question 10 is 10 marks)