

# Use of Amount of Sub; Masses

## Pure Subs

### Question Paper

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Chemistry
Exam Board	AQA
Topic	5.3 Quantitative Chemistry
Sub-Topic	Use of Amount of Sub; Masses Pure Subs
Difficulty Level	Bronze Level
Booklet	Question Paper

Time Allowed: 32 minutes

Score: /32

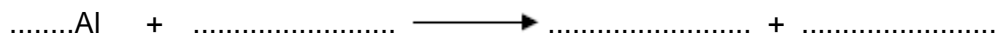
Percentage: /100

Grade Boundaries:

**Q1.** Formulae and equations are used to describe chemical reactions.

- (a) Aluminium reacts with sulfuric acid ( $\text{H}_2\text{SO}_4$ ) to produce aluminium sulfate,  $\text{Al}_2(\text{SO}_4)_3$  and hydrogen ( $\text{H}_2$ ).

Complete and balance the equation for this reaction.



(2)

- (b) Calcium carbonate reacts with nitric acid to produce calcium nitrate.

Calculate the relative formula mass ( $M_r$ ) of calcium nitrate,  $\text{Ca}(\text{NO}_3)_2$

Relative atomic masses ( $A_r$ ): N = 14; O = 16; Ca = 40

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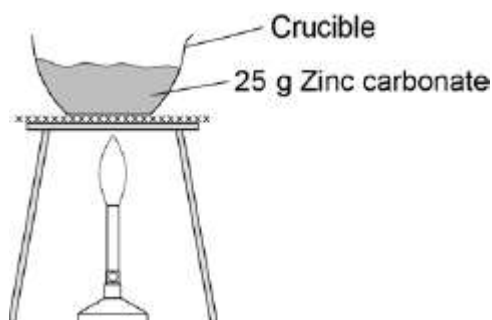
Relative formula mass ( $M_r$ ) = .....

(2)

- (c) Zinc carbonate decomposes when heated.

A student heated 25 g zinc carbonate ( $\text{ZnCO}_3$ ).

The figure below shows how he set up the apparatus.



The balanced chemical equation for the decomposition reaction is:



The student measured the mass of solid product after heating until there was no further change in mass.

The student did the experiment four times. The table below shows the results.

Experiment	1	2	3	4
Mass of solid product in g	17.4	19.7	17.6	16.9

Calculate the mean mass of the solid product.

Do **not** use any anomalous results in your calculation.

.....  
.....

Mean mass = ..... g

(2)  
(Total 6 marks)

**Q2.** Thermosoftening polymers can be used to make plastic bottles and food packaging.

- (a) Why are thermosoftening polymers **not** suitable for storing very hot food?

.....  
.....

(1)

- (b) The reaction to produce the polymers uses a catalyst.

Why are catalysts used in chemical reactions?

.....  
.....

(1)

- (c) Compounds from food packaging must not get into food.

Gas chromatography can be used to separate compounds in food.

The output from the gas chromatography column can be linked to an instrument which can identify the compounds.

- (i) Name the instrument used to identify the compounds.

.....  
.....

(1)

- (ii) Give **one** reason why instrumental methods of analysis are used to identify the compounds.

.....  
.....

(1)

- (d) Poly(ethene) is a thermosoftening polymer.

Poly(ethene) can be made with different properties. The properties depend on the conditions used when poly(ethene) is made.

Suggest **two** conditions which could be changed when poly(ethene) is made.

.....  
.....

(2)

(Total 6 marks)

**Q3.** This question is about lithium and sodium.

- (a) Use the Chemistry Data Sheet to help you to answer this question.

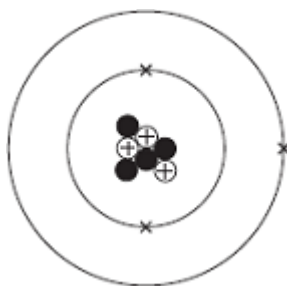
In which group of the periodic table are lithium and sodium?

Group

(1)

- (b) A lithium atom can be represented as  ${}^7_3\text{Li}$

The diagram represents the lithium atom.



- (i) Some particles in the nucleus have a positive charge.

What is the name of these particles?

.....

(1)

- (ii) Some particles in the nucleus have no charge.

What is the name of these particles?

.....

(1)

- (iii) Use the correct answer from the box to complete the sentence.

3	4	7
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The mass number of this atom of lithium is

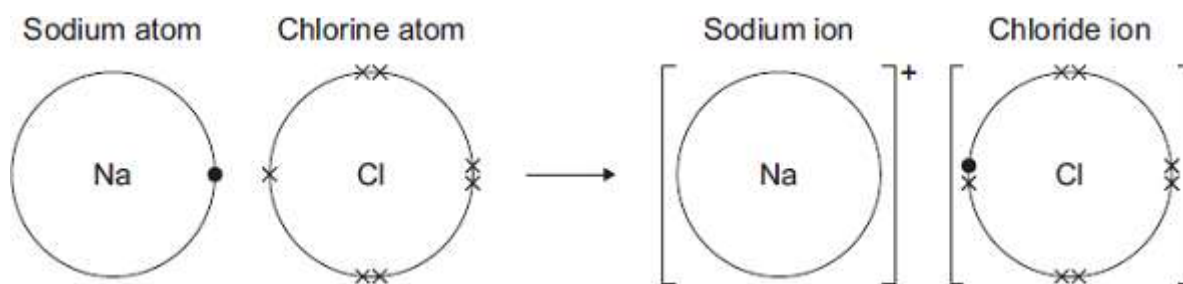
(1)

- (c) Sodium reacts with chlorine to produce sodium chloride.

sodium + chlorine  $\longrightarrow$  sodium chloride

The diagram shows how the reaction happens.

Only the outer electrons are shown.



Draw a ring around the correct answer to complete each sentence.

(i)

A sodium atom changes into a sodium ion by

gaining	an electron.
losing	
sharing	

(1)

(ii)

A sodium ion has

a negative	charge.
no	
a positive	

(1)

(iii)

The ions in sodium chloride are held together by

covalent	forces.
electrostatic	

strong

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magnetic

(1)

(d) Sodium chloride is an ionic compound.

Tick (✓) **two** properties of ionic compounds.

Property	Tick (✓)
Do <b>not</b> dissolve in water	
High melting points	
Low boiling points	
Strong bonds	

(2)

(e) (i) The formula of sodium chloride is NaCl

Calculate the relative formula mass of sodium chloride.

Relative atomic masses: Na = 23; Cl = 35.5

.....  
 .....

Relative formula mass = .....

(1)

(ii) Draw a ring around the correct answer to complete each sentence.

The relative formula mass of a substance, in grams, is one

ion

isotop

of the substance.

e	
mole	

(1)

- (f) Nanoparticles of sodium chloride (salt) are used to flavour crisps.

What are nanoparticles?

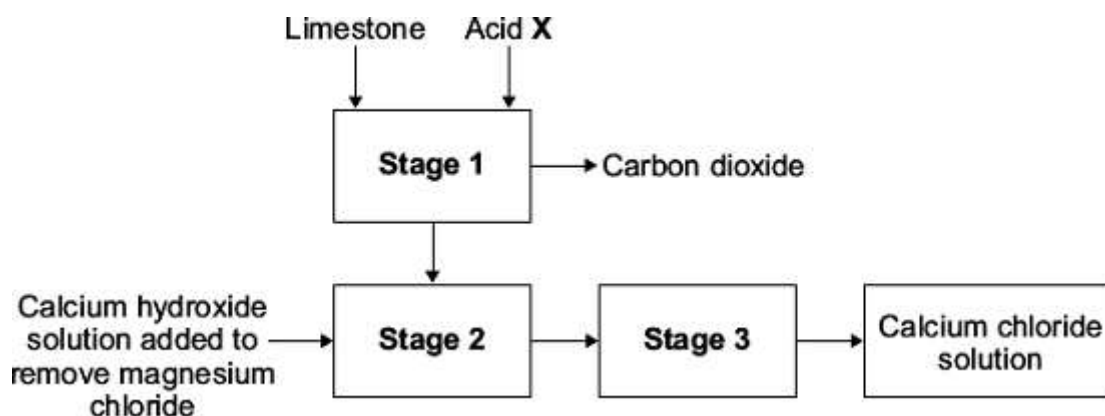
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(1)

(Total 12 marks)

- Q4.** (a) Calcium chloride is made from limestone. Limestone contains mainly calcium carbonate and a small amount of magnesium carbonate.



- (i) In **stage 1** calcium carbonate reacts with acid **X** to form calcium chloride.

Draw a ring around the name of acid **X**.

hydrochloric

nitric

sulfuric

(1)

- (ii) **Stage 1** produces a concentrated solution of calcium chloride.



The solution also contains magnesium chloride.

Calcium hydroxide solution is added in **stage 2** to remove the magnesium chloride.

The equation for this reaction is:



Draw a ring around the correct answer to complete each sentence.

In **stage 2** a precipitate is made because magnesium hydroxide is

dissolved

insoluble in water.

soluble

In **stage 3** the solid magnesium hydroxide can be separated from the calcium chloride

solution using

chromatography.

electrolysis.

filtration.

(2)

- (iii) What method can be used to change the calcium chloride solution into solid calcium chloride? Draw a ring around your answer.

crystallisation

electrolysis

reduction

(1)

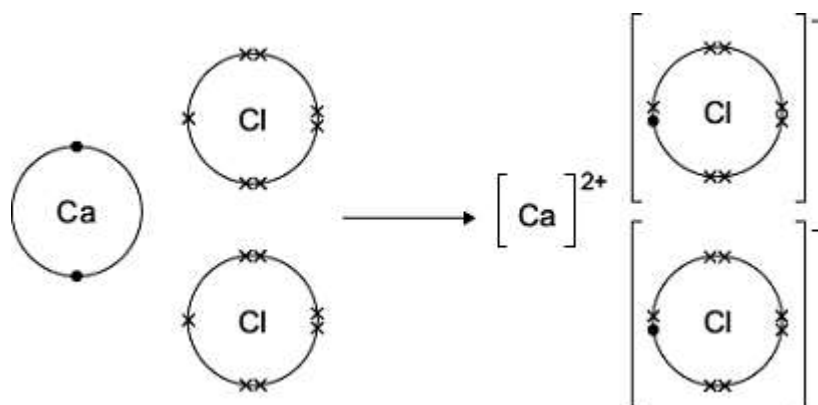
- (b) Calcium chloride can also be made by reacting calcium with chlorine:

calcium + chlorine → calcium chloride

The diagram shows what happens to atoms of calcium and chlorine in this reaction.

The dots (•) and crosses (x) are used to represent electrons.

Only the outer electrons are shown.



Use the diagram to help you to answer this question.

Describe, as fully as you can, what happens when calcium reacts with chlorine to make calcium chloride.

.....

.....

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.....

.....

.....

.....

.....

(4)  
(Total 8 marks)