

Sulfur – 2019 Nov IGCSE

1. 0620/33/O/N/19/No.4

This question is about sulfur and compounds of sulfur.

An isotope of sulfur is written as shown.



(a) Deduce the number of protons, electrons and neutrons in this isotope of sulfur.

number of protons

number of electrons

number of neutrons

[3]

(b) Draw the electronic structure of a sulfur atom.

[2]

(c) The table shows some observations made when four metals are heated with liquid sulfur.

metal	observations
copper	turns black very slowly
gold	no reaction
sodium	reacts explosively
tin	turns black slowly

Use this information to put the **four** metals in order of their reactivity.
Put the least reactive metal first.

least reactive \longrightarrow most reactive

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[2]

(d) Name **one** source of sulfur.

..... [1]

(e) Sulfur is used in the manufacture of sulfur dioxide and sulfuric acid.

(i) Give **one** different use of sulfur dioxide.

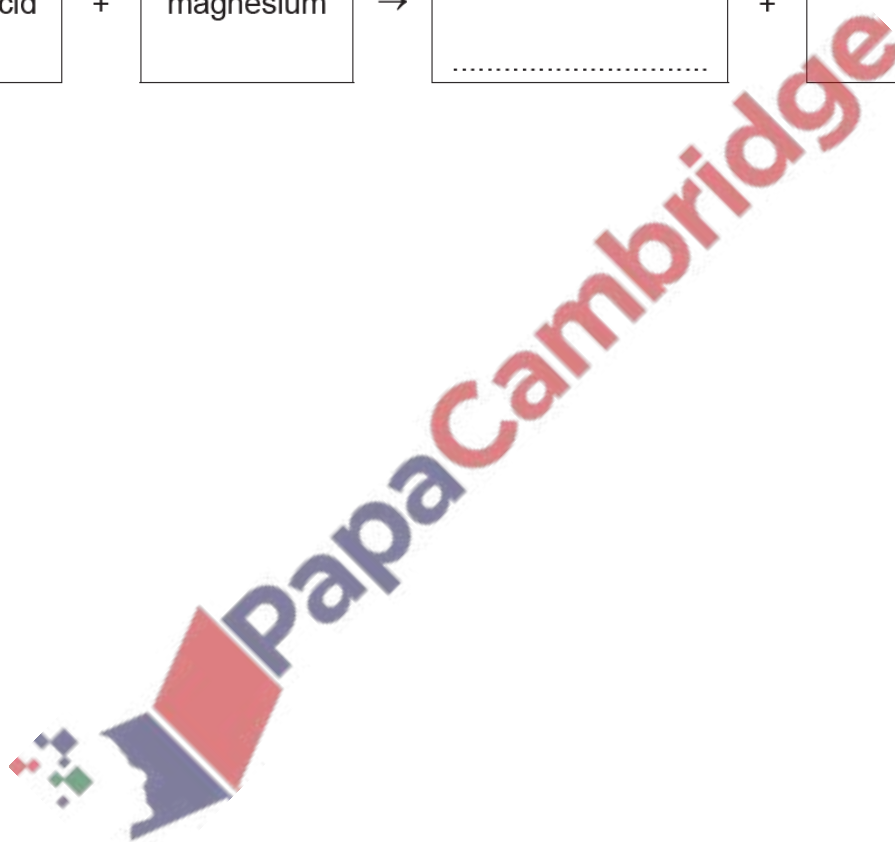
..... [1]

(ii) Complete the word equation for the reaction of dilute sulfuric acid with magnesium.



[2]

[Total: 11]

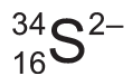


(a) Sulfur exists as a number of different isotopes.

What is meant by the term *isotopes*?

.....
.....
..... [2]

(b) A sulfide ion has the symbol shown.



(i) How many neutrons are contained in this sulfide ion?

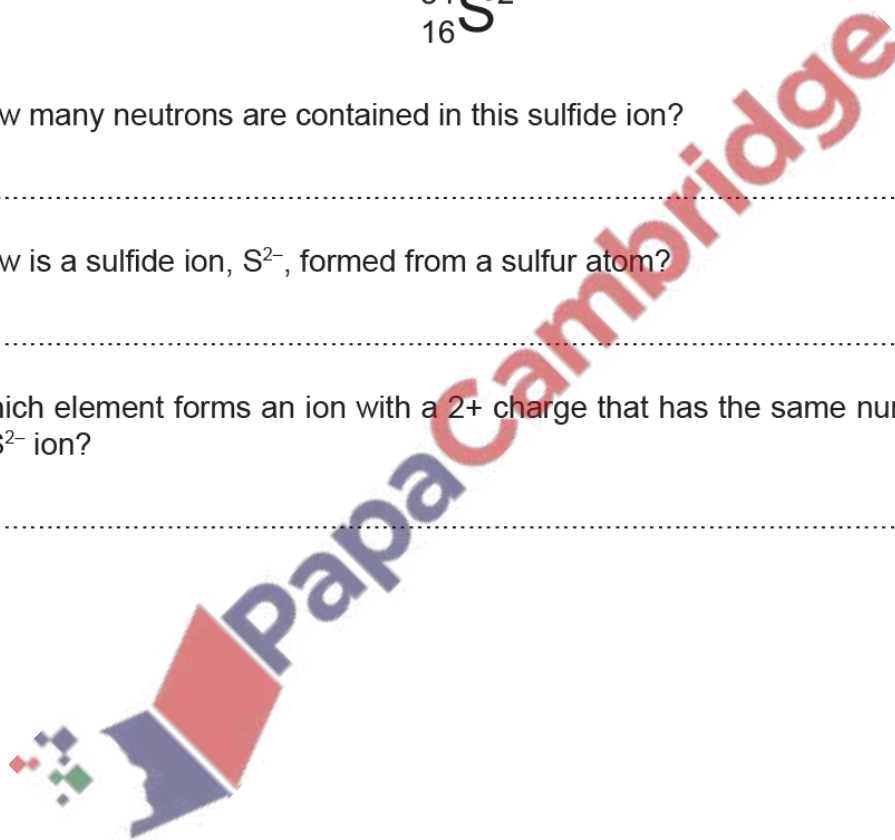
..... [1]

(ii) How is a sulfide ion, S^{2-} , formed from a sulfur atom?

..... [1]

(iii) Which element forms an ion with a 2+ charge that has the same number of electrons as a S^{2-} ion?

..... [1]



(c) The manufacture of sulfuric acid by the Contact process occurs in four stages.

stage 1 Molten sulfur is burned in air to produce sulfur dioxide gas.

stage 2 Sulfur dioxide is reacted with oxygen to form sulfur trioxide.

stage 3 Sulfur trioxide is combined with concentrated sulfuric acid to form oleum, $\text{H}_2\text{S}_2\text{O}_7$.

stage 4 Oleum is added to water to form sulfuric acid.

(i) Complete the chemical equation for **stage 1** by adding the appropriate state symbols.



(ii) Name the catalyst used in **stage 2** and state the temperature used.

catalyst

temperature °C

[2]

(iii) Write chemical equations for the reactions in **stage 3** and **stage 4**.

stage 3

stage 4

[2]

(d) Sulfur dioxide is a toxic gas.

(i) State one **environmental** reason why sulfur dioxide should **not** be released into the atmosphere.

..... [1]

(ii) Describe the test for sulfur dioxide.

test

.....

observations

.....

[2]

(e) Sulfur dioxide reacts with aqueous sodium sulfite to produce a compound with the following composition by mass: 29.1% Na, 40.5% S and 30.4% O.

Calculate the empirical formula of this compound.

empirical formula = [3]

[Total: 16]

