

- 1 A student carries out an investigation to compare the reactivities of four metals, aluminium, copper, zinc and M.

He adds strips of zinc to the aqueous solutions of the nitrates of each metal.

After a few minutes he removes the strips of zinc and examines them.

The table shows his results.

Solution	Result
aluminium nitrate	no change
copper(II) nitrate	brown coating on zinc
zinc nitrate	no change
nitrate of metal M	grey coating on zinc

- (a) Name the substance that causes the brown coating on the zinc.

(1)

copper

- (b) State why there is no change in the experiment with zinc nitrate solution.

(1)

zinc can't displace zinc because they have the same reactivity

- (c) The student repeats the experiment with strips of metal M instead of strips of zinc. The table shows his results.

Solution	Result
aluminium nitrate	no change
copper(II) nitrate	brown coating on M
zinc nitrate	no change
nitrate of metal M	no change

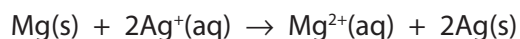
Using information from both tables of results, place the metals aluminium, copper, zinc and M in order of decreasing reactivity.

(2)

most reactive **Al**
..... **Zn**
..... **M**
least reactive **Cu**

(d) Magnesium reacts with an aqueous solution of silver nitrate.

The reaction can be represented by the ionic equation



(i) State why this reaction is described as a redox reaction.

(1)

one reactant is being reduced and the other is oxidised

(ii) Explain, in terms of electrons, which species is behaving as an oxidising agent in this reaction.

(2)

Ag is the oxidising agent because it is positively charged and so can cause another species to lose electrons, i.e. be oxidised.

(Total for Question 1 = 7 marks)

2 The table gives information about barium salts.

Barium salt	Formula	Solubility in water	Toxic (poisonous)
barium chloride	BaCl₂	soluble	yes
barium nitrate	Ba(NO ₃) ₂	soluble	yes
barium carbonate	BaCO₃	insoluble	no
barium sulfate	BaSO ₄	insoluble	no

(a) Complete the table by giving the formula of barium chloride and of barium carbonate.

(2)

(b) The human stomach contains hydrochloric acid.

Suggest why barium carbonate may cause poisoning when it enters the stomach.

(2)

It may react with the HCl to form BaCl₂ which is toxic

(c) Before patients have stomach X-rays they are given a barium salt to swallow.

Which salt in the table is safe to use?

(1)

Barium Sulphate

(d) A student accidentally swallowed a small amount of barium hydroxide solution, which is poisonous.

Suggest a reason why a solution of magnesium sulfate could be given to the student to swallow as a first aid treatment. Write a word equation for the reaction that takes place.

(3)

Reason.....**Magnesium Sulphate would react with the Barium hydroxide to form Barium sulphate which is not toxic and is insoluble so can't be absorbed into the blood.**

Word equation

barium hydroxide + magnesium sulphate -> barium sulphate + magnesium hydroxide.

(e) The table gives information about the first five elements in Group 2 of the Periodic Table.

Element	Atomic number	Reaction with cold water	Reaction with air
beryllium	4	no reaction	burns when strongly heated
magnesium	12	reacts very slowly	burns when heated
calcium	20	reacts slowly	reacts slowly without heating
strontium	38	reacts quickly	reacts quickly without heating
barium	56		

Use the information in the table to help you answer the questions.

(i) Suggest how barium reacts with cold water and with air.

(2)

Reaction with cold water **reacts very quickly, fizzing violently.**

.....

Reaction with air **reacts very quickly without heating**

.....

(ii) Use your answer to (e)(i) to suggest how barium should be stored.

(1)

barium should be stored in an oil-filled container to protect it from the air.

.....

(iii) Suggest a connection between the atomic number and the reactivity of the elements in Group 2.

(1)

The higher the atomic number the more reactive the metal.

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(Total for Question 2 = 12 marks)

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