Paper 3

Questions are applicable for both core and extended candidates

1 Samarium is a metal.

(d) Table 5.1 shows the observations when samarium and three other metals are heated in oxygen.

Table 5.1

metal	observations
nickel	reacts very slowly
samarium	reacts rapidly
strontium	reacts very rapidly
yttrium	does not react

Put the four metals in order of their reactivity.
Put the least reactive metal first.

least reactive ⟶ most reactive

[2]

2 This question is about metals and compounds of metals.

(d) Table 4.2 shows the reactions of four different metals with steam.

Table 4.2

metal	reaction with steam
iron	reacts slowly
magnesium	reacts very rapidly
nickel	reacts very slowly
niobium	does not react

Put the four metals in order of their reactivity.
Put the least reactive metal first.

least reactive ⟶ most reactive

[2]

3 This question is about metals.

(d) Table 5.1 shows the observations made when four different metals react with dilute hydrochloric acid of the same concentration.

Table 5.1

metal	observations
iron	bubbles form slowly
lead	no bubbles formed
magnesium	bubbles form rapidly
nickel	bubbles form very slowly

Put the four metals in order of their reactivity.
Put the least reactive metal first.

least reactive → most reactive

[2]

4 This question is about metals and metal compounds.

(d) Table 5.2 gives some observations about the reactivity of four metals with dilute hydrochloric acid.

Table 5.2

metal	observations
iron	bubbles form slowly
magnesium	bubbles form very quickly
mercury	no bubbles form
tin	bubbles form very slowly

Put the four metals in order of their reactivity.
Put the least reactive metal first.

least reactive → most reactive

[2]

5 (c) (i) Table 3.1 compares the reactivity of cobalt with that of three other metals.

Table 3.1

metal	reactivity with cold water	reactivity with steam
barium	reacts rapidly	
cobalt	no reaction	reacts slowly when heated
magnesium	reacts very slowly	reacts rapidly
zinc	no reaction	reacts easily when heated

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

least reactive → most reactive

[2]

6 This question is about metals.

(c) Place these metals in order of their reactivity with oxygen.

copper
magnesium
potassium
zinc

Put the least reactive metal first.

least reactive → most reactive

[2]

7 This question is about metals.

(e) The table shows the rates of reaction of four metals with steam.

metal	rate of reaction
magnesium	fast
nickel	slow
sodium	very fast
tin	very slow

Put the four metals in order of their reactivity.
Put the least reactive metal first.

least reactive → most reactive

[2]

Paper 4

Questions are applicable for both core and extended candidates unless indicated in the question

8 Boron and aluminium are Group III elements.

(e) Explain the apparent unreactivity of aluminium. **(extended only)**

.....

..... [2]

9 Copper is a transition element. It has variable oxidation states.

(c) Copper metal is obtained when scrap iron is added to aqueous copper(II) sulfate.

(i) The reaction between iron and aqueous copper(II) sulfate is a displacement reaction.

State why this displacement reaction takes place. **(extended only)**

.....

..... [1]

(ii) Write a symbol equation for the reaction between iron and aqueous copper(II) sulfate.

(extended only)

..... [1]

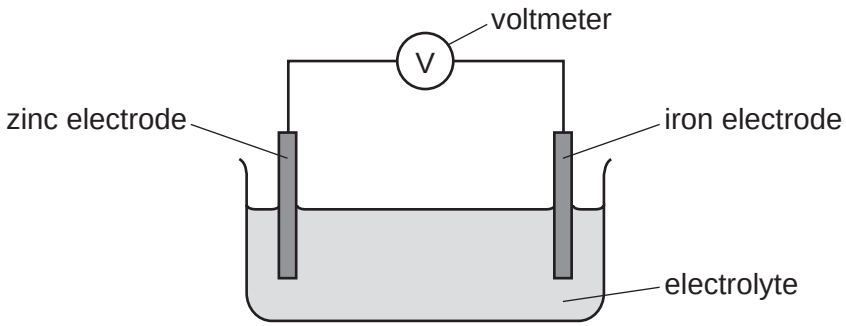
(iii) A displacement reaction is one method for obtaining copper metal from aqueous copper(II) sulfate.

Identify **another** method for obtaining copper metal from aqueous copper(II) sulfate.

..... [1]

10 This question is about chemical reactions and electricity.

The diagram shows the apparatus used in the production of electrical energy in a simple cell.



The zinc electrode dissolves in the electrolyte forming $Zn^{2+}(aq)$ ions.

(b) The reading on the voltmeter can be increased if either zinc or iron is replaced by another metal.

(i) Name a metal that can replace zinc and increase the reading on the voltmeter.

(extended only)

..... [1]

(ii) Name a metal that can replace iron and increase the reading on the voltmeter.

(extended only)

..... [1]