Paper 1

Questions are applicable for both core and extended candidates

1 The table shows the results of separately heating four metals with oxides of different metals.

The four metals are iron, copper, magnesium and Y.

The results are shown.

metal	magnesium oxide	Y oxide	copper oxide	iron oxide
iron	✗	✗	✓	✗
copper	✗	✗	✗	✗
magnesium	✗	✓	✓	✓
Y	✗	✗	✓	✓

key

✓ = reaction

✗ = no reaction

What is the order of reactivity of the metals, least reactive first?

	least reactive →			most reactive
A	copper	iron	Y	magnesium
B	copper	Y	iron	magnesium
C	magnesium	iron	Y	copper
D	magnesium	Y	iron	copper

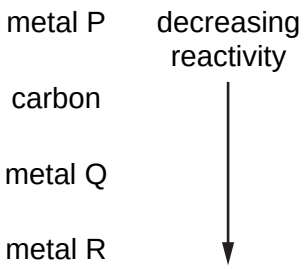
2 Some statements about the reactions of the metals tin, lithium and manganese are listed.

- Tin does not react with steam but does react with dilute hydrochloric acid.
- Lithium reacts with cold water.
- Manganese does not react with cold water but does react with steam.

What is the order of reactivity of the three metals?

	least reactive →		most reactive
A	lithium	manganese	tin
B	tin	lithium	manganese
C	manganese	tin	lithium
D	tin	manganese	lithium

3 Part of the reactivity series of metals is shown.



Which row shows how each metal is extracted from its ore?

	metal P	metal Q	metal R
A	electrolysis of molten ore	electrolysis of molten ore	heating with carbon
B	heating with carbon	electrolysis of molten ore	electrolysis of molten ore
C	heating with carbon	heating with carbon	electrolysis of molten ore
D	electrolysis of molten ore	heating with carbon	heating with carbon

4 Metals W, X, Y and Z are reacted with dilute hydrochloric acid.

The oxides of metals W, X, Y and Z are heated with carbon.

The results are shown.

reaction	W	X	Y	Z
metal + dilute hydrochloric acid	fizzing	fizzing	violent fizzing	no reaction
metal oxide + carbon and heat	no reaction	metal produced	no reaction	metal produced

What is the order of reactivity of the metals?

	most reactive →			least reactive
A	Y	W	X	Z
B	Y	X	W	Z
C	Z	W	X	Y
D	Z	X	W	Y

Paper 2

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

5 The equation for the reaction of metal M with aqueous zinc sulfate is shown.

$$M(s) + ZnSO_4(aq) \rightarrow MSO_4(aq) + Zn(s)$$

Which statement explains why metal M reacts with aqueous zinc sulfate? **(extended only)**

A Zinc is less reactive than M because M is able to accept electrons from zinc ions.

B Zinc is a more powerful reducing agent than M.

C Zinc is more reactive than M because it can lose electrons more easily than M.

D Zinc ions can remove electrons from M.

6 Which statements about the metal zinc are correct?

1 It is extracted from the ore bauxite.

2 It is used to galvanise steel.

3 It is used to make the alloy brass.

4 It reacts with dilute hydrochloric acid to produce hydrogen gas.

A 1, 2 and 4 **B** 1, 3 and 4 **C** 2, 3 and 4 **D** 2 and 3 only

7 Zinc oxide reacts with carbon to produce zinc.

Which equation represents this reaction?

A $2ZnO + C \rightarrow 2Zn + CO$

B $2ZnO + 2C \rightarrow 2Zn + 2CO_2$

C $ZnO + C \rightarrow Zn + CO$

D $ZnO + 2C \rightarrow Zn + 2CO_2$

8 When a piece of aluminium foil is added to dilute hydrochloric acid, no effervescence is seen.

Which statement explains why no effervescence is seen? **(extended only)**

A Aluminium does not make a gas when it reacts with an acid.

B Aluminium has a surface layer of aluminium oxide.

C Aluminium is less reactive than hydrogen.

D Aluminium only reacts with concentrated acid.

9 The section of the reactivity series shown includes a newly discovered metal, symbol X.

Ca
Mg
Fe
X
H
Cu

The only oxide of X has the formula XO.

Which equation shows a reaction which occurs? **(extended only)**

A $Cu(s) + X^{2+}(aq) \rightarrow Cu^{2+}(aq) + X(s)$

B $2X(s) + Cu^{2+}(aq) \rightarrow 2X^{+}(aq) + Cu(s)$

C $X(s) + Fe_2O_3(s) \rightarrow 2Fe(s) + 3XO(s)$

D $X(s) + 2HCl(aq) \rightarrow XCl_2(aq) + H_2(g)$

10 Reactions of three metals and their oxides are shown.

metal	add dilute hydrochloric acid to metal	heat metal oxide with carbon
1	✓	✓
2	✓	✗
3	✗	✓

key
✓ = reacts
✗ = does not react

What is the order of reactivity of these metals, from most reactive to least reactive?

A $1 \rightarrow 2 \rightarrow 3$ **B** $1 \rightarrow 3 \rightarrow 2$ **C** $2 \rightarrow 1 \rightarrow 3$ **D** $2 \rightarrow 3 \rightarrow 1$