KS3 Science

Reactivity Series

Mark Scheme

Time available: 39 minutes
Marks available: 47 marks

Mark schemes

1.   (a)   (i)   any **one** from

- bubbles

- fizzing
    accept 'effervescence'

- gas is given off
    'metal goes into solution or turns into a salt'
    and 'there would be a rise in temperature'
    are insufficient answers as they are
    ***not** shown in the drawings*

         1 (L3)

   (ii)
- magnesium
    accept 'Mg'

- zinc
    accept 'Zn'

- iron
    accept 'Fe'

- copper
    accept 'Cu'
    answers must be in the correct order
    ***all four** answers are required for the mark*

         1 (L4)

(b)   (i)
- copper
    accept 'Cu'

         1 (L3)

   (ii)
- iron
    accept 'Fe'

         1 (L4)

         [4]

2. (a) any **one** from

- zinc displaces copper from the copper sulphate

- zinc changes places with copper

    accept 'copper is displaced by the zinc'

    accept 'the more reactive metal displaces
    ***or** takes the place of the other one'*

    accept 'zinc takes the sulphate'

1 (L6)

(b) • he only needed to find out the temperature rise **or** change

1 (L7)

(c) (i) any **one** from

- magnesium is the most reactive metal used

- the biggest difference in reactivity is between magnesium
  and copper

    accept 'magnesium is above the others'
    accept 'magnesium is more reactive than iron and zinc'

1 (L7)

(ii) any **one** from

- the reactivity is nearly the same

- they are next to each other in the reactivity series

    accept 'zinc is slightly more reactive than iron'

    'zinc is more reactive than iron' is insufficient

1 (L7)

(iii) •

mixture	Would there be a rise in temperature?
aluminium + sodium chloride	no
calcium + zinc sulphate	yes
lead + zinc chloride	no
magnesium + iron chloride	yes

award one mark for identifying the two reactions that take place

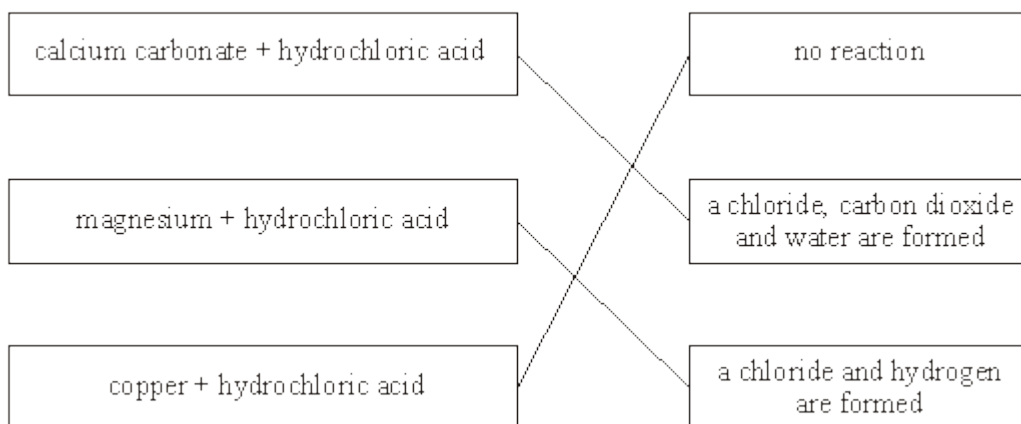*award one mark for identifying the two mixtures of chemicals which do not react*

2 (L7)

[6]

3. (a)

	copper	iron	magnesium	zinc
calcium nitrate	X	X	X	X
copper nitrate		✓	✓	✓
iron nitrate	X		✓	✓

award one mark for each correct row

3 (L7)

(b)

calcium carbonate + hydrochloric acid		no reaction
magnesium + hydrochloric acid		a chloride, carbon dioxide and water are formed
copper + hydrochloric acid		a chloride and hydrogen are formed

if all three answers are correct, award two marks
*if one **or** two answers are correct, award one mark*
if more than one line is drawn from a pair of reactants,
award no credit for that pair

2 (L7)

[5]

4.

(a) • magnesium displaces copper from the copper sulphate

       accept 'magnesium has taken the sulphate'

• copper is replaced by magnesium

       accept 'copper and magnesium change places'

1 (L6)

(b)

pairs of chemicals	*Does a displacement reaction take place? Yes or no*	*reason*
iron + sodium chloride	no	iron is below sodium (in the reactivity series) or sodium is above iron (in the reactivity series)
magnesium + lead nitrate	yes	magnesium is above lead (in the reactivity series) or lead is below magnesium (in the reactivity series)

accept 'iron is less reactive' **or** *the converse*

accept 'magnesium is more reactive' **or** *the converse*

both *the answer and the correct reason are required*
for each mark

2 (L7)

(c) (i) any **one** from

- add zinc to a solution of a salt of each of the other metals

  accept 'add zinc to copper chloride and if it reacts add it to a solution of a salt of the next metal up and so on'

- add each of the other metals to a solution of a zinc salt

  accept 'add the other metals to zinc chloride'

  accept any named zinc salt

1 (L7)

(ii) any **one** from

- place zinc between the metal in the salt which does react and the metal in the salt which does not react

  accept 'whatever zinc displaced should be below zinc'

- place zinc between the metal which does react and the metal which does not react

  accept 'put zinc below all the metals that react'

  parts (c)(i) and(c)(ii) should be marked together

  *do **not** accept 'test the other metals with zinc to see if they react'*

1 (L7)

[5]

5. (a) (i) iron

*do **not** accept '1540°C'*

1 (L3)

(ii) mercury

*do **not** accept '−37°C'*

1 (L3)

(b) solid *to a* liquid

answers must be in the correct order

***both** answers are required for the mark*

1 (L3)

(c) 5

1 (L3)

(d) (i) sodium

1 (L3)

(ii) gold

1 (L3)

[6]

6. (a) (i) electrolysis

allow 'react (ore) with potassium

1

(ii)　any **one** from:

　　　　allow gold

- zinc

- lead

- copper

1

(iii)　because hydrogen is more reactive than copper

　　　　accept the converse

1

(b)　(i)　carbon reacts with oxygen to make carbon dioxide.

　　　　accept C + O$_2$ → CO$_2$

1

　　　　carbon dioxide reacts with more carbon to make carbon monoxide

　　　　accept CO$_2$ + C → 2CO

　　　　*2C + O$_2$ → 2CO for **1** mark*

1

(ii)　Fe2O$_3$ + **3** CO → **2** Fe + **3** CO$_2$

　　　　correct reactants

1

　　　　correct products

1

　　　　correct balancing

1

(iii)　carbon **or** carbon monoxide is oxidised / takes oxygen

　　　　either order

1

　　　　iron (oxide) is reduced / loses oxygen

1

[10]

7.　(a)　aluminium oxide

1 (L7)

(b)　aluminium
iron
copper

　　　　answers must be in the correct order

　　　　*do **not** accept 'iron oxide'*

1 (L6)

(c) (i) no reaction

       accept 'nothing'

       accept 'zinc and calcium oxide'

       1 (L7)

(ii) any **one** from

- zinc

       accept 'Zn'

- silver

       accept 'Ag'

- magnesium

       accept 'Mg'

       1 (L7)

(d) zinc + oxygen →

       1 (L7)

zinc oxide

       1 (L7)

       [6]

8. (a) any **one** from

- there is a colour change

       *accept 'it goes green **or** orange'*
       'the colour' is insufficient

- a new metal is formed

       accept 'the iron filings change colour'

       1 (L5)

(b) (i) copper

       accept 'Cu'

       1 (L5)

(ii) iron sulphate

       accept 'FeSO$_4$'

       1 (L6)

(iii) • no ✓

any **one** from

• iron is more reactive than copper
accept 'iron is higher on the reactivity series'

• copper is less reactive than iron
accept 'copper does not displace iron'
both *an indication that the reaction does not happen*
and the explanation are required for the mark

1 (L6)

(c) • calcium ✓
potassium ✓
if more than two boxes are ticked, award no mark
both *answers are required for the mark*

1 (L6)

[5]