

# Reactivity series

## Question Paper 2

Level	IGCSE
Subject	Chemistry (0620/0971)
Exam Board	Cambridge International Examinations (CIE)
Topic	Metals
Sub-Topic	Reactivity series
Booklet	Question Paper 2

**Time Allowed:** 30 minutes

**Score:** /25

**Percentage:** /100

### Grade Boundaries:

9	8	7	6	5	4	3	2	1
>85%	75%	68%	60%	53%	48%	40%	33%	<25%

1. W, X and Y are metals, one of which is copper and one of which is iron.
- W has a coloured oxide which can be reduced by carbon.
  - X has a black oxide and is also found in nature as a pure metal.
  - Y has an oxide which cannot be reduced by carbon.

Which metal is the most reactive and what is the possible identity of W?

	most reactive metal	possible identity of W
<b>A</b>	X	Cu
<b>B</b>	X	Fe
<b>C</b>	Y	Cu
<b>D</b>	Y	Fe

2. Tin is a metal that is less reactive than iron and is extracted from its ore cassiterite,  $\text{SnO}_2$ .

Which statements about tin are correct?

- 1 Tin can be extracted from cassiterite using carbon.
- 2 Tin does not conduct electricity.
- 3 Tin is hard and shiny.

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

3. Some chemical properties of three metals W, X and Y and their oxides are shown.

metal	reaction with steam	reaction with dilute hydrochloric acid	reaction of metal oxide with carbon
W	reacts	reacts	reacts
X	no reaction	no reaction	reacts
Y	reacts	reacts	no reaction

What is the order of reactivity of these metals, most reactive first?

- A  $W \rightarrow Y \rightarrow X$
- B  $X \rightarrow Y \rightarrow W$
- C  $Y \rightarrow W \rightarrow X$
- D  $Y \rightarrow X \rightarrow W$

4. The list shows the order of reactivity of some elements.

K      Na      Ca      Mg      Zn      Fe      (H)      Cu

Which statement about the reactivity of these metals is correct?

- A Copper reacts with steam to form hydrogen gas.
- B Magnesium is more reactive than calcium.
- C Potassium reacts with water to form hydrogen gas.
- D Sodium oxide is reduced by carbon to sodium.

5. A student investigated the reactions of four metals, R, S, T and U, with solutions of their salts.

The results are given in the table.

metal	metal salt	result
R	S nitrate	reacts
R	T nitrate	reacts
S	U nitrate	no reaction
T	U nitrate	reacts
U	R nitrate	no reaction

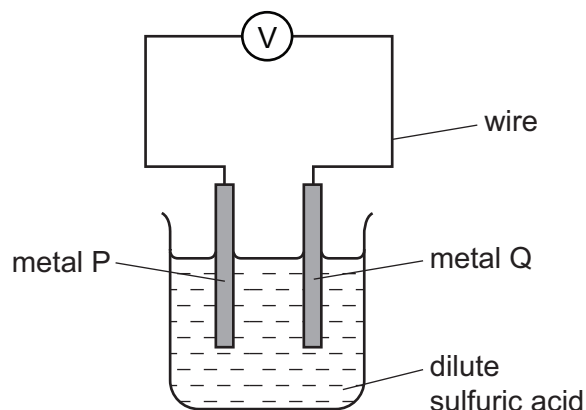
What is the order of reactivity of the metals, most reactive first?

- A** R → S → U → T  
**B** R → T → U → S  
**C** S → U → T → R  
**D** U → R → T → S
6. Some magnesium compounds undergo thermal decomposition.

What are the products of thermal decomposition of magnesium nitrate,  $\text{Mg}(\text{NO}_3)_2$ , and magnesium hydroxide,  $\text{Mg}(\text{OH})_2$ ?

	$\text{Mg}(\text{NO}_3)_2$	$\text{Mg}(\text{OH})_2$
<b>A</b>	MgO, $\text{NO}_2$ and $\text{O}_2$	MgO and $\text{H}_2\text{O}$
<b>B</b>	MgO, $\text{NO}_2$ and $\text{O}_2$	MgO and $\text{H}_2$
<b>C</b>	$\text{Mg}(\text{NO}_2)_2$ and $\text{O}_2$	MgO and $\text{H}_2\text{O}$
<b>D</b>	$\text{Mg}(\text{NO}_2)_2$ and $\text{O}_2$	MgO and $\text{H}_2$

7. The diagram shows a simple cell.



Which pair of metals produces the largest voltage?

	metal P	metal Q
<b>A</b>	iron	copper
<b>B</b>	magnesium	copper
<b>C</b>	magnesium	zinc
<b>D</b>	zinc	copper

8. Four metals P, Q, R and S are added to separate aqueous solutions of their ions.

The results are shown.

metal	P <sup>2+</sup>	Q <sup>2+</sup>	R <sup>2+</sup>	S <sup>2+</sup>	
P	x	x	✓	✓	key ✓ = reaction occurs x = reaction does not occur
Q	✓	x	✓	✓	
R	x	x	x	x	
S	x	x	✓	x	

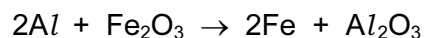
What is the order of reactivity of the metals, most reactive first?

- A** Q → P → S → R
- B** Q → S → P → R
- C** R → P → S → Q
- D** R → S → P → Q

9. Which metal reacts with steam but **not** with cold water?

- A calcium
- B copper
- C sodium
- D zinc

10. The reaction below is called the ‘thermite reaction’.



Which pair of substances reacts in a similar way?

- A Fe and MgO
- B Fe and ZnO
- C Mg and CuO
- D Zn and  $Al_2O_3$

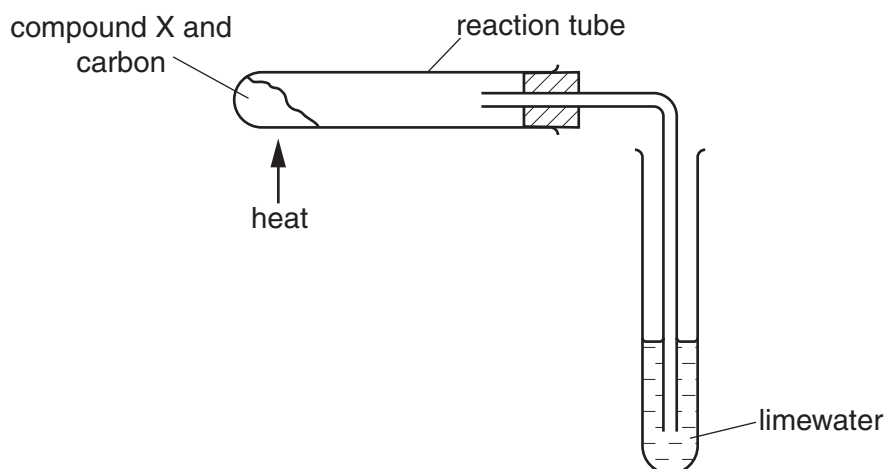
11. The table shows the results of adding three metals, P, Q and R, to dilute hydrochloric acid and to water.

metal	dilute hydrochloric acid	water
P	hydrogen produced	hydrogen produced
Q	no reaction	no reaction
R	hydrogen produced	no reaction

What is the order of reactivity of the metals?

	most reactive	→	least reactive
<b>A</b>	P		Q
<b>B</b>	P		R
<b>C</b>	R		P
<b>D</b>	R		Q

12 Compound X is heated with carbon using the apparatus shown.



A brown solid is formed in the reaction tube and the limewater turns cloudy.

What is compound X?

- A calcium oxide
- B copper(II) oxide
- C magnesium oxide
- D sodium oxide

13. Some reactions of three metals are listed in the table.

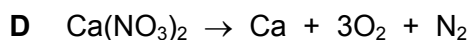
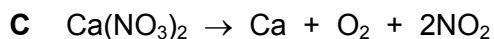
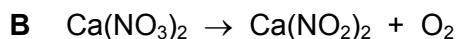
metal	metal reacts with dilute hydrochloric acid	metal oxide is reduced by carbon
P	yes	no
Q	no	yes
R	yes	yes

What is the order of reactivity of the metals?

	most reactive	→	least reactive
<b>A</b>	P	R	Q
<b>B</b>	Q	P	R
<b>C</b>	R	P	Q
<b>D</b>	R	Q	P

14. Calcium nitrate decomposes when it is heated.

What is the equation for the thermal decomposition of calcium nitrate?



15. Some metal nitrates and carbonates decompose when heated strongly.

Metal Q has a nitrate that decomposes to give a salt and a colourless gas only.

The carbonate of metal Q does not decompose when heated with a Bunsen burner.

What is metal Q?

A calcium

B copper

C sodium

D zinc



16. Some reactions of three metals and their oxides are shown.

metal	metal reacts with dilute hydrochloric acid	metal oxide reacts with carbon
S	no	yes
T	yes	no
U	yes	yes

What is the order of reactivity of the metals?

	least reactive	→	most reactive
<b>A</b>	S		U
<b>B</b>	S		T
<b>C</b>	T		U
<b>D</b>	U		S

17. Calcium, copper, iron and magnesium are metals. They can be placed in order of reactivity.

Which statement is correct?

- A** Copper reacts with dilute hydrochloric acid to form copper(II) chloride.
- B** Iron reacts with steam but magnesium does not.
- C** Iron(II) oxide cannot be reduced by heating strongly with carbon.
- D** Magnesium and calcium both react with hot water.

18 Which row shows how the metal reacts?

	metal	reacts with dilute acid	reacts rapidly with cold water	reacts with steam
<b>A</b>	calcium	x	✓	✓
<b>B</b>	copper	✓	x	x
<b>C</b>	magnesium	✓	x	✓
<b>D</b>	zinc	✓	x	x

19. A list of metals is shown.

aluminium  
copper  
iron  
magnesium  
silver  
zinc

Which metal will displace all of the other metals from aqueous solutions of their salts?

- A** aluminium
- B** iron
- C** magnesium
- D** zinc

20 The section of the reactivity series shown includes a newly discovered element, symbol X.

The only oxide of X has the formula XO.

Ca

Mg

Fe

X

H

Cu

Which equation shows a reaction which occurs?

- A  $\text{Cu(s)} + \text{X}^{2+}(\text{aq}) \rightarrow \text{Cu}^{2+}(\text{aq}) + \text{X(s)}$
- B  $2\text{X(s)} + \text{Cu}^{2+}(\text{aq}) \rightarrow 2\text{X}^+(\text{aq}) + \text{Cu(s)}$
- C  $\text{X(s)} + \text{Fe}_2\text{O}_3(\text{s}) \rightarrow 2\text{Fe(s)} + 3\text{XO(s)}$
- D  $\text{X(s)} + 2\text{HCl(aq)} \rightarrow \text{XCl}_2(\text{aq}) + \text{H}_2(\text{g})$

21 Which statement about **all** metals is correct?

- A They are attracted to a magnet.
- B They are weak and brittle.
- C They may be used to form alloys.
- D They react with water.

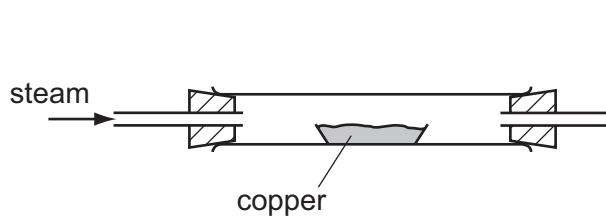
22 Which metal carbonate does **not** produce carbon dioxide when it is heated with a Bunsen burner?

- A copper(II) carbonate
- B magnesium carbonate
- C sodium carbonate
- D zinc carbonate

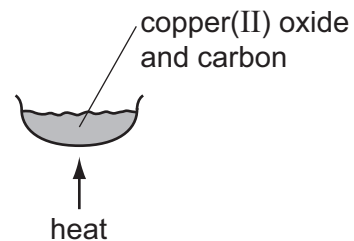
23 Two experiments are carried out.

In experiment 1, copper is heated with steam.

In experiment 2, copper(II) oxide is heated with carbon.



experiment 1



experiment 2

Which row describes what happens in experiments 1 and 2?

	experiment 1	experiment 2
<b>A</b>	no reaction	no reaction
<b>B</b>	no reaction	reaction
<b>C</b>	reaction	no reaction
<b>D</b>	reaction	reaction

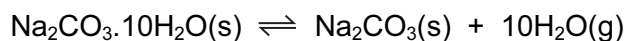
24 Metal X is added to a colourless aqueous solution of the sulfate of metal Y.

A coloured solution is formed and metal Y is deposited at the bottom of the beaker.

Which row describes elements X and Y and their relative reactivity?

	type of element	relative reactivity
<b>A</b>	X is a transition element	X is more reactive than Y
<b>B</b>	X is a transition element	Y is more reactive than X
<b>C</b>	Y is a transition element	X is more reactive than Y
<b>D</b>	Y is a transition element	Y is more reactive than X

25 The equation for the effect of heat on hydrated sodium carbonate is as shown.



Statements made by four students about the reaction are given.

- P Anhydrous sodium carbonate is formed.
- Q Steam is formed.
- R There is a colour change from blue to white.
- S The reaction is reversible.

Which students' statements are correct?

- A** P, Q and R only
- B** P, Q and S only
- C** Q, R and S only
- D** P, Q, R and S