

- 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	C
<b>B</b>	X	F
<b>C</b>	Y	C
<b>D</b>	Y	F

- 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                      **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**  $Y \rightarrow X \rightarrow W$

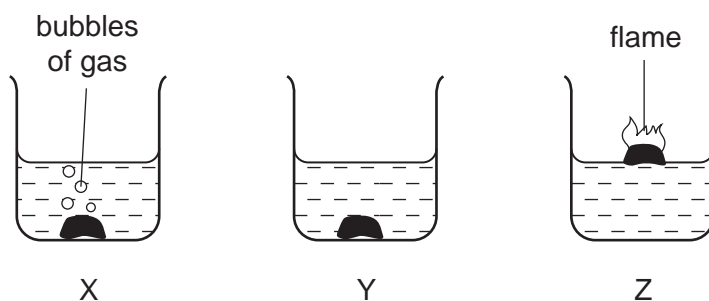
- 4 The list shows the order of reactivity of some elements.

K      Na      Ca      Mg      Zn      Fe      (H)

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 The diagrams show what happens when three different metals are added to water.



What are X, Y and Z?

	X	Y	Z
<b>A</b>	calcium	copper	potassium
<b>B</b>	copper	calcium	potassium
<b>C</b>	potassium	calcium	copper
<b>D</b>	potassium	copper	calcium

6 Which substances do **not** react together?

- A** calcium + water
- B** copper + dilute hydrochloric acid
- C** sodium + water
- D** zinc + dilute hydrochloric acid

7 W, X, Y and Z are four metals.

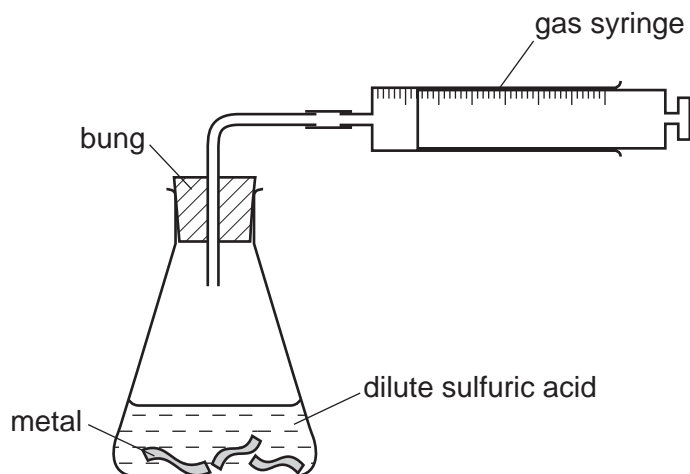
Some properties of these metals are listed below.

- 1 Only W and Z can be extracted by reduction of their oxides with carbon.
- 2 Only X will react with cold water.
- 3 Only Z can be found 'native' (not combined with any other element).

What is the correct order of these metals in the reactivity series (most reactive first)?

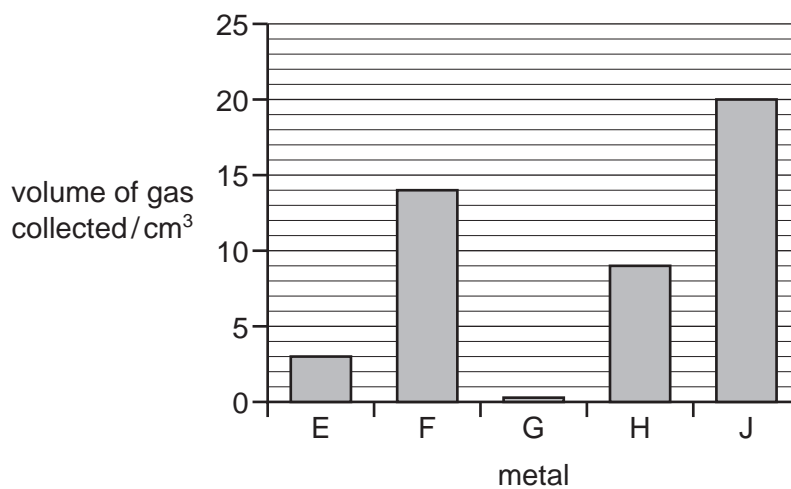
- A** X, W, Y, Z
- B** X, Y, W, Z
- C** Z, W, Y, X
- D** Z, Y, W, X

- 8 Samples of five different metals, E, F, G, H and J were reacted with dilute sulfuric acid using the apparatus shown.



The volume of hydrogen gas collected after one minute was measured.

The results are shown on the bar chart.



What is the order of reactivity of the metals (most reactive first)?

- A** E, F, G, H, J
- B** G, E, H, F, J
- C** J, F, H, E, G
- D** J, H, G, F, E

9 The statements describe how different metals react with cold water.

- Calcium sinks, fizzing and releasing a steady stream of hydrogen.
- Copper does not react.
- Sodium floats, fizzing and rapidly releasing hydrogen.
- Zinc does not react but does react with steam, releasing hydrogen.

Using the information, where should hydrogen be placed in the reactivity series?

- A** below copper
- B** between sodium and calcium
- C** between calcium and zinc
- D** between zinc and copper

10 Metal X lies between zinc and iron in the reactivity series.

Which statements about metal X are correct?

- 1 It reacts with steam to produce hydrogen gas.
- 2 It does not react with steam but will produce hydrogen with dilute acid.
- 3 The metal can be obtained from its oxide by heating strongly with charcoal.
- 4 The metal oxide cannot be reduced using carbon.

- A** 1 and 3      **B** 1 and 4      **C** 2 and 3      **D** 2 and 4

11 The table shows the reactions of four different metals with water.

metal	reaction
W	reacts vigorously with cold water
X	no reaction with water
Y	reacts very slowly with water, more vigorously with steam
Z	reacts violently with cold water

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

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

12 The oxide of element X is reduced by heating with carbon.

Element X does not react with cold water, steam or dilute hydrochloric acid.

What is X?

- A copper
- B iron
- C magnesium
- D zinc

13 An element X has the two properties listed.

- 1 It acts as a catalyst.
- 2 It forms colourless ions.

Which of these properties suggest that X is a transition element?

	property 1	property 2
A	✓	✓
B	✓	x
C	x	✓
D	x	x

- 14 In an experiment, three test-tubes labelled X, Y and Z were half-filled with dilute hydrochloric acid. A different metal was added to each test-tube. After a few minutes the following observations were made.

In tube X, bubbles slowly rose to the surface.

In tube Y, there was a rapid release of bubbles.

In tube Z, no bubbles were produced.

Which three metals match the observations?

	tube X	tube Y	tube Z
<b>A</b>	copper	zinc	iron
<b>B</b>	magnesium	iron	copper
<b>C</b>	zinc	magnesium	copper
<b>D</b>	zinc	magnesium	iron

- 15 A student carried out an experiment to find the order of reactivity of five metals. They were tested with cold water, hot water and steam and the results recorded in a table.

metal	cold water	hot water	steam
V	no reaction	reacts slowly	vigorous reaction
W	no reaction	no reaction	slow reaction
X	reacts slowly	vigorous reaction	not attempted
Y	no reaction	no reaction	no reaction
Z	vigorous reaction	explosive reaction	not attempted

What is the order of reactivity of these metals?

	most reactive $\longrightarrow$ least reactive				
<b>A</b>	V		Y	X	Z
<b>B</b>	W		Z	V	Y
<b>C</b>	Z		V	W	Y
<b>D</b>	Z		Y	W	V

16 Reactions of three metals and their oxides are listed in the table.

metal	reacts with cold water	metal oxide reacts with carbon
W	no	no
X	no	yes
Y	yes	no

What is the order of reactivity of the metals?

	least reactive	→	most reactive
<b>A</b>	W	X	Y
<b>B</b>	X	W	Y
<b>C</b>	X	Y	W
<b>D</b>	Y	W	X

17 The list gives the order of some metals (and hydrogen) in the reactivity series.

Metal X is also included:

Most reactive      K  
                          Mg  
                          Zn  
                          (H)  
                          X  
 Least reactive      Cu

Which row correctly shows the properties of metal X?

	reacts with dilute acids	oxide reduced by carbon
<b>A</b>	no	no
<b>B</b>	no	yes
<b>C</b>	yes	no
<b>D</b>	yes	yes



18 Below are some metals in decreasing order of reactivity.

magnesium

zinc

iron

copper

Titanium reacts with acid and cannot be extracted from its ore by heating with carbon.

Where should titanium be placed in this list?

- A** below copper
- B** between iron and copper
- C** between magnesium and zinc
- D** between zinc and iron

19 Q, R, S and T are four metals.

Q is found naturally as the metal.

R reacts with steam but not with cold water.

S reacts violently with cold water.

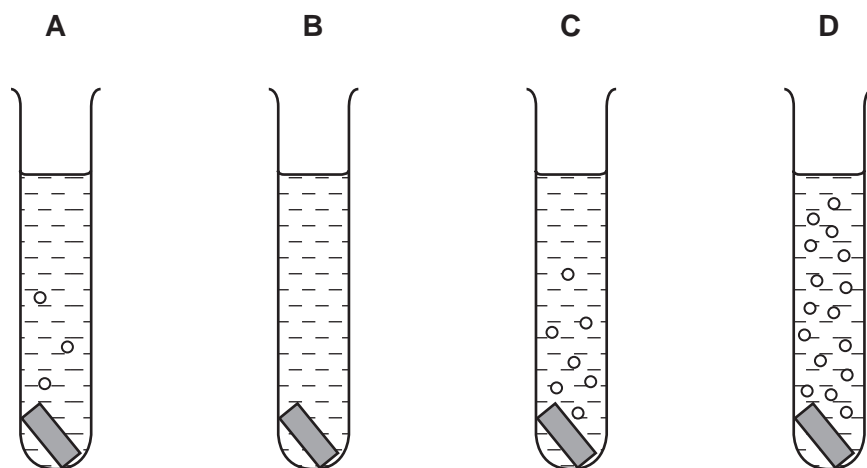
The oxide of T is reduced to T by heating with carbon.

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

- A**  $Q \rightarrow R \rightarrow T \rightarrow S$
- B**  $Q \rightarrow T \rightarrow R \rightarrow S$
- C**  $S \rightarrow R \rightarrow Q \rightarrow T$
- D**  $S \rightarrow R \rightarrow T \rightarrow Q$

- 20 Pieces of copper, iron, magnesium and zinc are added to separate test-tubes containing dilute hydrochloric acid.

Which test-tube contains iron and dilute hydrochloric acid?



- 21 How does the reactivity of potassium compare with that of sodium and how does the reactivity of calcium compare with that of magnesium?

	reactivity of potassium and sodium	reactivity of calcium and magnesium
<b>A</b>	K greater than Na	Ca greater than Mg
<b>B</b>	K greater than Na	Mg greater than Ca
<b>C</b>	Na greater than K	Ca greater than Mg
<b>D</b>	Na greater than K	Mg greater than Ca

22 Metal X reacts violently with water.

Metal Y reacts slowly with steam.

Metal Z does not react with dilute hydrochloric acid.

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

**A**  $X \rightarrow Y \rightarrow Z$

**B**  $X \rightarrow Z \rightarrow Y$

**C**  $Z \rightarrow X \rightarrow Y$

**D**  $Z \rightarrow Y \rightarrow X$

23 A metal has the following properties.

- It does not react with cold water.
- It reacts with dilute hydrochloric acid.
- It cannot be extracted from its oxide using carbon.

Between which two metals in the reactivity series should it be placed?

**A** calcium and magnesium

**B** iron and copper

**C** magnesium and zinc

**D** zinc and iron

24 A chemical engineer plans to produce hydrochloric acid.

Which metal is best for the reaction container?

**A** copper

**B** iron

**C** magnesium

**D** zinc

- 25 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	R	Q
<b>B</b>	P	Q	R
<b>C</b>	R	Q	P
<b>D</b>	R	P	Q

- 26 The table shows some reactions of the halogens.

Which reaction is the most likely to be explosive?

reaction	chlorine gas	bromine gas	iodine gas
reaction with hydrogen	<b>A</b>	<b>B</b>	<b>C</b>
reaction with iron	very vigorous	less vigorous	<b>D</b>

- 27 Some metals react readily with dilute hydrochloric acid.

Some metals can be extracted by heating their oxides with carbon.

For which metal are **both** statements correct?

- A** calcium
- B** copper
- C** iron
- D** magnesium

28 The diagram shows the positions of elements P, Q, R, S and T in the Periodic Table.

These letters are not the chemical symbols for the elements.

[illegible]

Which statement about the properties of these elements is correct?

- A** P reacts more vigorously with water than does Q.
- B** P, Q and R are all metals.
- C** T exists as diatomic molecules.
- D** T is more reactive than S.

29 The table compares the properties of Group I elements with those of transition elements.

Which entry in the table is correct?

	property	Group I elements	transition elements
A	catalytic activity	low	high
B	density	high	low
C	electrical conductivity	low	high
D	melting point	high	low

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

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

What is the order of reactivity of the metals?

	most reactive	→	least reactive
<b>A</b>	G	H	J
<b>B</b>	H	G	J
<b>C</b>	H	J	G
<b>D</b>	J	H	G

31 Which property do all metals have?

- A** They are hard.
- B** They conduct electricity.
- C** They form acidic oxides.
- D** They react with water.