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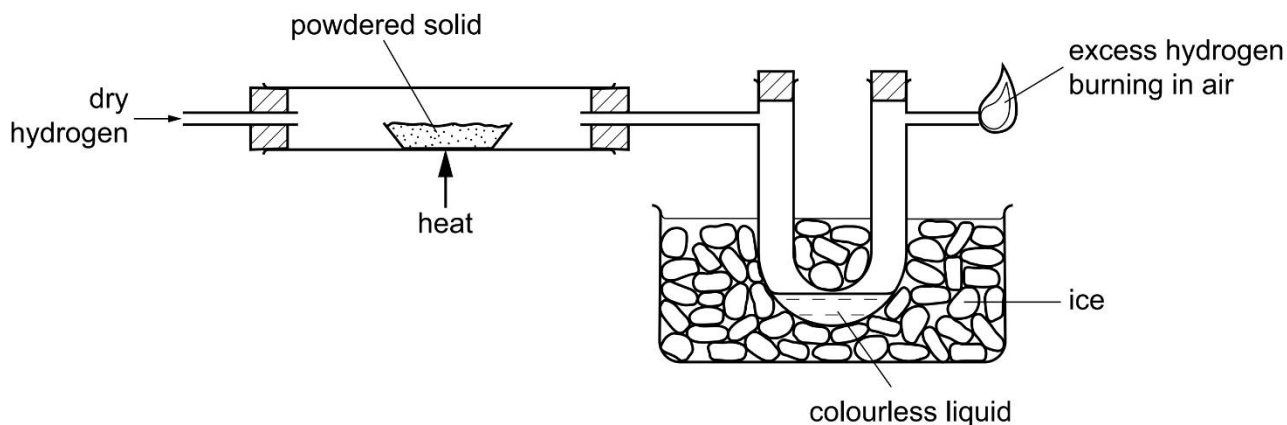
Multiple-choice Questions on Metals

1. Chromium is between zinc and iron in the reactivity series.

Which element reduces the oxide of chromium?

A Carbon **B** Copper **C** Iron **D** Lead

2. Dry hydrogen gas is passed over a heated powdered solid and then through a cooled U-tube before the excess of hydrogen is burned in air.



A colourless liquid collects in the U-tube.

What could the powdered solid be?

A Calcium oxide **B** Copper(II) oxide
C Magnesium **D** Zinc oxide

3. Which oxide is most readily reduced to the metal by heating in a stream of hydrogen?

A Calcium oxide
B Lead(II) oxide
C Sodium oxide
D Zinc oxide

4. A metal, **X**, has a low melting point, reacts with water, forms only one oxide and is extracted from its ore by electrolysis.

What is the identity of **X**?

A Aluminium **B** Copper **C** Iron **D** Sodium

5. Metallic objects may be decorated by having very thin layers of gold applied to them.
Which properties of gold make it suitable for this use?

	it conducts electricity	it is malleable	it is unreactive
A	✗	✓	✓
B	✓	✗	✓
C	✓	✓	✗
D	✓	✓	✓

6. Iron pipes corrode rapidly when exposed to sea water.
Which metal, when attached to the iron, would **not** offer protection against corrosion?

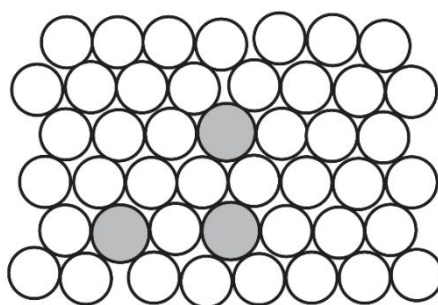
A Aluminium **B** Copper **C** Magnesium **D** Zinc

7. Metal **M** will displace copper from aqueous copper(II) sulfate solution, but will not displace iron from aqueous iron(II) sulfate solution. **M** is extracted from its oxide by heating the oxide with carbon.

What is the order of reactivity of these four metals?

	least reactive → → → most reactive			
A	sodium	metal M	iron	copper
B	sodium	iron	metal M	copper
C	copper	iron	metal M	sodium
D	copper	metal M	iron	sodium

8. The diagram shows the structure of an alloy.



Which statement about alloys is correct?

- A** Alloys can only be formed by mixing copper or iron with other metals.
B High carbon steel alloys are soft and easily shaped.
C In an alloy there is attraction between positive ions and delocalised electrons.
D The alloy brass has a chemical formula.

9. The metals iron, lead and zinc can be manufactured by the reduction of their oxides with coke. What is the correct order of the ease of reduction of the metal oxides?

	→ oxides become more difficult to reduce →
A	iron → lead → zinc
B	iron → zinc → lead
C	lead → iron → zinc
D	zinc → iron → lead

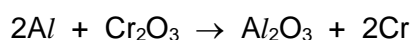
10. Which metal can react rapidly with steam but reacts only **very slowly** with cold water?

A Calcium **B** Copper **C** Iron **D** Potassium

11. What suggests that metal *M* is **not** in Group 1 of the Periodic Table?

- A** *M* has a bright, silvery appearance and is a good conductor of electricity.
B *M* is hard and difficult to cut.
C *M* produces an alkaline solution when it reacts with water.
D *M* produces hydrogen gas when it reacts with water.

12. Aluminium reacts with chromium(III) oxide as shown.



Which statements are correct?

- 1 Aluminium is more reactive than chromium.
 2 A similar reaction would also take place between aluminium and iron(III) oxide.
 3 Iron(III) oxide is reduced by another metal in the blast furnace.

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

13. Brass is an alloy.

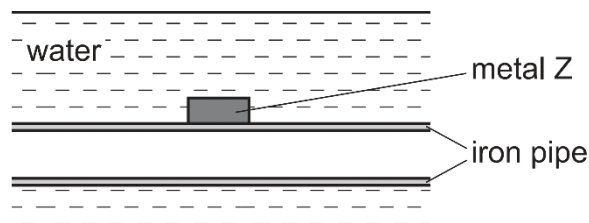
Which statement about brass is correct?

- A** It contains a sea of electrons.
B It contains positive and negative ions which are free to move.
C It is a compound of a metal and a non-metal.
D It is a compound of two or more metals.

14. Which item is made from mild steel?

- A** A car body.
B A container to store gas in a chemical plant.
C A scalpel for use in an operating theatre.
D A set of cutlery.

15. The diagram shows how an underwater iron pipe can be protected from rusting.



Metal Z can be ...1... because it is ...2... reactive than iron.

Which words correctly complete gaps 1 and 2?

	1	2
A	copper	more
B	lead	less
C	magnesium	more
D	zinc	less

16. Which metal can react with water at room temperature and pressure?

- A** Calcium **B** Copper **C** Lead **D** Zinc

17. Which two statements about alloys are correct?

- 1 Alloys are formed by mixing two metals.
- 2 Alloys do **not** conduct electricity.
- 3 Atoms in an alloy must all be the same size.
- 4 In an alloy there is metallic bonding.

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

18. A powdered mixture of metals contains aluminium, calcium, silver and iron.

Excess hydrochloric acid is added until no more mixture dissolves.

What is the undissolved residue?

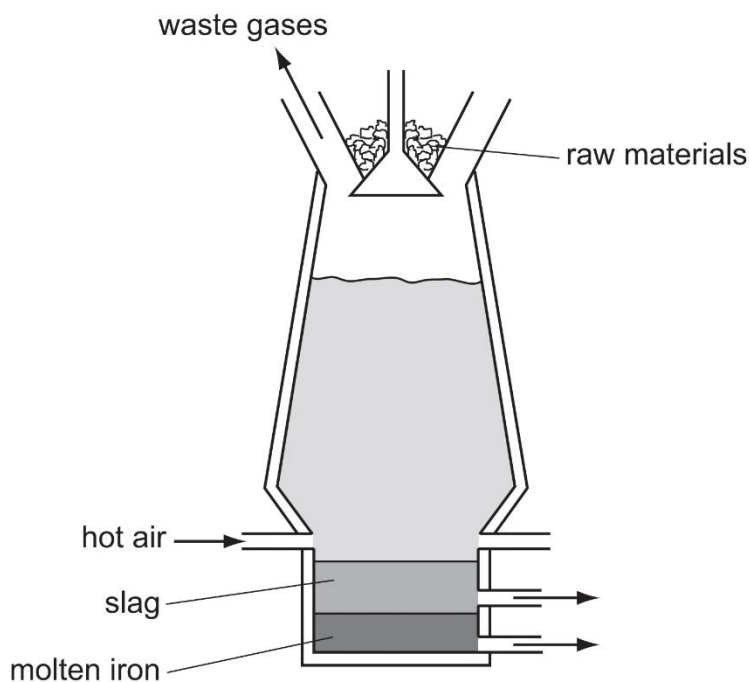
- A** Aluminium **B** Calcium **C** Iron **D** Silver

19. Iron rusts when exposed to oxygen in the presence of water.

Which method will **not** slow down the rate of rusting of an iron roof?

- A** Attaching strips of copper to it.
B Coating it with plastic.
C Galvanising it with zinc.
D Painting it.

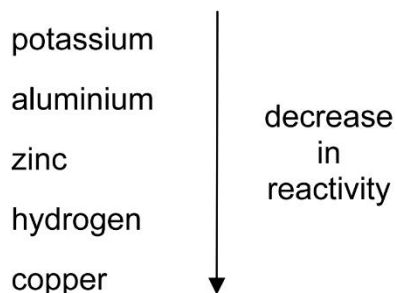
20. Iron is produced in the blast furnace.



Which statement about this process is correct?

- A Carbon is oxidised to carbon dioxide.
- B Carbon monoxide is produced by the thermal decomposition of calcium carbonate.
- C Haematite is reduced by calcium carbonate.
- D Impurities are removed by the hot air blast.

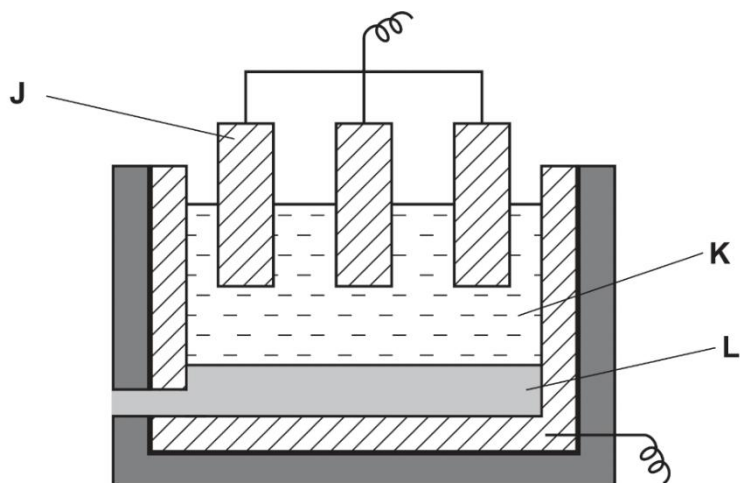
21. Four metals and hydrogen are arranged in order of decreasing reactivity.



Which statement about these elements is correct?

- A Aluminium is formed when aluminium oxide is heated with hydrogen.
- B Copper displaces zinc from zinc sulfate solution.
- C Copper is formed when copper(II) oxide is heated with hydrogen.
- D When added to water, aluminium forms positive ions more readily than potassium.

22. The diagram shows apparatus that can be used to extract aluminium.



What are **J**, **K** and **L**?

	J	K	L
A	negative electrode	aluminium oxide + cryolite	aluminium
B	negative electrode	cryolite	aluminium oxide
C	positive electrode	aluminium oxide	cryolite
D	positive electrode	aluminium oxide + cryolite	aluminium

23. An alloy of aluminium is used in the construction of aircraft.

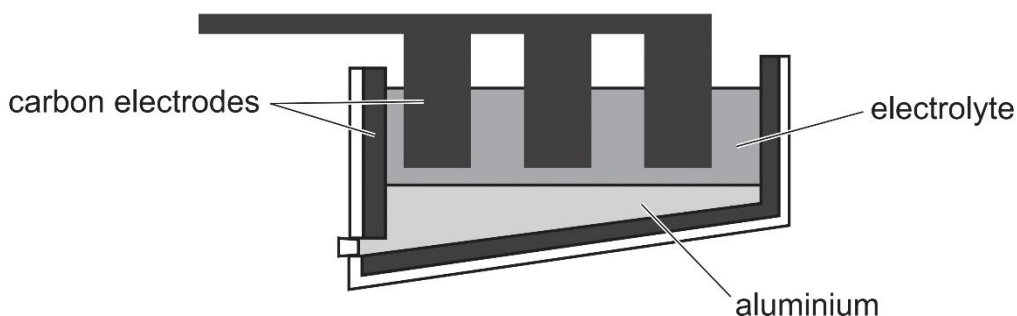
Why is pure aluminium never used?

- A** Pure aluminium cannot be manufactured.
- B** Pure aluminium conducts electricity.
- C** Pure aluminium is less dense than its alloys.
- D** Pure aluminium is too malleable.

24. What happens when a strip of silver is immersed in an aqueous solution of copper(II) sulfate?

- A** Bubbles of gas will appear.
- B** No reaction occurs.
- C** Pink copper will be deposited on the silver strip.
- D** The silver strip will start to dissolve.

25. The diagram shows the apparatus used to extract aluminium from aluminium oxide.



Which statement about this process is correct?

- A The electrolyte is a solid mixture of aluminium and cryolite.
- B The electrolyte is aluminium oxide dissolved in water.
- C The equation for the reaction at the positive electrode is $Al^{3+} + 3e^{-} \rightarrow Al$.
- D The positive carbon electrodes lose mass during the process and need regular replacement.

26. Aqueous copper(II) sulfate solution is placed in an iron container and left to stand for several days. Which statement describes what happens?

- A Atmospheric oxygen reacts with the copper(II) sulfate to give black copper(II) oxide.
- B Some fine iron particles are formed in the solution.
- C The part of the container in contact with the solution is coated with copper.
- D The solution turns from green to blue.

27. Attaching pieces of magnesium to underground iron pipes can protect the iron from corrosion.

Which reaction protects the iron from corrosion?

- A $Fe^{2+}(aq) + 2e^{-} \rightarrow Fe(s)$
- B $Fe(s) \rightarrow Fe^{2+}(aq) + 2e^{-}$
- C $Mg^{2+}(aq) + 2e^{-} \rightarrow Mg(s)$
- D $Mg(s) \rightarrow Mg^{2+}(aq) + 2e^{-}$

28. The list shows the position of metal X in the reactivity series of metals.

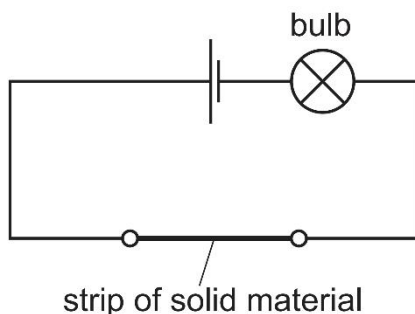
Na Al Fe X Cu Ag

Which methods could be used to extract metal X?

- 1 electrolysis of the solid metal oxide
- 2 heating the metal oxide with carbon
- 3 heating the metal oxide with copper

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

29. The diagram shows a circuit used to test the electrical conductivity of strips of solid materials. If the material conducts, the bulb lights. Strips of brass, nylon and zinc are each tested separately by connecting them into the circuit.



For which strips does the bulb light?

- A Brass, nylon and zinc.
- B Brass and nylon only.
- C Nylon and zinc only.
- D Zinc and brass only.

30. An old commercial process for aluminium extraction used large quantities of sodium to convert aluminium ions into aluminium atoms.

The modern aluminium extraction process uses electrolysis. Which statements are correct?

- In the old process:
 - 1 The sodium acted as an oxidising agent.
 - 2 The reaction worked because sodium is more reactive than aluminium.
- In the modern process:
 - 3 The equation for the reaction at the cathode is $Al^{3+}(l) + 3e^{-} \rightarrow Al(l)$
 - 4 The carbon anode needs replacing often because it is oxidised to carbon dioxide by the oxygen evolved.

	old process	modern process
A	1 and 2	3 and 4
B	1 and 2	3 only
C	1 only	4 only
D	2 only	3 and 4

31. Aluminium is used to make saucepans because of its apparent lack of reactivity.

Which property of aluminium explains its apparent lack of reactivity?

- A It has a layer of oxide on its surface.
- B It has a low density.
- C It is a good conductor of electricity.
- D It is in Group 13 of the Periodic Table.

32. Metal carbonates decompose when heated.

Which carbonate is most stable to heat?

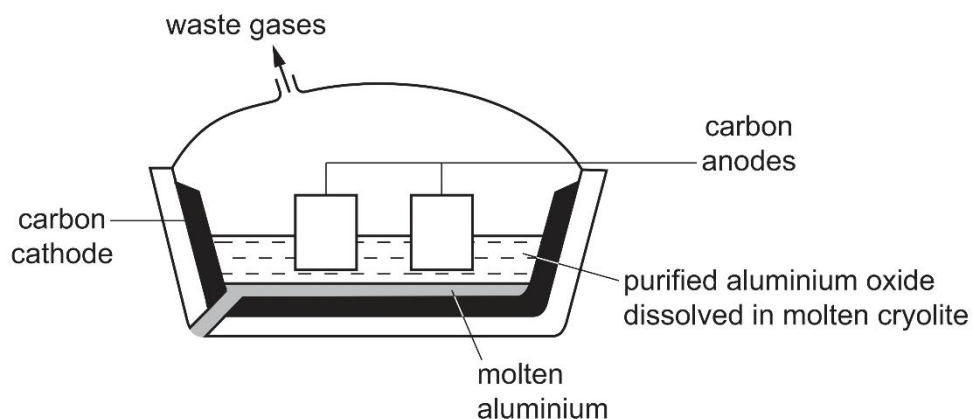
- A Calcium carbonate
- B Copper(II) carbonate
- C Lead(II) carbonate
- D Zinc carbonate

33. Tin is a metal between iron and lead in the reactivity series.

Which method is used for the extraction of tin from its ores?

- A Electrolysis of the molten ore.
- B Heat alone.
- C Heat with aluminium powder.
- D Heat with carbon.

34. Aluminium is extracted from aluminium oxide by electrolysis.

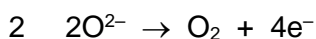
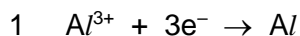


Which statement about this electrolysis is correct?

- A Aluminium ions gain electrons to form aluminium.
- B Cryolite increases the melting point of the electrolyte.
- C Cryolite reacts with impurities to form slag.
- D The carbon cathode has to be replaced regularly as it reacts with oxygen.

- 35.** Metals are elements that have many similar properties because of their structure.
Which statement about metals is correct?
- A** Metals are malleable because the layers of atoms can slide over each other.
 - B** Metals conduct electricity because their ions vibrate and pass on energy to each other.
 - C** The melting point of metals depends on the strength of the intermolecular forces in the lattice.
 - D** To form an alloy of two metals, the metals must have very similar ionic radii.
- 36.** Iron is extracted from haematite in a blast furnace.
Coke and limestone are added to the blast furnace.
What is the function of the limestone?
- A** It decomposes and neutralises acidic impurities.
 - B** It is a fuel which heats the furnace.
 - C** It oxidises the iron in haematite.
 - D** It releases oxygen allowing the coke to burn.
- 37.** Different metals react with water in different ways.
Which statement is correct?
- A** Calcium does not react with cold water.
 - B** Iron reacts slowly with steam to produce an oxide of iron and hydrogen.
 - C** Magnesium reacts with steam to produce magnesium hydroxide and oxygen.
 - D** Sodium reacts with cold water to produce aqueous sodium oxide and hydrogen.
- 38.** Metal X is more reactive than zinc but less reactive than sodium.
What would be the best method for obtaining metal X from its ore?
- A** Electrolysis of an aqueous solution of a salt of X.
 - B** Electrolysis of the molten oxide of X.
 - C** Heating the oxide of X in hydrogen.
 - D** Heating the oxide of X with powdered carbon.
- 39.** Steel is often galvanised.
Which statements about galvanising are correct?
- 1 Galvanising makes a steel alloy.
 - 2 Galvanising provides a sacrificial protection against rusting.
 - 3 Galvanising coats a layer of zinc onto steel.
- A** 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

40. In the extraction of aluminium from aluminium oxide, the following three reactions take place.



Which reactions take place at the positive electrode?

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

41. A *gold karat* refers to how pure gold is. In jewellery, gold is thought to be made-up of 24 parts, and so 24 karat gold refers to gold that is 100% pure.

18 karat gold is an alloy of gold and silver. Which statement about 18 karat gold is correct?

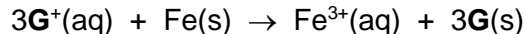
- A** The alloy has the same melting point as pure gold.
B The alloy is 50% gold by mass.
C The alloy is a compound of gold and silver.
D The alloy is harder than pure gold.

42. **G** is a metal. It occurs naturally as an element and sometimes in ores containing its oxide.

G forms the chloride **GCl**. No other chloride of **G** exists.

A student makes some statements about metal **G**.

1 It can be displaced from solutions containing its ions according to the equation shown.



2 It can be extracted from its ore by electrolysis.

3 It can be extracted from its ore by reduction with carbon.

4 It is likely to be found as an ore containing the compound **G₂O₃**.

Which statements are correct?

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

43. The list shows some properties of metals.

1 Metals are good conductors of heat.

2 Metals form ions by the loss of electrons.

3 Metals have high melting points.

Mercury is a metallic element.

Which of these statements do **not** apply to mercury?

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

44. In the electrolysis of aluminium oxide to extract pure aluminium a compound called cryolite is first added to the oxide.

What is the reason for adding the cryolite?

- A To reduce the corrosion of the carbon electrodes by oxygen.
- B To reduce energy costs.
- C To enable the aluminium ions and oxygen ions to move to the electrodes.
- D To prevent the aluminium formed from being oxidised back to aluminium oxide.

45. The steel bodies of cars can be protected from rusting by spraying them with zinc.

Why is zinc used?

- A Zinc does not react with acidic exhaust fumes.
- B Zinc forms a stable compound with iron.
- C Zinc has a high melting point.
- D Zinc is higher in the reactivity series than iron.

46. An alloy of copper and zinc is added to an excess of dilute hydrochloric acid.

Which observations are correct?

	residue	filtrate
A	grey	blue solution
B	none	blue solution
C	none	colourless solution
D	reddish-brown	colourless solution

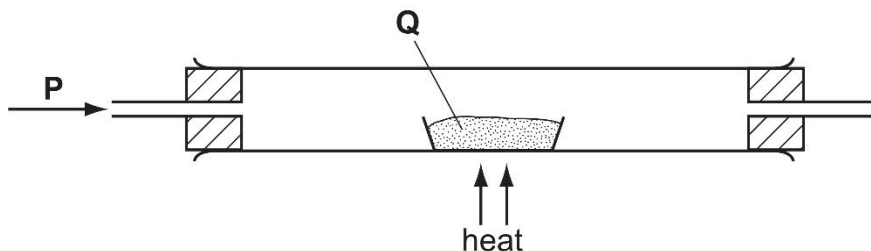
47. From your knowledge of the manufacture of both aluminium and iron, what is the order of chemical reactivity of aluminium, carbon and iron towards oxygen?

	most reactive → → → least reactive		
A	aluminium	carbon	iron
B	aluminium	iron	carbon
C	carbon	aluminium	iron
D	carbon	iron	aluminium

48. What happens when zinc foil is placed in an aqueous solution of copper(II) sulfate?

- A Copper(II) ions are oxidised.
- B There is no reaction.
- C Zinc atoms are oxidised.
- D Zinc sulfate is precipitated.

49. In the apparatus shown, gas P is passed over solid Q.



No reaction occurs if P and Q are...

	P	Q
A	hydrogen	lead(II) oxide
B	hydrogen	magnesium oxide
C	oxygen	carbon
D	oxygen	sulfur

50. Which element can only be extracted from its ore using electrolysis?

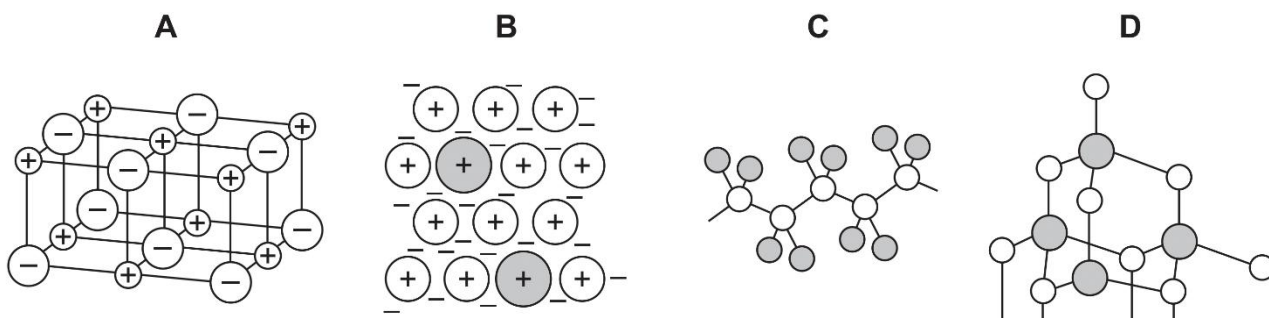
- A Calcium
- B Copper
- C Lead
- D Silver

51. Scrap iron is often recycled.

Which reason for recycling is **not** correct?

- A It reduces the amount of pollution at the site of the ore extraction.
- B It reduces the amount of waste taken to landfill sites.
- C It reduces the need to collect the scrap iron.
- D It saves natural resources.

52. Which diagram represents the structure of an alloy?

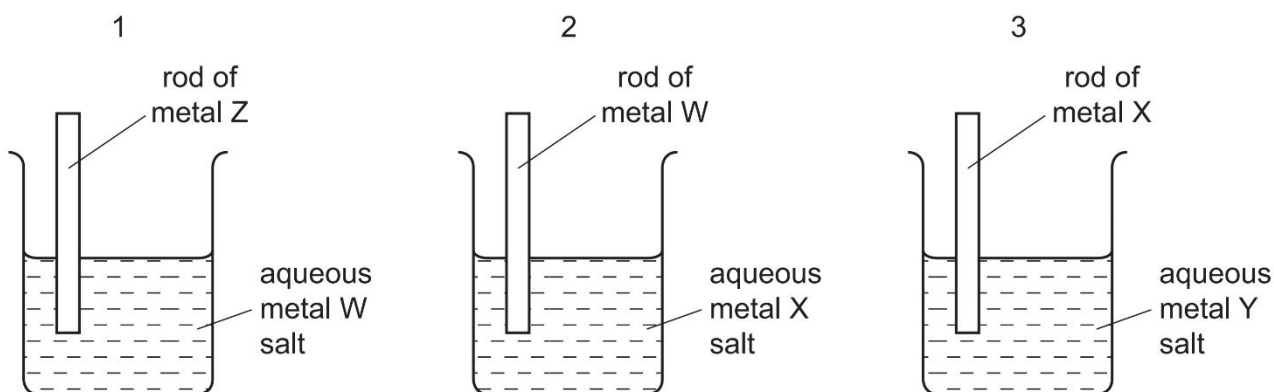


53. Which pair of metals are **not** oxidised when added to water?

- 1 Calcium
- 2 Copper
- 3 Potassium
- 4 Silver

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

54. Three different beakers are set up as shown.



In beaker 1 metal W is displaced from solution.

In beaker 2 metal X is displaced from solution.

In beaker 3 metal Y is displaced from solution.

What is the order of **decreasing** reactivity of the four metals?

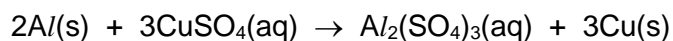
	most reactive → → → least reactive			
A	W	X	Y	Z
B	X	Y	W	Z
C	Z	W	X	Y
D	Z	X	W	Y

55. Aluminium and copper are often used to make coins but iron is not.

Which statement explains this?

- A** Iron is above both aluminium and copper in the reactivity series.
- B** Iron is more expensive to manufacture than aluminium or copper.
- C** Iron is rarer than both aluminium and copper.
- D** Iron reacts with water.

56. Aluminium is higher than copper in the reactivity series so the following displacement reaction should be feasible.

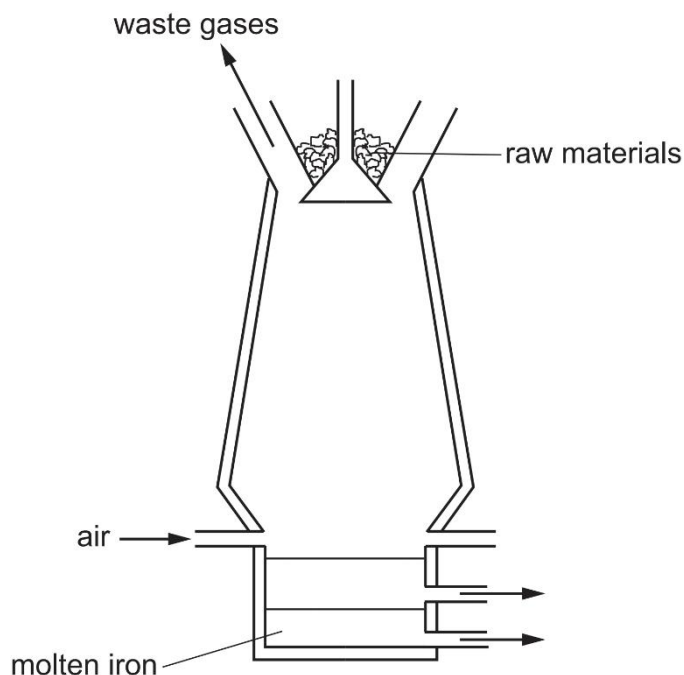


The reaction does not take place at room temperature.

What is the reason for this?

- A Aluminium has an inert coating all over it.
 - B The compound aluminium sulfate does not exist.
 - C The reaction is exothermic.
 - D The reaction needs to be warmed to take place.
57. Which metal oxide will be reduced by heating with iron?
- A Calcium oxide
 - B Lead oxide
 - C Magnesium oxide
 - D Zinc oxide

58. Iron is extracted from haematite in the blast furnace.



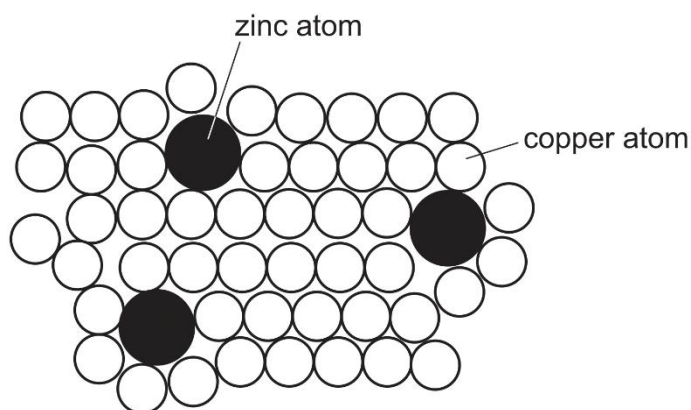
Which other raw material is added in this extraction?

- A Bauxite
 - B Cryolite
 - C Limestone
 - D Slag
59. Which two substances are removed from the bottom of a blast furnace?
- 1 Coke
 - 2 Iron
 - 3 Limestone
 - 4 Slag
- A 1 and 3
 - B 1 and 4
 - C 2 and 3
 - D 2 and 4

60. The table gives the melting points, densities and electrical conductivities of four elements. Which element is copper?

	melting point in °C	density in g/cm ³	electrical conductivity
A	-38.9	13.6	good
B	-7.2	3.12	poor
C	97.8	0.97	good
D	1083	8.96	good

61. The diagram shows the structure of brass.



Why is brass harder than pure copper?

- A** The zinc atoms form strong covalent bonds with copper atoms.
B The zinc atoms prevent layers of copper atoms from sliding over each other easily.
C The zinc atoms prevent the 'sea of electrons' from moving freely in the solid.
D Zinc atoms have more electrons than copper atoms.
62. Aluminium is obtained by the electrolysis of molten aluminium oxide.

Which row shows the electrode at which aluminium is formed and the correct equation for its formation?

	electrode	equation
A	anode	$Al^{3+} + 3e^{-} \rightarrow Al$
B	anode	$Al^{3+} - 3e^{-} \rightarrow Al$
C	cathode	$Al^{3+} + 3e^{-} \rightarrow Al$
D	cathode	$Al^{3+} - 3e^{-} \rightarrow Al$

63. Which metal is attached to underground pipes made of iron, to provide sacrificial protection from corrosion?

A Ag **B** Cu **C** Mg **D** Pb

64. After the collapse of a river bridge, a new car was immersed in the river water for several months. When it was recovered, the parts of the car made of steel, an alloy of iron, were found to be corroded. The parts made of aluminium were not corroded.

Which statement explains these differences in corrosion?

- A Aluminium has a coating of aluminium oxide.
- B Aluminium has a very low density.
- C Aluminium is an excellent conductor of electricity.
- D Aluminium is less reactive than iron.

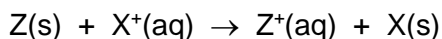
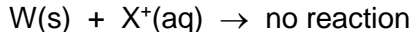
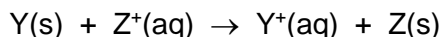
65. Some metals and the compounds in their ores are shown.

metal	Al	Ca	Pb	Na	Fe	Mg
compound in the ore	Al ₂ O ₃	CaCO ₃	PbS	NaCl	Fe ₂ O ₃	MgCO ₃

Which type of reaction occurs in the extraction of each of these metals from their ore?

- A Decomposition by heat
- B Electrolysis
- C Precipitation
- D Reduction

66. The results of experiments involving four metals, W, X, Y and Z, and their ions are shown.



What is the order of reactivity of the four metals, **most** reactive to **least** reactive?

- A W → X → Y → Z
- B X → W → Z → Y
- C Y → Z → X → W
- D Z → Y → W → X

67. Aircraft manufacture requires a metal that:

- 1 Has a relatively low density.
- 2 Is resistant to corrosion.

Which of these conditions does aluminium satisfy?

- A 1 and 2
- B 1 only
- C 2 only
- D Neither 1 nor 2

68. Metals have a structure of positive ions in a 'sea of electrons'. Metals are malleable because it is possible to force the ions to slide over each other.

The alloy brass is1..... malleable than pure copper and pure zinc.

Brass is2..... to conduct electricity.

Which words correctly complete gaps 1 and 2?

	1	2
A	less	unable
B	less	able
C	more	unable
D	more	able

69. Which statement about the reactions of some metals and metal compounds is correct?

- A** Copper reacts with dilute hydrochloric acid to form hydrogen.
- B** Sodium oxide is reduced to sodium metal by heating with carbon.
- C** Zinc carbonate is more thermally stable than sodium carbonate.
- D** Zinc displaces copper from aqueous copper(II) sulfate.

70. Which metal is used in the galvanising of iron?

- A** Calcium **B** Copper **C** Lead **D** Zinc

71. Iron is obtained in the blast furnace from the ore haematite.

Which process takes place in the blast furnace?

- A** Calcium carbonate is used to remove acidic impurities.
- B** Coke is reduced to carbon dioxide.
- C** Haematite is oxidised by carbon monoxide.
- D** Haematite undergoes thermal decomposition.

72. Which pair of reagents will undergo a displacement reaction?

- A** Ag(s) and CuSO₄(aq)
- B** Cu(s) and MgSO₄(aq)
- C** Mg(s) and CaSO₄(aq)
- D** Zn(s) and CuSO₄(aq)

73. Aluminium is a Group 13 element. It is extracted from its ore by electrolysis.

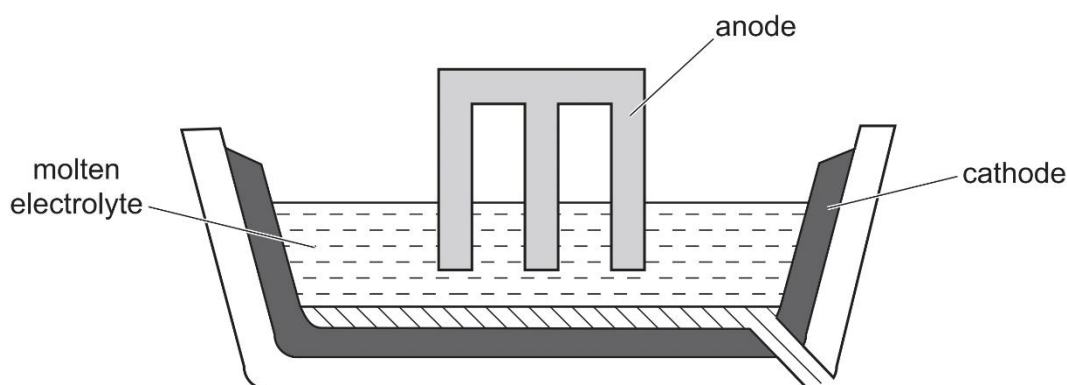
The position of aluminium in the Periodic Table indicates that its aqueous ion is likely to be1..... .

Its method of extraction indicates that aluminium is2..... in the reactivity series.

Which words complete gaps 1 and 2?

	1	2
A	coloured	high
B	coloured	low
C	colourless	high
D	colourless	low

74. The diagram shows a cell that can be used to extract a metal from its oxide.



Molten aluminium oxide, copper(II) oxide, lead(II) oxide and magnesium oxide are each electrolysed in separate cells. Each cell receives the same number of electrons.

Which statement is correct?

- A** All the metals can also be extracted from their oxides using coke.
- B** The anode and cathode should be made of the metal being extracted.
- C** The pure metal is always produced at the cathode.
- D** The same mass of each metal is formed.

75. A power cable requires an element that:

- 1 Conducts electricity.
- 2 Has a relatively low density.
- 3 Is resistant to aerial oxidation.

Which of these conditions does aluminium satisfy?

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

76. The reactivity series for some metals, with two gaps labelled **X** and **Y**, is shown.

most reactive											least reactive
K	Na	Ca	Mg	X	Zn	Y	Pb	(H)	Cu	Ag	

Which row correctly identifies metals **X** and **Y** and the method of extraction of **Y** from its ore?

	metal X	metal Y	method of extraction of Y
A	Al	Fe	electrolysis
B	Al	Fe	reduction with carbon
C	Fe	Al	electrolysis
D	Fe	Al	reduction with carbon

77. Metal **M** is displaced from aqueous **M** nitrate by copper.

Which statement about metal **M** and its compounds is correct?

- A** **M** carbonate is stable when heated.
- B** **M** oxide is reduced to **M** by heating with carbon.
- C** **M** reacts with dilute hydrochloric acid to give hydrogen.
- D** **M** reduces zinc oxide to zinc on heating.

78. Steel is produced by blowing oxygen into impure molten iron.

A student suggests two reasons why this process is carried out.

- 1 The oxygen removes some of the carbon from the impure iron.
- 2 The oxygen oxidises iron(II) ions to iron(III) ions.

Which reasons are correct?

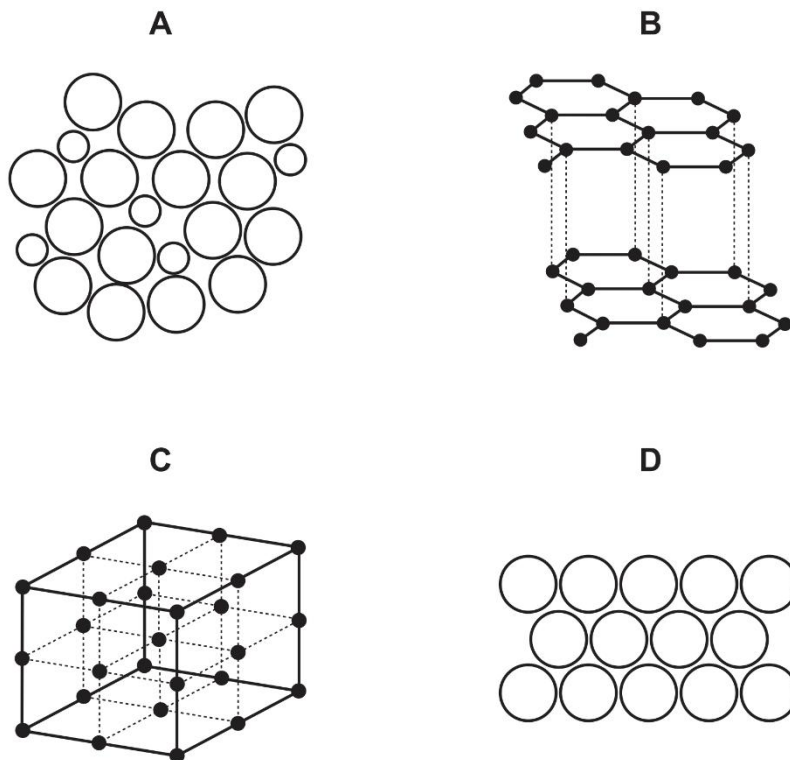
- A** Both 1 and 2
- B** 1 only
- C** 2 only
- D** Neither 1 nor 2

79. The equations show reactions taking place in the blast furnace.

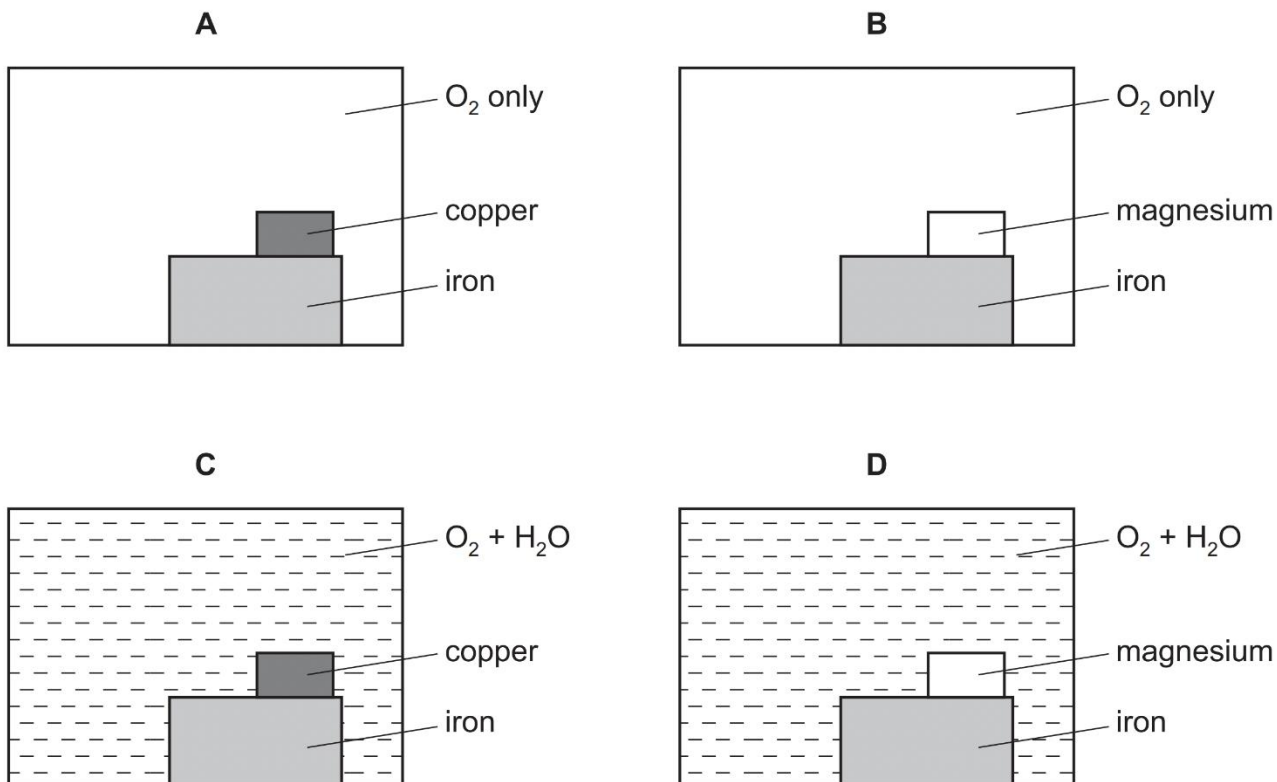
In which reaction is an acidic impurity, present in iron ore, removed?

- A** $C + O_2 \rightarrow CO_2$
- B** $C + CO_2 \rightarrow 2CO$
- C** $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$
- D** $CaCO_3 + SiO_2 \rightarrow CaSiO_3 + CO_2$

80. Which diagram shows the structure of an alloy?



81. Which diagram correctly shows the conditions necessary for the rusting of iron and also the metal that can be used to prevent rusting by sacrificial protection?



82. Metals have high melting points.

What is the reason for this?

- A Their atoms are joined by strong covalent bonds in a giant lattice.
- B They have strong forces of attraction between negative ions and delocalised electrons.
- C They have strong forces of attraction between negative ions and positive ions.
- D They have strong forces of attraction between positive ions and delocalised electrons.

83. The metal beryllium does not react with cold water.

It reacts with hydrochloric acid but cannot be extracted from its ore by using carbon. Where is beryllium placed in the reactivity series?

magnesium

A

zinc

B

iron

C

copper

D

84. Pure iron is a soft metal.

When mixed with small amounts of tungsten it produces a hard alloy called tungsten steel.

Which statements are correct?

- 1 Pure iron is a transition element.
- 2 The particles in pure iron are arranged in ordered layers.
- 3 Tungsten steel is a compound.

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

85. Four equations are shown.

- 1 $C + O_2 \rightarrow CO_2$
- 2 $CaCO_3 \rightarrow CaO + CO_2$
- 3 $SiO_2 + 2CO \rightarrow Si + 2CO_2$
- 4 $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

Which equations represent reactions that take place during the extraction of iron from haematite?

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

86. Copper is used to make saucepans.

Which two properties of copper make it suitable for this use?

- 1 Copper has a relatively high melting point.
- 2 Copper has a low density.
- 3 Copper is a good conductor of electricity.
- 4 Copper is a good conductor of heat.

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

87. The properties of four substances are given.

Which substance is a metal?

- A** It conducts electricity when dissolved in water but not when solid.
- B** It has a high melting point and conducts heat when solid.
- C** It has a low melting point and is brittle.
- D** It has a giant covalent structure with a high melting point.

88. Group 1 elements and transition elements are metals.

- Student X suggests that the Group 1 elements are above hydrogen in the metal reactivity series but that not all transition elements are.
- Student Y suggests that the densities of Group 1 elements are lower than those of the transition elements.

Which students are correct?

A Both X and Y **B** X only **C** Y only **D** Neither X nor Y

89. Which reactions take place during the extraction of aluminium from aluminium oxide using carbon electrodes?

- 1 $2\text{O}^{2-} \rightarrow \text{O}_2 + 4\text{e}^-$
- 2 $\text{C} + \text{O}_2 \rightarrow \text{CO}_2$
- 3 $\text{Al}^{2+} + 2\text{e}^- \rightarrow \text{Al}$

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

90. The carbonates of metals W, X and Y are heated and the results are shown.

	colour of metal carbonate	gas given off which turns limewater cloudy	colour after heating
W	white	yes	yellow when hot, white when cold
X	green	yes	black
Y	white	no	no change

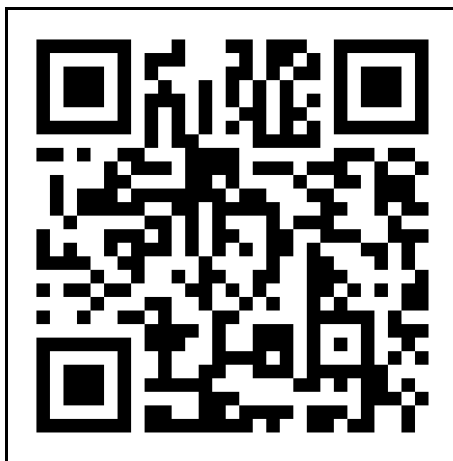
These experimental results can be used to write statements about W, X and Y.

- 1 The carbonates of W and X gave off carbon dioxide on heating.
- 2 Metals W and X are less reactive than metal Y.
- 3 X could be copper.

Which statements are correct?

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

- Scan the QR Code below to view the answers to this assignment.



http://www.chemist.sg/metals/metals_ans.pdf