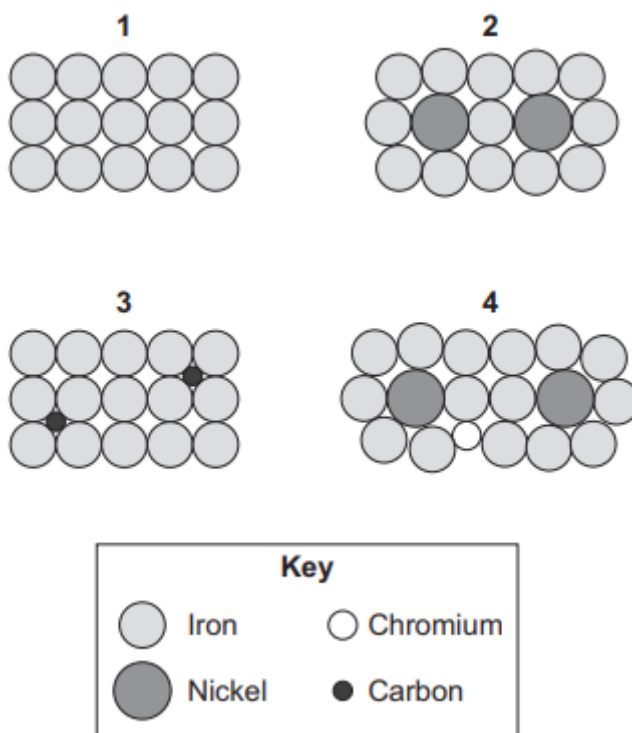


METALS & NON-METALS 4

Q1. The diagrams show the arrangements of atoms in a pure metal and in some of its alloys. The different circles represent atoms of different elements.



Match descriptions, A, B, C and D, with the numbers 1– 4 on the diagrams.

- A it is probably the softest substance
- B it is the alloy that contains only two metals
- C it is an alloy that contains only one metal
- D it contains the largest number of different elements

(4 marks)

Q2. A scientist investigated the chemistry of four metals, W, X, Y and Z.

These are the results.

- The oxides of W and Y were reduced to the metal when mixed with carbon and heated.
- The oxide of Z could not be reduced by heating with carbon.
- The oxide of X decomposed to the metal on heating alone.
- Y gave off hydrogen gas with dilute acid but W and X did not.

(a) Starting with the most reactive, what is the order of reactivity for the four metals?

- 1 X, W, Y, Z
- 2 Z, Y, W, X
- 3 X, W, Z, Y
- 4 Z, W, Y, X

(1 mark)

(b) Which metal is most likely to be found in the ground as the pure metal?

- 1 W
- 2 X
- 3 Y
- 4 Z

(1 mark)

Titanium is extracted from titanium chloride by mixing the titanium chloride with sodium and heating the mixture in a furnace. The extraction of titanium is a batch process. This means that the furnace does not operate continuously, but is cooled after each operation so that the titanium can be removed.

(c) Which row in the table correctly describes the reaction for extraction of titanium?

	Why the reaction occurs	Products of the reaction
1	Sodium is more reactive than titanium	Titanium, sodium and chlorine
2	Titanium is more reactive than sodium	Titanium and chlorine
3	Titanium is more reactive than sodium	Titanium and sodium chloride
4	Sodium is more reactive than titanium	Titanium and sodium chloride

(1 mark)

(d) The extraction of iron using a blast furnace is a continuous process. Over a period of 12 months, the batch method for extraction of titanium requires much more energy per tonne of metal than the continuous method for extraction of iron.

One reason for this is because . . .

- 1 the batch process is completed more quickly.
- 2 iron is more dense than titanium.

3 the furnace used for titanium is not maintained at a high temperature.

4 titanium chloride is not as pure as iron oxide.

(1 mark)

Q3. The table shows some information about four metals, A, B, C and D.

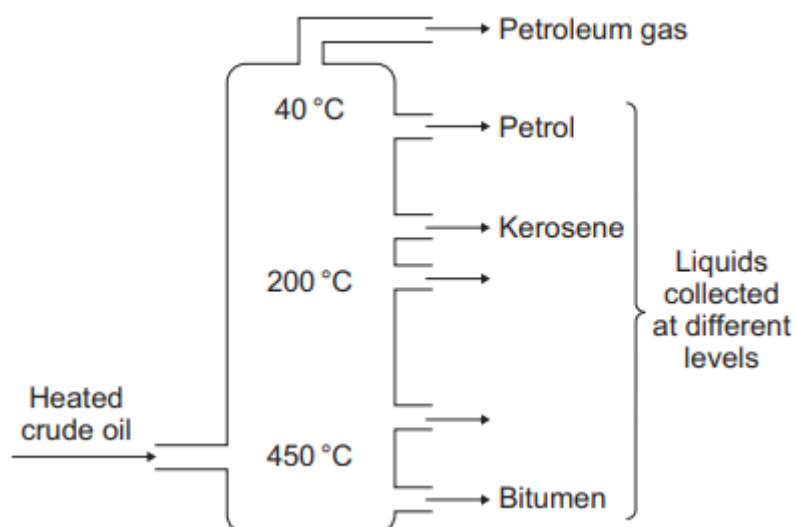
	Metal	Date of discovery	Boiling point in °C	Position in reactivity series
A	Iron	Before 1200	2900	Middle
B	Aluminium	1827	2640	High
C	Copper	Before 1200	2570	Low
D	Calcium	1808	1480	High

Match metals, A, B, C and D, with the numbers 1– 4 in the table below.

1	It is alloyed with carbon to make steel.
2	It was the last to be discovered.
3	It has the lowest boiling point.
4	It is the one most likely to be found as the metal itself.

(4 marks)

Q4. The substances that we get from the distillation of crude oil have a range of properties. Match words, A, B, C and D, with the numbers 1– 4 in the sentences.



- A kerosene
- B petroleum gas
- C petrol
- D bitumen

The substance with the lowest boiling point is . . . 1

The substance collected at about 150 °C is . . . 2

The most volatile liquid collected is . . . 3

The most viscous substance collected is . . . 4

(4 marks)

Q5. This question is about how we obtain some metals.

Match statements, A, B, C and D, with the numbers 1– 4 in the table.

- A uses another metal
- B does not use a chemical reaction
- C could be done in a blast furnace
- D is called electrolysis

1	Aluminium is made when an electric current passes through a molten aluminium compound.
2	Gold can be found at the bottom of some streams.
3	Titanium is made by reacting titanium chloride with magnesium.
4	Zinc is made when a mixture of zinc oxide and carbon is heated.

(4 marks)

Q6. Aluminium is extracted from a substance called bauxite. Bauxite contains aluminium oxide and impurities such as sand. Bauxite is first purified to make pure aluminium oxide. Then electricity is passed through the molten aluminium oxide. The molten aluminium oxide splits to make aluminium and oxygen.

- (a)** Bauxite is an example of . . .
- 1 an element.
 - 2 a compound.
 - 3 an ore.

4 a solution.

(1 mark)

(b) The process used to extract aluminium is . . .

- 1 thermal decomposition.
- 2 electrolysis.
- 3 corrosion.
- 4 distillation.

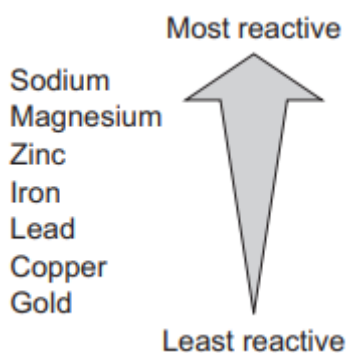
(1 mark)

(c) Aluminium cannot be extracted from aluminium oxide using carbon because . . .

- 1 aluminium is more reactive than carbon.
- 2 the density of aluminium is too low.
- 3 carbon is higher in the reactivity series than aluminium.
- 4 aluminium is covered in a layer of aluminium oxide.

(1 mark)

Q7. A metal will displace a less reactive metal from its compounds.



If a reaction occurs, it releases heat. The reactivity of metals can be investigated by measuring the temperature rise if a fair test is carried out between metals and metal compounds.

Metal	Metal compound	Temperature rise in °C
Zinc	Lead nitrate	10
Iron	Lead nitrate	6
Zinc	Copper sulfate	19
Magnesium	Copper sulfate	48
Copper	Zinc sulfate	0

- (a)** The results in the table suggest that the largest rise in temperature occurs when . . .
- 1 a metal reacts with a metal compound that is a sulfate.
 - 2 a transition metal is used with a metal compound.
 - 3 there is a large difference in reactivity between the metal used and the metal in the metal compound.
 - 4 a Group 1 metal reacts with a transition metal compound.

(1 mark)

- (b)** Using copper and zinc sulfate does not cause a temperature rise. This is because . . .
- 1 not enough copper is used.
 - 2 zinc is more reactive than copper.
 - 3 copper corrodes easily.
 - 4 too much zinc sulfate is added.

(1 mark)

- (c)** Which of the following metals will cause the largest temperature rise when added to iron nitrate solution?
- 1 gold
 - 2 sodium
 - 3 lead
 - 4 zinc

(1 mark)

- (d)** Carbon can reduce zinc oxide.
Magnesium can react with carbon dioxide.
Carbon can produce iron from iron oxide.

Where should carbon be placed in the reactivity series?

- 1 above magnesium but below sodium
- 2 above zinc but below magnesium
- 3 below iron but above lead
- 4 below lead but above copper

(1 mark)

Q8. This question is about metals.

Match metals, A, B, C and D, with the numbers 1– 4 in the table.

- A iron
- B aluminium
- C gold
- D stainless steel

1	It is found in the Earth as the metal itself.
2	It is an alloy which is resistant to corrosion.
3	It is extracted by reduction of its oxide in a blast furnace.
4	It is extracted from its oxide by electrolysis.

(4 marks)

Total marks (31)