

Section A [45 marks]

Answer **all** the questions in the spaces provided.

1 Name the substances needed for the following purposes.

purpose	name of substance
reducing the acidity in soil	
testing for presence of carbon dioxide gas	
testing for presence of chloride ions in water	

[3]

[Total: 3 marks]

2 The diagrams **N, P, Q, R, S** and **T** in Fig 2.1 represent the particles in different substances.

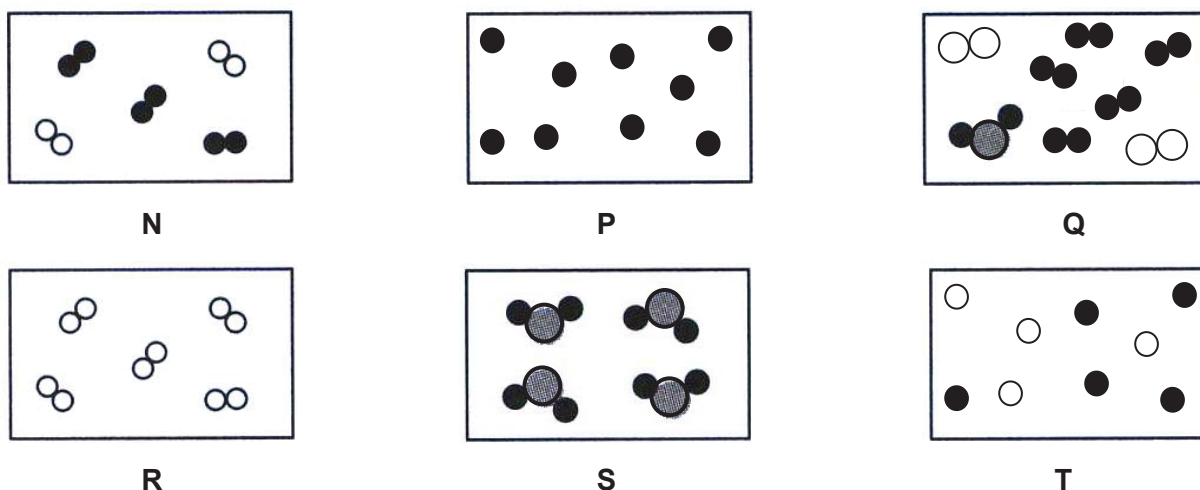


Fig 2.1

Use the diagrams **N, P, Q, R, S** and **T** to answer the questions below.

(a) Which of the following above best represents liquid water?

..... [1]

(b) Which of the following above best represents a mixture containing fluorine and chlorine gases?

..... [1]

(c) Which of the following above best represents air?

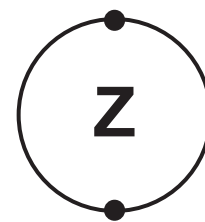
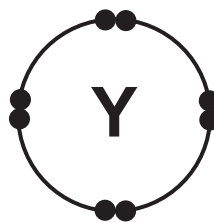
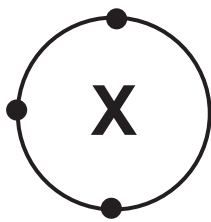
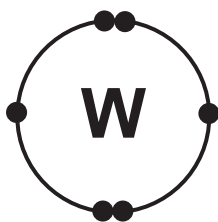
..... [1]

(d) Which of the following above best represents neon gas?

..... [1]

[Total: 4 marks]

- 3 The atomic structures of atoms **W**, **X**, **Y** and **Z** are shown below. The elements are found in Period 3 of the Periodic Table. The letters do not represent the elements and only the valence electrons of the elements are shown.



- (a) State and explain which group does atom **Z** belongs to in the Periodic Table.

.....
.....
[2]

- (b) (i) Write the chemical formula of the compound formed between atoms **W** and **X**.

.....
[1]

- (ii) The compound formed between **W** and **X** has a melting point of 1100 °C. In terms of structure and bonding of the compound formed, explain why it has a high melting point.

.....
.....
.....
[2]

- (c) Explain why atom **Y** is the least chemically reactive as compared to the other atoms.

.....
.....
.....
[1]

[Total: 6 marks]

4 The Blast furnace reaction is an industrial process used to obtain iron from its ore. The iron obtained is usually used to produce stainless steel, an *alloy*, which is harder and stronger than pure iron. Stainless steel is an important material in construction building.

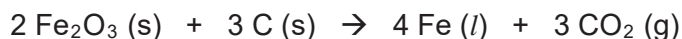
(a) (i) Define the term, *alloy*.

.....
[1]

(ii) Apart from its hardness and strength, state another advantage of using stainless steel as an industrial material.

.....
[1]

(b) Carbon, also known as coke, is added to the Blast furnace reaction for the extraction of iron. The chemical equation for this reaction is given below.



Given 30% of iron(III) oxide, Fe_2O_3 , is present in 1000 kg of haematite used, calculate the mass of carbon required for the extraction of iron.

[relative atomic masses, A_r : C, 12; O, 16; Fe, 56]

mass of carbon required =
[3]

- (c) Silicon dioxide, SiO_2 , is an impurity produced in Blast furnace.
Explain how silicon dioxide is removed from the Blast furnace.

.....
.....
.....

[2]

- (d) During the production of iron, sulfur dioxide gas is produced. Explain why sulfur dioxide gas produced pose an environmental threat to water bodies.

.....
.....
.....

[2]

[Total: 9 marks]

5 Chlorine gas, a member of the halogens, is an element in Group VII of the Periodic Table.

(a) State **two** physical properties of chlorine, other than existing as a gas at room temperature and pressure.

.....
.....
[2]

(b) Explain, using its electronic structure, why chlorine is found in Period 3 of the Periodic Table.

.....
.....
[2]

(c) Chlorine gas reacts vigorously with hot zinc metal to produce solid zinc chloride. Construct a balanced chemical equation, including state symbols, for the reaction.

.....
[2]

(d) When chlorine gas is bubbled into aqueous potassium bromide, potassium chloride and bromine solution is obtained. Explain why this reaction occurs.

.....
.....
.....
[2]

[Total: 8 marks]

- 6 (a) Metals **A**, **B** and **C** are placed in salt solutions as shown in the table.

metal	result of placing metal in solution of		
	salt of A	salt of B	salt of C
A	no reaction	no reaction	C displaced
B	A displaced	no reaction	C displaced
C	no reaction	no reaction	no reaction

Arrange the reactivity of the metals, starting with the least reactive metal.

.....
[1]

- (b) Explain why carbon can be used to obtain zinc from zinc oxide but not to obtain sodium from sodium oxide.

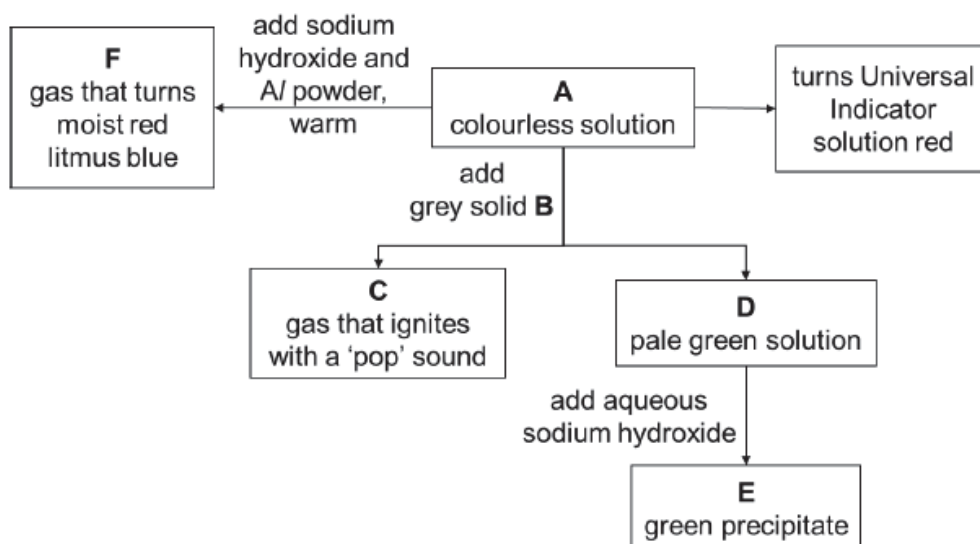
.....
.....
.....
[2]

- (c) Sodium metal is kept in oil to prevent it from corrosion.
Explain how the oil prevents the sodium metal from corrosion, stating clearly the conditions that cause the corrosion of sodium.

.....
.....
.....
[3]

[Total: 6 marks]

7 The figure below describes the reactions between colourless solution **A** and grey solid **B**.



(a) Identify **A**, **B**, **C**, **D**, **E** and **F**.

A

B

C

D

E

F

[6]

(b) Construct a balanced ionic equation for the formation of precipitate **E**. State symbols are **not** required.

.....
[2]

(c) Explain why grey solid **B** cannot be a metal carbonate.

.....
.....
[1]

[Total: 9 marks]