AQA GCSE CHEMISTRY (HIGHER) · 8462

CHEMISTRY



EXAM QUESTION PACK

4.1.1 ATOMIC STRUCTURE, SYMBOLS, RELATIVE ATOMIC MASS, CHARGE AND ISOTOPES (PACK 5)

SCORE	PERCENTAGE
/233	%

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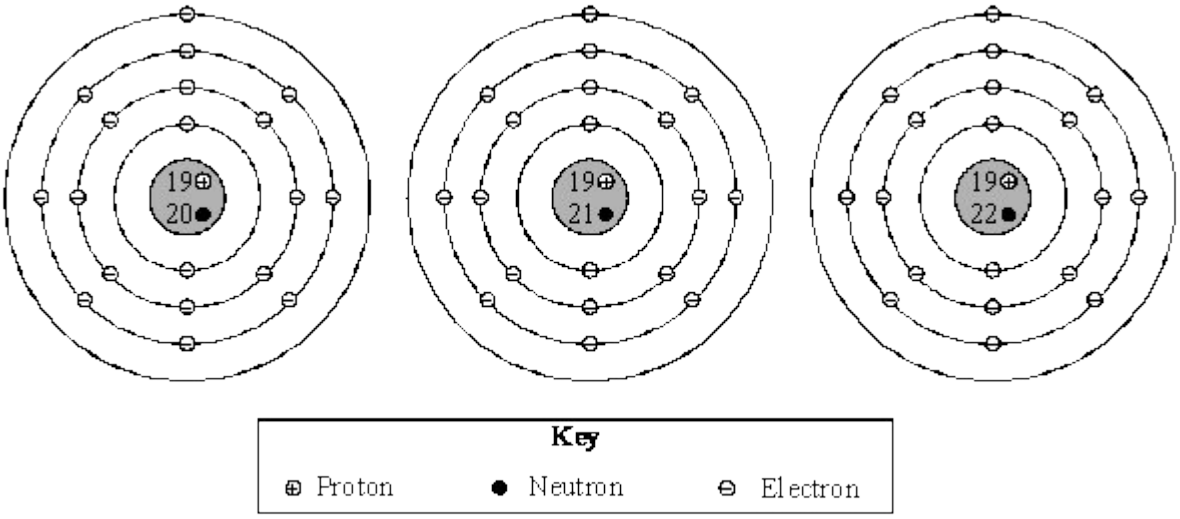
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Q1.

The diagrams show three *isotopes* of potassium.



(i) In what way does the atomic structure show you that they are all **atoms**?

_____

_____

(1)

(ii) Explain why these three atoms are called *isotopes* of potassium.

_____

_____

_____

_____

_____

_____

(3)

(Total 4 marks)

Q2.

Many everyday substances can be classified as acids, bases or salts. For example, car batteries contain sulphuric acid, oven cleaners contain sodium hydroxide and table salt contains sodium chloride.

(a) A solution of each of these substances was tested with universal indicator.

Solution	Colour of universal indicator
Sulphuric acid (H_2SO_4)	red

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Sodium hydroxide (NaOH)	purple
Sodium chloride (NaCl)	green

(i) Explain how these universal indicator colours and the corresponding pH values could be used to identify each of these solutions.

_____

_____

_____

_____

_____

(3)

(ii) Name and give the formula of the ion which causes the solution to be acidic.

Name of ion _____

Formula of ion _____

(2)

(b) Sodium chloride can be made by reacting sodium hydroxide with hydrochloric acid in the presence of an indicator.

(i) What is the name of this type of reaction?

_____

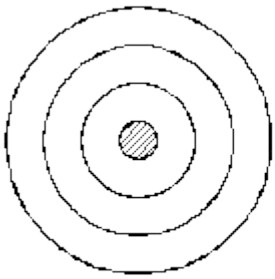
(1)

(ii) Write a balanced chemical equation for this reaction.

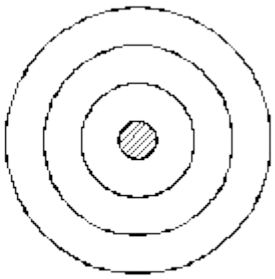
_____(aq) + _____(aq) → _____(aq) + _____(l)

(2)

(c) The atomic number for sodium is 11 and for chlorine is 17.



Sodium atom



Chlorine atom

(i) Complete the diagrams to show the electron arrangements for a sodium atom and a chlorine atom.

(2)

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(ii) These atoms form different particles by one electron transferring from the sodium atom to the chlorine atom. What is the name given to the particles formed?

_____

(1)

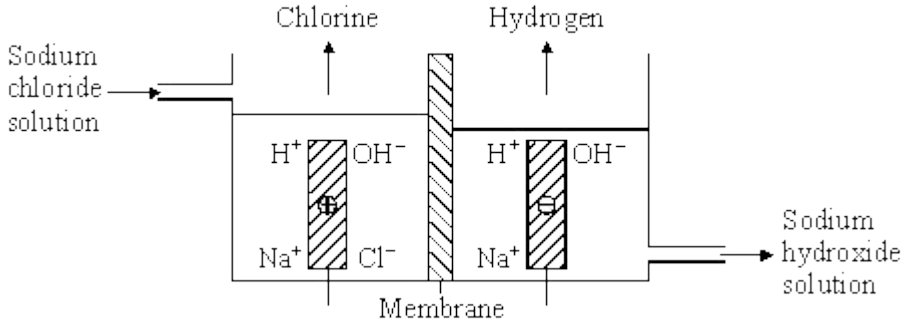
(iii) Why do these sodium and chloride particles bond?

_____

_____

(1)

(d) Sodium chloride solution is electrolysed to form three products, hydrogen, chlorine and sodium hydroxide.



Describe how each of these products are formed.

_____

_____

_____

_____

_____

_____

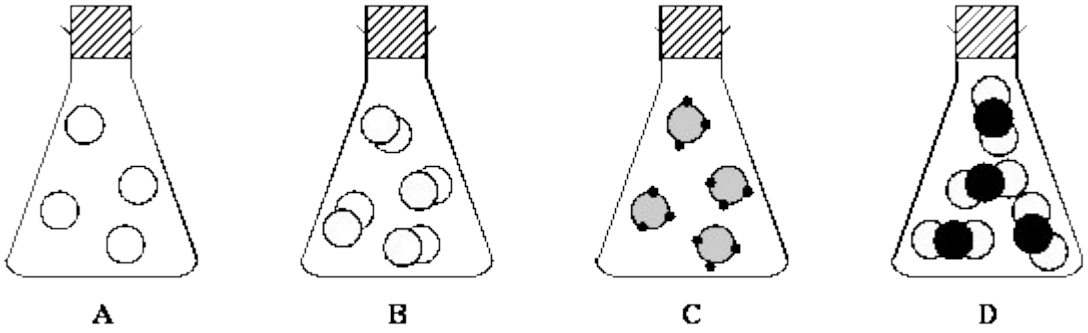
(3)

(Total 15 marks)

Q3.

In the flasks are the particles of four different gases. (Each circle represents an atom.)

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(a) Which diagram represents

(i) oxygen, O_2 _____

(1)

(ii) steam, H_2O _____

(1)

(b) The gases in **A** and **B** are elements and the gases in **C** and **D** are compounds. Explain why.

_____

_____

_____

_____

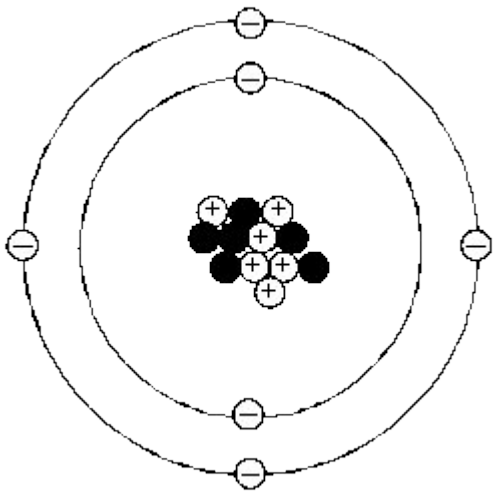
_____

(3)

(Total 5 marks)

Q4.

About 100 years ago a scientist called J. J. Thomson thought that an atom was a ball of positive charge with negative particles stuck inside. Today a different model is used. The diagram shows how an atom of carbon is represented by this model.



(a) The negative particles ⊖ are called electrons.

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(i) What is the name of the positive particles ⊕?

_____

(1)

(ii) What particle is represented by ●?

_____

(1)

(iii) What is the central part of the atom called that contains both ⊕ and ●?

_____

(1)

(b) Use the model to explain why the six electrons are arranged as shown.

_____

_____

_____

_____

(2)

(Total 5 marks)

Q5.

Follow the steps to find the percentage of iron in iron oxide.

Relative atomic masses: O 16; Fe 56.

(i) Step 1

Calculate the relative formula mass of iron oxide, Fe_2O_3.

_____

_____

(1)

(ii) Step 2

Calculate the total relative mass of just the iron atoms in the formula, Fe_2O_3.

_____

(1)

(iii) Step 3

Calculate the percentage (%) of iron in the iron oxide, Fe_2O_3.

_____

_____

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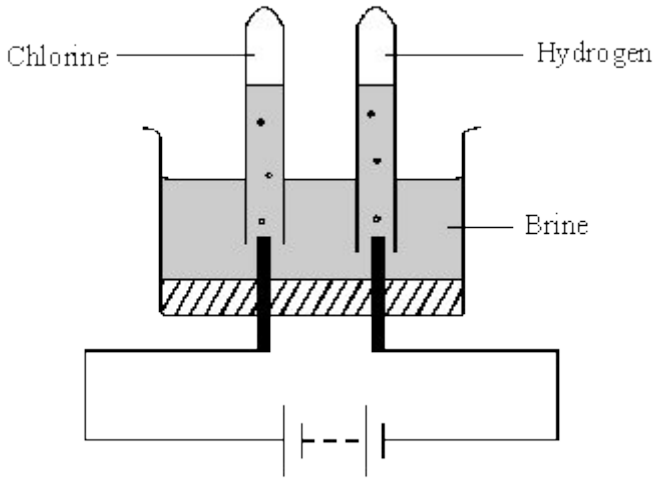
Percentage of iron _____ %

(1)

(Total 3 marks)

Q6.

Brine, a solution containing sodium chloride in water, can be used to manufacture chlorine, hydrogen and sodium hydroxide. A student sets up a simplified model of the industrial cell.



(a) The electron arrangements of some atoms are shown here.

H	1
O	2.6
Na	2.8.1
C1	2.8.7

(i) Use the relevant electron arrangements to describe the bonding in water.

_____

_____

_____

_____

_____

_____

(2)

(ii) Use the relevant electron arrangements to describe the bonding in sodium chloride.

_____

_____

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_____

_____

_____

_____

(3)

(b) Use the atomic structures of $^{35}_{17}Cl$ and $^{37}_{17}Cl$ to explain the meaning of the term *isotopes.*

_____

_____

_____

_____

_____

_____

(3)

(Total 8 marks)

Q7.

This question is about sodium chloride (common salt) which is an important chemical.

Sodium chloride can be made by burning sodium in chlorine gas.



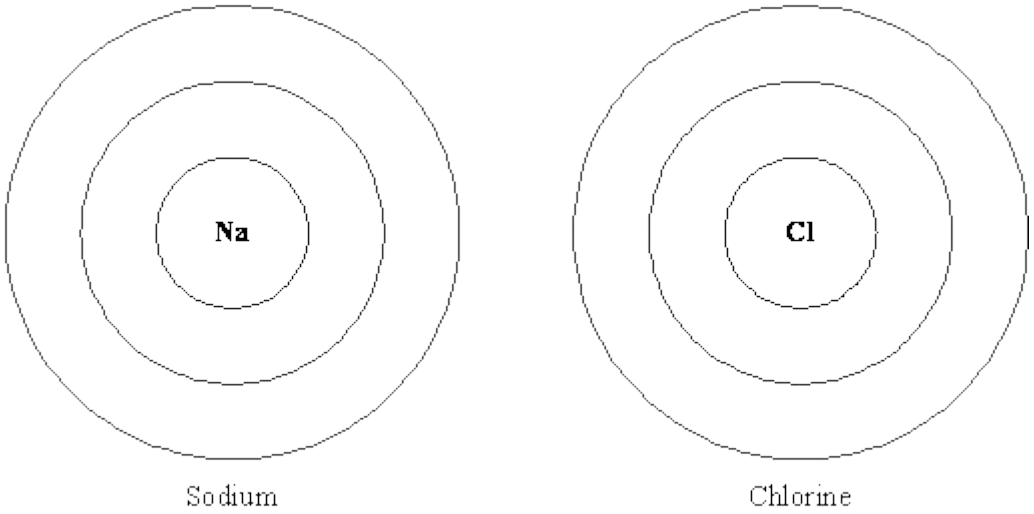
(a) Balance the symbol equation for the reaction of sodium with chlorine.

$$Na_{(s)} \quad + \quad Cl_{2(g)} \quad \rightarrow \quad NaCl_{(s)}$$

(1)

(b) (i) Complete the diagrams below to show the electronic structures of a sodium and a chlorine atom. (Atomic number of sodium = 11 and chlorine = 17.)

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(3)

(ii) When sodium reacts with chlorine the sodium atoms are changed into sodium ions (Na^+) and the chlorine atoms are changed into chlorine ions (Cl^-).

Explain how:

1. a sodium atom changes into a sodium ion;

_____

_____

(2)

2. a chlorine atom changes into a chloride ion.

_____

_____

(2)

(c) The element potassium is in the same group of the Periodic Table as sodium. Potassium reacts with chlorine to make potassium chloride which is sometimes used instead of common salt in cooking.

(i) Predict the formula of potassium chloride.

_____

(1)

By reference to the electronic structures of potassium and sodium explain:

(ii) Why the reaction of potassium with chlorine is similar to the reaction of sodium with chlorine.

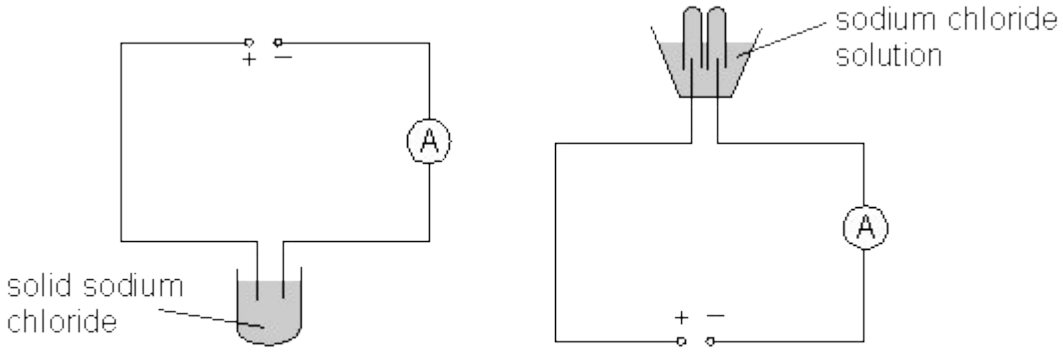
_____

_____

(1)

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(d) The electrolysis of sodium chloride solution is an important industrial process. The diagrams below show two experiments set up during an investigation of the electrolysis of sodium chloride.



Experiment 1 Experiment 2

(i) What would be the reading on the ammeter in experiment 1?

_____ A

(ii) Explain your answer.

_____

_____

_____

(3)

(e) The equations below show the reactions which take place in experiment 2.

$H_2O_{(1)} \rightarrow H^+_{(aq)} + OH^-_{(aq)}$

$2H^+_{(aq)} + 2e^- \rightarrow H_{2(g)}$

$2Cl^-_{(aq)} - 2e^- \rightarrow Cl_{2(g)}$

(i) Which substance provides hydrogen ions?

_____

(1)

(ii) Name the product formed at:

(A) the positive electrode;

_____

(B) the negative electrode.

_____

(1)

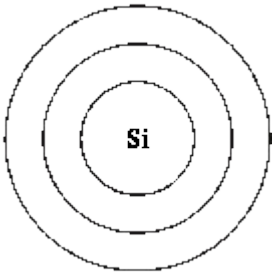
(Total 15 marks)

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Q8.

Silicon is an extremely important element. More than a million tonnes of silicon are produced each year. Silicon is made by reducing silicon oxide (sand) with carbon (coke).

(a) (i) Complete the diagram below to show the arrangement of electrons in an atom of silicon. The Data Sheet may help you with this question.



(2)

(ii) Which electrons in the silicon atom take part in chemical reactions with other atoms?

_____

_____

(1)

(iii) What features of all the atoms of the elements in group 4 of the Periodic Table might give them similar chemical properties?

_____

_____

(1)

(b) Silicon is difficult to classify as a metal or a non-metal because it has properties which resemble both. Some of the properties of silicon are listed below.

- Silicon is a shiny blue/grey solid.
- Silicon is placed in Group 4 of the Periodic Table.
- Silicon has a relative atomic mass of 28.
- Silicon has a very high melting point (1410ºC).
- Silicon has a very high boiling point (2355ºC).
- Silicon conducts electricity.
- Silicon oxide will neutralise alkalis.
- Silicon forms compounds in which the silicon atoms are bonded to other atoms by covalent bonds.

(i) Select **two** properties from the list above in which silicon resembles a metal.

1. _____

2. _____

(2)

(ii) Select **two** properties from the list above in which silicon resembles a non-metal.

1. _____

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2. _____

(2)

(Total 8 marks)

Q9.

Limestone ($CaCO_3$) is a raw material. On strong heating it is converted to calcium oxide which is a very useful substance.

$$CaCO_3 \xrightarrow{\text{heat}} CaO + CO_2$$

(a) Calculate the formula mass (M_r) of calcium carbonate.

_____

M_r of calcium carbonate = _____

(2)

(b) About 60 million tonnes of calcium oxide is made in Britain each year.
Calculate the mass of calcium carbonate needed to make this amount of calcium oxide.

_____

_____

_____

_____

_____

_____

Mass of calcium carbonate needed = _____ million tonnes

(4)

(c) Water is added to some of the calcium oxide produced in a process known as 'slaking'. The product of this reaction is used to make plaster.

$CaO_{(s)} + H_2O_{(1)} \rightarrow Ca(OH)_{2(s)}$

(i) Give the chemical name of $Ca(OH)_2$.

_____

(1)

(ii) What is the physical state of the $Ca(OH)_2$ formed in the reaction?

_____

(1)

(Total 8 marks)

Q10.

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There are millions of different substances that make up our world. All these substances are made from chemical elements.

(a) What is an element?

_____

_____

_____

_____

(1)

(b) Many substances are compounds. What is a compound?

_____

_____

_____

_____

(2)

(Total 3 marks)

Q11.

Use the Periodic Table on the Data Sheet to help you to answer this question.

(a) State **one** similarity and **one** difference in the electronic structure of the elements:

(i) across the Period from sodium to argon;

_____

_____

_____

(2)

(ii) down Group 7 from fluorine to astatine.

_____

_____

_____

(2)

(b) (i) State the trend in reactivity of the Group 1 elements.

_____

(1)

(ii) Explain this trend in terms of atomic structure.

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_____

_____

_____

_____

_____

(3)

(c) Hydrogen is an element which is difficult to fit into a suitable position in the Periodic Table. Give reasons why hydrogen could be placed in either Group 1 or Group 7.

_____

_____

_____

_____

_____

_____

(3)

(Total 11 marks)

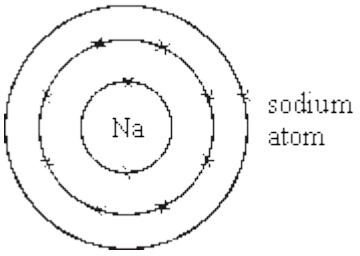
Q12.

(a) The electronic structure of a sodium atom can be written 2,8,1.
Write the electronic structure of a potassium atom in the same way.

_____

(1)

(b) The electronic structure of a sodium atom can also be represented as in the diagram below.



(i) Draw a similar diagram for a fluorine atom.

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(ii) Draw similar diagrams to show the electronic structure of the particles in sodium fluoride.

(4)

(Total 5 marks)

Q13.

The following passage was taken from a chemistry textbook.

Germanium is a white, shiny, brittle element. It is used in the electronics industry because it is able to conduct a small amount of electricity.

It is made from germanium oxide obtained from flue dusts of zinc and lead smelters. The impure germanium oxide from the flue dusts is changed into germanium by the process outlined below.

STEP 1 The germanium oxide is reacted with hydrochloric acid to make germanium tetrachloride. This is a volatile liquid in which the germanium and chlorine atoms are joined by covalent bonds.

STEP 2 The germanium tetrachloride is distilled off from the mixture.

STEP 3 The germanium tetrachloride is added to an excess of water to produce germanium oxide and hydrochloric acid.

STEPS 1 to 3 are repeated several times.

STEP 4 The pure germanium oxide is reduced by hydrogen to form germanium.

(a) Balance the equation below which represents the reaction in step 1.

GeO_2 + _____ HCl → $GeCl_4$ + _____ H_2O

(1)

(b) Write a word equation for the reaction in step 3.

_____

(1)

(c) Suggest why steps 1 to 3 are repeated several times.

_____

_____

(1)

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(d) The equation which represents the reaction in step 4 is shown below.

$$GeO_2 + 2H_2 \rightarrow Ge + 2H_2O$$

(i) Explain what is meant by the term 'reduced'.

_____

_____

(1)

(ii) Calculate the mass of germanium which could be made from 525 g of germanium oxide. (Relative atomic masses: Ge = 73; O = 16).

_____

_____

_____

_____

Mass _____ g

(3)

(e) Germanium is difficult to classify as either a metal or a non-metal.

(i) Give as much evidence as you can from the information in this question to support the view that germanium is a metal. Explain your answer as fully as you can.

_____

_____

_____

_____

_____

(3)

(ii) Give as much evidence as you can from the information in this question to support the view that germanium is a non-metal. Explain your answer as fully as you can.

_____

_____

_____

_____

(3)

(Total 13 marks)

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Q14.

(a) The list below gives six substances.

- aluminium
- beer
- copper
- milk
- pure water
- sodium chloride

Put each substance in the correct column of the table.

ELEMENTS	COMPOUNDS	MIXTURES

(3)

(b) Elements can be divided into two groups, metals and non-metals.

The list below gives some properties of elements.

- brittle
- can be hammered into shape
- dull
- good conductors of electricity
- poor conductors of electricity
- shiny

Put each property into the correct column.

PROPERTIES OF METALS	PROPERTIES OF NON-METALS

(3)

(Total 6 marks)

Q15.

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Sando-K is a medicine. It is given to people whose bodies contain too little of a particular element.

Sando-K is a mixture of two compounds. The formulae of the two compounds are given below.

$KHCO_3$ KCl

(a) Use the Data Sheet to help you to name all the elements in these compounds.

_____

_____

_____

_____

(3)

(b) Which metal do people given Sando-K need?

_____

(1)

(Total 4 marks)

Q16.

Sando-K is a medicine. It is given to people whose bodies contain too little of a particular element.

Sando-K is a mixture of two compounds. The formulae of the two compounds are given below.

$KHCO_3$ KC1

(a) Which metal do people given Sando-K need?

_____

(1)

(b) Sando-K contains the ion, CO_3^{2-}. Which gas would be produced if a dilute acid was added to Sando-K? (The Data Sheet may help you to answer this question.)

_____

(1)

(c) The compounds in Sando-K contain ions.

Complete the two sentences below.

Atoms change into positive ions by _____ one or more

_____ .

Atoms change into negative ions by _____ one or

more _____ .

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(4)

(d) Electricity can be used to show that an aqueous solution of Sando-K contains ions.

(i) Draw a diagram of an apparatus that you could use to prove that Sando-K contains ions.

(4)

(ii) Explain, as fully as you can, what would happen when the electricity is switched on.

_____

_____

_____

_____

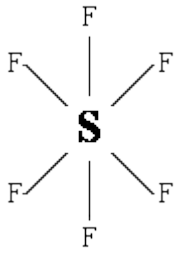
(3)

(Total 13 marks)

Q17.

Sulphur hexafluoride is a colourless, odourless, non-flammable gas, which is insoluble in water and extremely unreactive. It is used as an insulator in high voltage transformers and switchgear.

The diagram below represents a molecule of sulphur hexafluoride.



(a) What type of chemical bond holds the sulphur and fluorine atoms together in sulphur hexafluoride molecules?

_____

(1)

(b) Explain why sulphur hexafluoride has a low boiling point.

_____

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_____

(2)

(c) Explain how **three** of the properties of sulphur hexafluoride make it suitable for use as an insulator inside electrical transformers.

Property 1: _____

Explanation: _____

_____

Property 2: _____

Explanation: _____

_____

Property 3: _____

Explanation: _____

_____

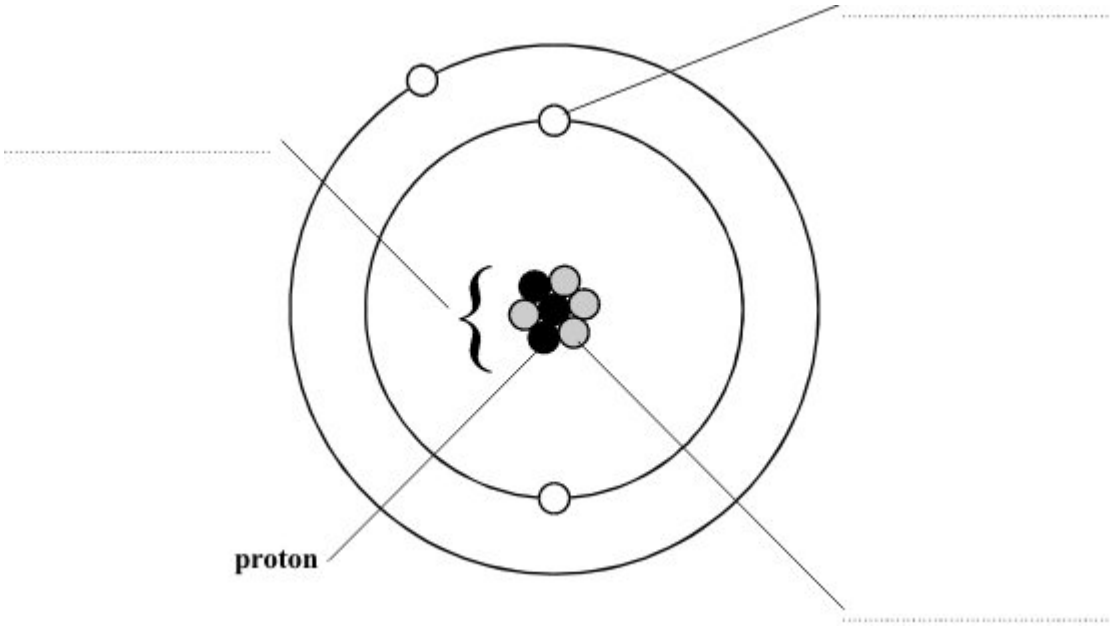
(3)

(Total 6 marks)

Q18.

The diagram represents an atom. Choose words from the list to label the diagram.

electron **ion** **neutron** **nucleus**



(Total 3 marks)

Q19.

Use these relative atomic masses: H = 1; O = 16; Ca = 40
to calculate the relative formula mass *(M_r)* of

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quicklime CaO _____

slaked lime $Ca(OH)_2$_____

(Total 2 marks)

Q20.

One definition of an element is:

"A substance that cannot be broken down into simpler substances by chemical methods"

The table below shows some of the 'substances' which Antoine Lavoisier thought were elements. He divided the 'substances' into four groups. He published these groups in 1789.

The modern names of some of the 'substances' are given in brackets.

ACID-MAKING ELEMENTS	GAS-LIKE ELEMENTS	METALLIC ELEMENTS		EARTHY ELEMENTS
sulphur	light	cobalt	mercury	lime (calcium oxide)
phosphorus	caloric (heat)	copper	nickel	magnesia (magnesium oxide)
charcoal (carbon)	oxygen	gold	platina (platinum)	barytes (barium sulphate)
	azote (nitrogen)	iron	silver	argilla (aluminium oxide)
	hydrogen	lead	tin	silex (silicon dioxide)
		magnese	tungsten	
		zinc		

(a) Name **one** 'substance' in the list which is **not** a chemical element or compound.

_____

(1)

(b) (i) Name **one** substance in the list which is a compound.

_____

(1)

(ii) Suggest why Lavoisier thought that this substance was an element.

_____

_____

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_____

_____

(1)

(Total 3 marks)

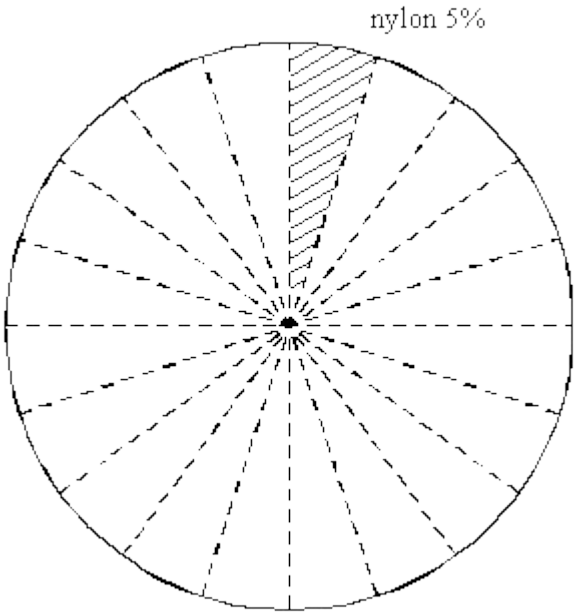
Q21.

Ammonia is a very important chemical.

(a) The table shows the percentage of ammonia used to make different substances.

SUBSTANCES MADE FROM AMMONIA	PERCENTAGE (%) OF AMMONIA USED
fertilisers	75
nitric acid	10
nylon	5
others	10

Shade on the pie chart the percentage of ammonia used to make nitric acid.



(1)

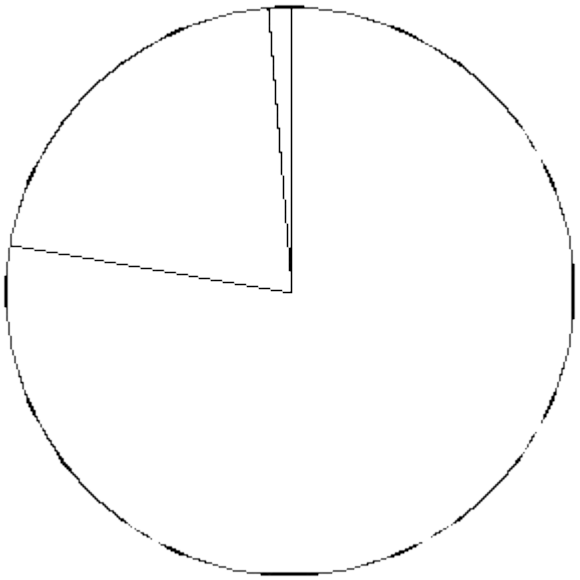
(b) Ammonia gas is made by the reaction between nitrogen gas and hydrogen gas.
Write a word equation to represent this reaction.

_____ + _____ ⇌ _____

(1)

(c) Nitrogen is one of the raw materials used to make ammonia.
Nitrogen is obtained from air.
This pie chart shows the proportion of nitrogen, oxygen and other gases in air.
Label the area which represents the proportion of nitrogen in air.

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(1)

(d) An artificial fertiliser contains compounds with the formulae:

NH_4NO_3 and **KCl**

(i) Use the Data Sheet to help you answer this question.
Name the elements in the compound NH_4NO_3.

1. _____

2. _____

3. _____

(2)

(ii) Use the Data Sheet to help you answer this question.
Name the compound KCl.

_____

(1)

(e) (i) Ammonium nitrate is one type of artificial fertiliser.
Calculate the relative formula mass of ammonium nitrate NH_4NO_3.
(Relative atomic masses: H = 1, N = 14, O = 16.)

_____

_____

(1)

(ii) Use your answer to part (f)(i) to help you calculate the percentage by mass of nitrogen present in ammonium nitrate NH_4NO_3.

_____

_____

_____

(2)

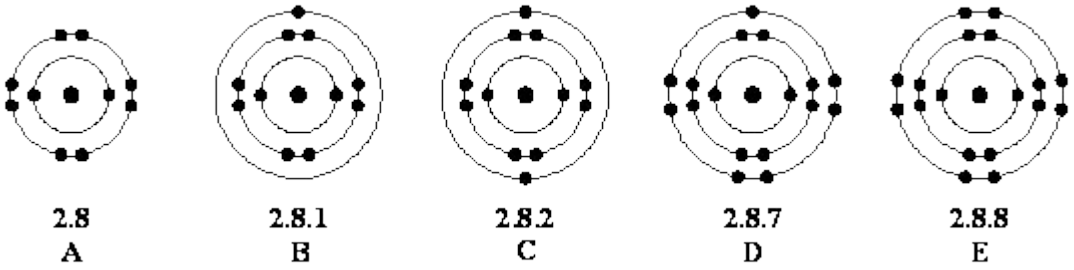
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(Total 9 marks)

Q22.

Use the Data Sheet to help you answer this question.

When sodium reacts with water it forms sodium ions.
The diagrams below represent the electron arrangements of some atoms and ions.



Which of the diagrams, **A** to **E**, represents the electron arrangement of each of the following?

(i) A sodium atom, Na _____

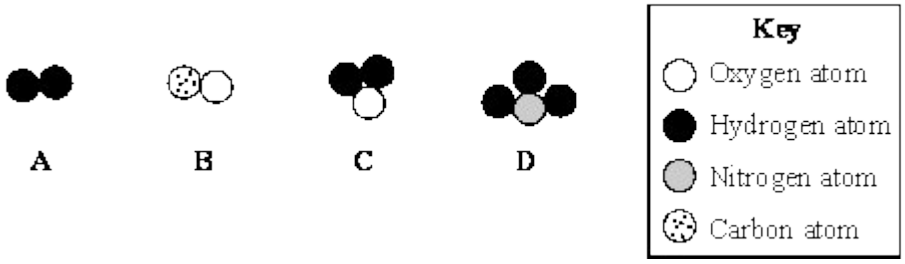
(ii) A sodium ion, Na^+ _____

(Total 2 marks)

Q23.

The periodic table on the Data Sheet might help you to answer this question.

Diagrams **A – D** show models of four different molecules.



Complete the table to give the name and the formula of each of the molecules **A – D**.

The first one has been done for you.

Molecule	Name	Formula
A	Hydrogen	H_2
B		
C		
D		

(Total 6 marks)

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Q24.

(a) You may find the Data Sheet helpful to complete the word equation.

These two gases react as shown in the balanced symbol equation.

$$2H_2 + O_2 \rightarrow 2H_2O$$

Complete the word equation for this reaction.

hydrogen + _____ → _____

(2)

(b) Complete this sentence by crossing out the **two** words in the box that are wrong.

catalyst
molecule
solution

This chemical reaction is much faster if a molecule if a is used.

(1)

(Total 3 marks)

Q25.

Use the Periodic Table of Elements on the Data Sheet to help you to answer this question.

(a) Describe, in as much detail as you can, the structure of a fluorine atom.

_____

_____

_____

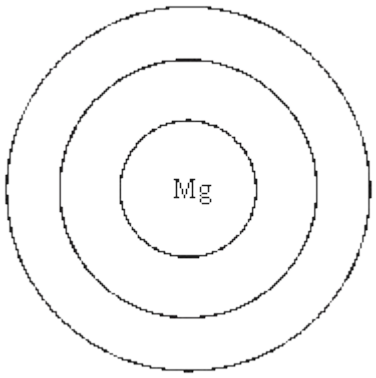
_____

_____

_____

(3)

(b) Complete the diagram to show the electronic structure of a magnesium atom.



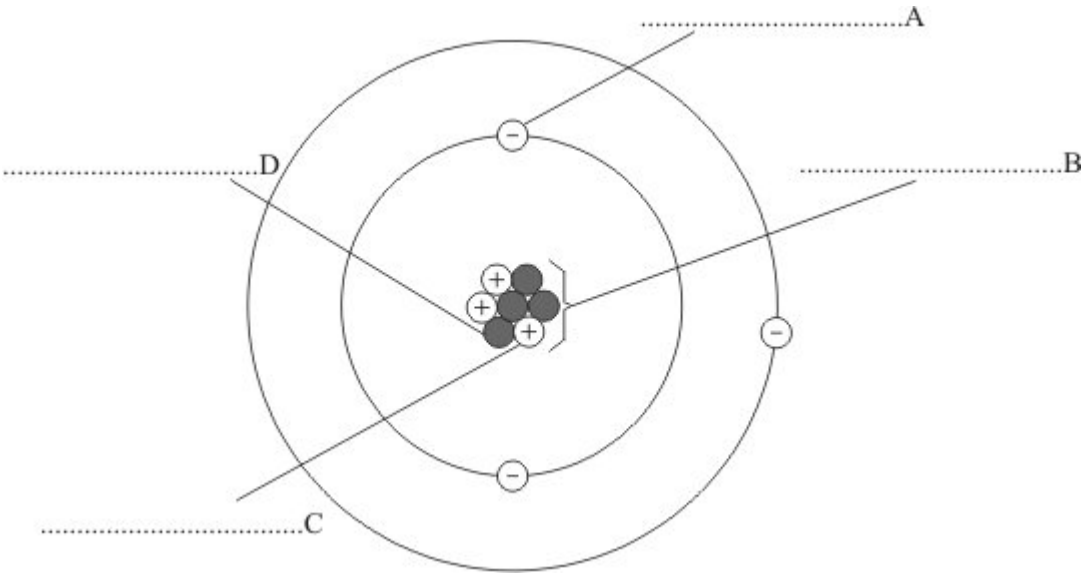
(1)

(Total 4 marks)

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Q26.

The diagram shows an atom.



(a) On the diagram, write the names of structures **A**, **B**, **C** and **D**.

(4)

(b) To which Group of the periodic table does this atom belong?

_____

Give **one** reason for your answer.

_____

_____

(2)

(c) Name the element which is made up of this type of atom.

_____

(1)

(Total 7 marks)

Q27.

Ammonium chloride, NH_4Cl, is made up of nitrogen, hydrogen and chlorine atoms.

(i) Complete the table to show the number of atoms of each element present in NH_4Cl.

Element	**Number of atoms in NH_4Cl**
nitrogen	1
hydrogen	
chlorine	

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(1)

(ii) Calculate the relative formula mass of ammonium chloride, NH_4Cl.

(Relative atomic masses: H = 1, N = 14, Cl = 35.5)

_____

_____

_____

_____

Relative formula mass = _____

(2)

(Total 3 marks)

Q28.

Electrons, neutrons and protons are sub-atomic particles.

(a) Complete the **six** spaces in the following table.

Name of sub-atomic particle	Relative mass	Relative charge
_____	1	_____
_____	_____	0
_____	$\frac{1}{1840}$	_____

(3)

(b) An aluminium atom has 13 electrons. How are these arranged in shells around the nucleus?

_____

(1)

(c) Chromium atoms have 24 protons and 28 neutrons.

(i) How many electrons does each neutral chromium atom have?

_____

(1)

(ii) What is the mass number of chromium?

_____

(1)

(d) What change occurs to an atom which undergoes the process of *reduction* in a chemical reaction?

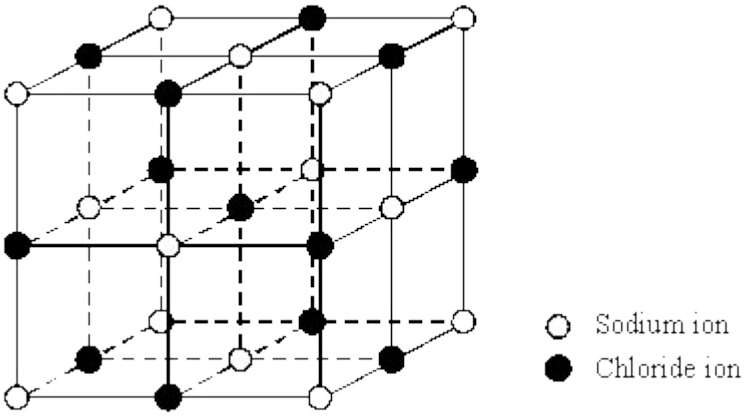
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_____

_____

(1)

(e) The diagram shows part of the ionic lattice of a sodium chloride crystal.



Explain why the ions in this lattice stay in place.

_____

_____

_____

_____

_____

_____

(3)

(Total 10 marks)

Q29.

(a) Atoms are made of sub-atomic particles. Complete the **six** spaces in the table.

Name of sub-atomic particle	Relative mass	Relative charge
_____	$\frac{1}{1840}$	_____
Neutron	_____	_____
_____	1	_____

(3)

(b) Complete the spaces in the sentences.

(i) The atomic number of an atom is the number of _____ in its

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nucleus and is equal to the number of _____ if the atom is not charged.

(1)

(ii) The mass number of an atom is the total number of _____ and _____ in its nucleus.

(1)

(c) The table gives information about the atoms of three elements.

Name of element	Chemical symbol	Number of electrons in:		
		1st shell	2nd shell	3rd shell
Fluorine	F	2	7	0
Neon	Ne	2	8	0
Sodium	Na	2	8	1

Two of these elements can react together to form a chemical compound.

(i) What is the name and the formula of this compound?

Name _____ Formula _____

(2)

(ii) What type of bonding holds this compound together?

_____

(1)

(iii) Explain, in terms of electron transfer, how the bonding occurs in this compound.

_____

_____

_____

_____

_____

_____

(2)

(Total 10 marks)

Q30.

The drawing shows a container of a compound called magnesium chloride.

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(i) How many elements are joined together to form magnesium chloride?

_____

(1)

(ii) Magnesium chloride is an ionic compound. What are the names of its ions?

_____ ions and _____ ions

(1)

(iii) How many **negative** ions are there in the formula for magnesium chloride?

_____

(1)

(iv) Complete the sentence.

Ions are atoms, or groups of atoms, which have lost or gained

_____ .

(1)

(v) Suggest **three** properties which magnesium chloride has because it is an ionic compound.

Property 1 _____

_____

Property 2 _____

_____

Property 3 _____

_____

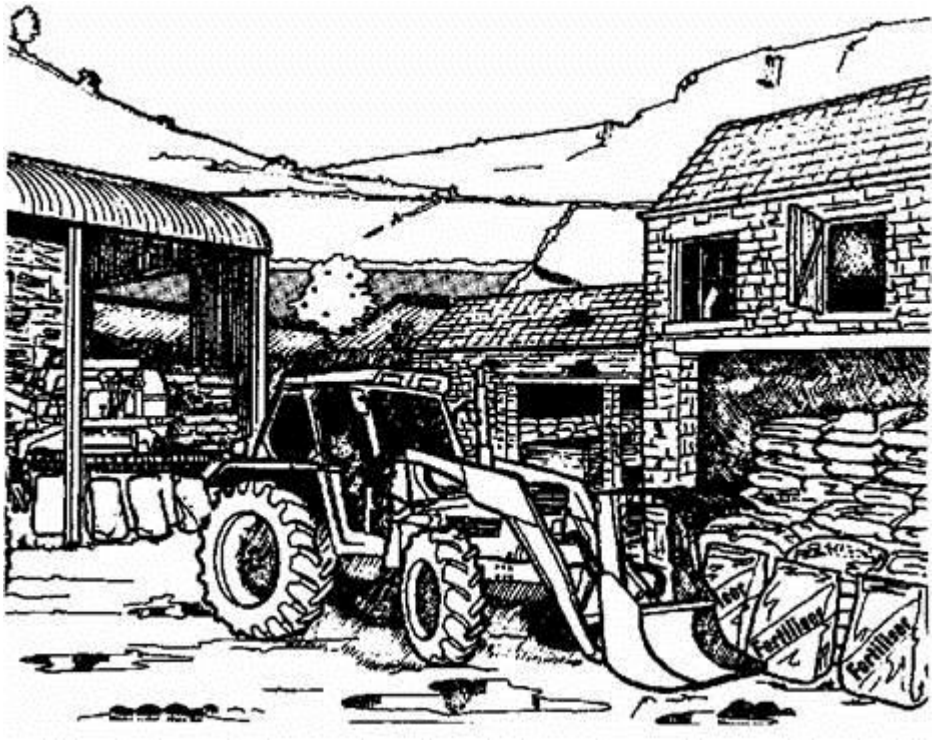
(3)

(Total 7 marks)

Q31.

Ammonium nitrate and ammonium sulphate are used as fertilisers.

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(i) Which acid reacts with ammonia to form ammonium nitrate?

_____

(1)

(ii) Which acid reacts with ammonia to form ammonium sulphate?

_____

(1)

(iii) The reactions in (i) and (ii) are both exothermic. How can you tell that a reaction is exothermic?

_____

_____

(1)

(iv) The reactions in (i) and (ii) are both examples of acid + base reactions. What is the name of the chemical change which takes place in every acid + base reaction?

_____

(1)

(Total 4 marks)

Q32.

Part of the Periodic Table showing the symbols for the first twenty elements is given below.

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		H							He
Li	Be			B	C	N	O	F	Ne
Na	Mg			Al	Si	P	S	Cl	Ar
K	Ca	Transition metals							

(a) Draw diagrams showing the arrangement of electrons (electronic structures) in:

(i) an aluminium atom;

(ii) a chlorine atom.

(2)

(b) (i) Use electronic structures to help you show why the formula of sodium oxide is Na_2O.

(3)

(ii) State why the formation of sodium ions is classified as an oxidation.

_____

_____

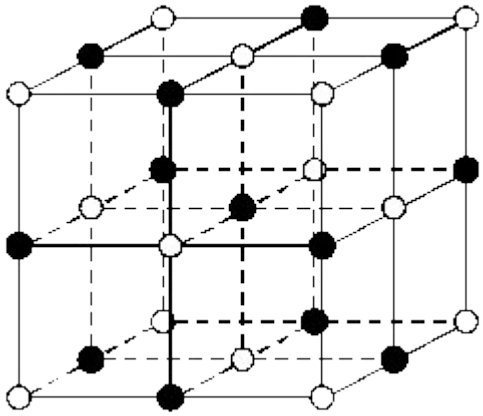
(1)

(Total 6 marks)

Q33.

(a) The diagram shows part of the ionic lattice of a sodium chloride crystal.

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(i) Complete the spaces in the table to give information about **both** of the ions in this lattice.

Name of ion	Charge
_____	_____
_____	_____

(2)

(ii) When it is solid, sodium chloride will not conduct electricity. However, molten sodium chloride will conduct electricity. Explain this difference.

_____

_____

_____

_____

(2)

(iii) Complete the sentence.

Sodium chloride conducts electricity when it is molten and when it is

_____

(1)

(b) The symbol for a calcium atom can be shown like this:

$$^{40}_{20}Ca$$

(i) What is the mass number of this atom?

_____

(1)

(ii) What information is given by the mass number?

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_____

_____

(1)

(c) Calcium burns in oxygen with a brick-red flame. The product is a white solid. It is calcium oxide and its formula is CaO.

(i) Balance the chemical equation for the reaction.

$$Ca(s) + O_2(g) \rightarrow CaO(s)$$

(1)

(ii) Describe, in terms of electrons, what happens to a calcium atom when it becomes a calcium ion.

_____

_____

_____

_____

(2)

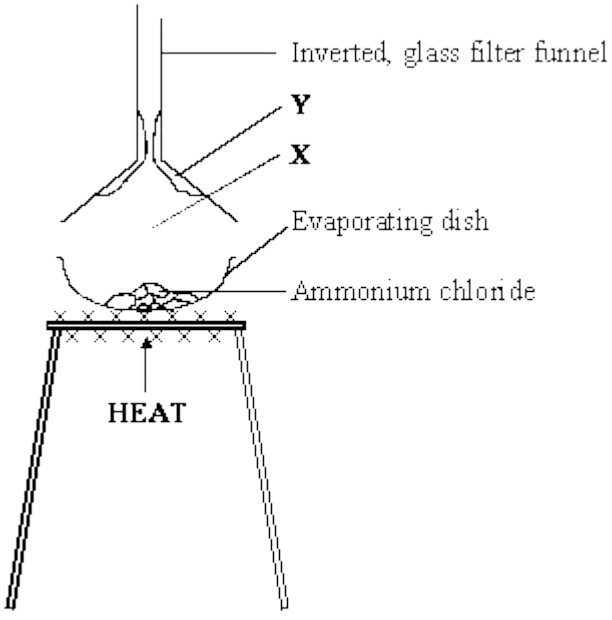
(Total 10 marks)

Q34.

(a) The equation for the reaction that takes place when ammonium chloride is heated is:

$$\underset{\text{ammonium chloride}}{NH_4Cl(s)} \rightleftharpoons \underset{\text{ammonia}}{NH_3(g)} + \underset{\text{hydrogen chloride}}{HCl\ (g)}$$

The diagram shows how a teacher demonstrated this reaction. The demonstration was carried out in a fume cupboard.



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(i) Apart from the gases normally in the atmosphere, which two gases would be at **X**?

_____ and _____

(1)

(ii) Name the white solid that has formed at **Y**.

_____

(1)

(iii) Why was the demonstration carried out in a fume cupboard?

_____

_____

(1)

(iv) Complete the **four** spaces in the passage.

The chemical formula of ammonia is NH_3. This shows that there is one atom of _____ and three atoms of _____ in each _____ of ammonia. These atoms are joined by bonds that are formed by sharing pairs of electrons. This type of bond is called a _____ bond.

(4)

(b) Electrons, neutrons and protons are sub-atomic particles.

(i) Complete the **three** spaces in the table.

Name of sub-atomic particle	Relative mass	Relative charge
_____	1	+1
_____	1	0
_____	$\frac{1}{1840}$	–1

(2)

(ii) Which **two** sub-atomic particles are in the nucleus of an atom?

_____ and _____

(1)

(Total 10 marks)

Q35.

Choose words from this list to complete the sentences below.

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carbonate chloride compound mixture oxide solution

(a) When two elements react, the new substance formed is called a _____ .

(1)

(b) The white powder formed when zinc reacts with oxygen is called zinc _____ .

(1)

(Total 2 marks)

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