



# THE PERIODIC TABLE

Period 1 2 3 4 5 6 7 0

Period

4	He	2
Helium		

1	H	1
Hydrogen		

1	7	9	11	12	14	16	19	20
	Li Lithium 3	Be Beryllium 4	B Boron 5	C Carbon 6	N Nitrogen 7	O Oxygen 8	F Fluorine 9	Ne Neon 10
	23	24	27	28	31	32	35.5	40
	Na Sodium 11	Mg Magnesium 12	Al Aluminium 13	Si Silicon 14	P Phosphorus 15	S Sulphur 16	Cl Chlorine 17	Ar Argon 18
2	39	40	45	48	51	52	55	56
	K Potassium 19	Ca Calcium 20	Sc Scandium 21	Ti Titanium 22	V Vanadium 23	Cr Chromium 24	Mn Manganese 25	Fe Iron 26
	86	88	89	91	93	96	99	101
	Rb Rubidium 37	Sr Strontium 38	Y Yttrium 39	Zr Zirconium 40	Nb Niobium 41	Mo Molybdenum 42	Tc Technetium 43	Ru Ruthenium 44
3	133	137	139	179	181	184	186	190
	Cs Caesium 55	Ba Barium 56	La Lanthanum 57	Hf Hafnium 72	Ta Tantalum 73	W Tungsten 74	Re Rhenium 75	Os Osmium 76
4	223	226	227	272	273	274	275	276
	Fr Francium 87	Ra Radium 88	Ac Actinium 89	Th Thorium 90	Pa Protactinium 91	U Uranium 92	Np Neptunium 93	Pu Plutonium 94
5	115	119	122	127	131	136	140	143
	In Indium 49	Sn Tin 50	Sb Antimony 51	Te Tellurium 52	I Iodine 53	Xe Xenon 54	Po Polonium 84	At Astatine 85
6	204	207	209	210	210	210	210	210
	Tl Thallium 81	Pb Lead 82	Bi Bismuth 83	Po Polonium 84	At Astatine 85	Rn Radon 86	Fr Francium 87	Ra Radium 88
7	287	288	289	290	291	292	293	294
	Nh Nihonium 113	Fl Flerovium 114	Mc Moscovium 115	Lv Livermorium 116	Ts Tennessine 117	Og Oganesson 118	Uue Ununennium 119	Uub Unbinilium 120

Key

Relative atomic mass
Symbol
Name
Atomic number

1. Use the substances from the list to complete the following table.

*Leave blank*

- argon**
- carbon dioxide**
- chlorine**
- iron**
- potassium**
- sodium chloride**

Each substance may be used once, more than once or not at all.

<b>Description</b>	<b>Substance</b>
An unreactive gas, consisting of separate atoms	.....
A metal that reacts with water to form an alkaline solution	.....
A solid used to de-ice roads	.....
A green gas	.....
A gas that turns limewater milky	.....
A metal used as a catalyst	.....

(6) **Q1**

(Total 6 marks)

**TURN OVER FOR QUESTION 2**

2. Hydrocarbon fuel is burnt in excess air to form carbon dioxide gas.

*Leave blank*

(a) The names and formulae of four compounds are shown

carbon dioxide  
 $\text{CO}_2$

ethanol  
 $\text{C}_2\text{H}_5\text{OH}$

glucose  
 $\text{C}_6\text{H}_{12}\text{O}_6$

propane  
 $\text{C}_3\text{H}_8$

Which compound is a hydrocarbon? Explain your answer.

Compound .....

Explanation .....

..... (2)

(b) Explain why carbon dioxide is called a **compound**.

.....

.....

.....

..... (2)

(c) Explain how the amount of carbon dioxide in the atmosphere is reduced by

(i) green plants

.....

.....

..... (2)

(ii) the oceans

.....

..... (1)

(d) Sometimes carbon monoxide gas is formed when a hydrocarbon burns.

*Leave blank*

(i) Why is carbon monoxide formed instead of carbon dioxide?

.....  
.....

(1)

(ii) A faulty room heater gives off carbon monoxide gas.  
Explain why this is dangerous.

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

(2)

Q2

(Total 10 marks)

--	--

**TURN OVER FOR QUESTION 3**

3. Copper can be found as copper oxide contained in rock.

(a) What is the name for a metal compound, found in rocks, from which the metal can be extracted?

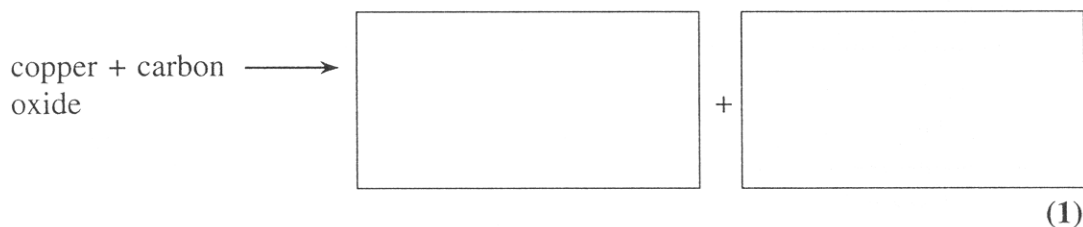
.....  
(1)

(b) Copper oxide reacts when mixed with carbon to produce copper.

(i) What must be done to start the reaction?

.....  
(1)

(ii) Complete the word equation for this reaction.

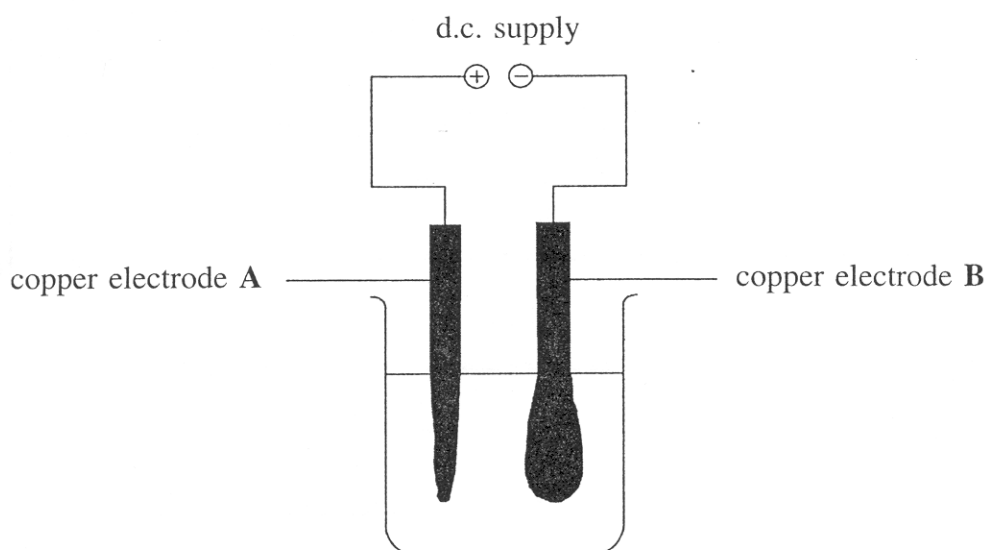


(iii) Copper oxide undergoes reduction in this reaction.  
Explain what is meant by **reduction**.

.....  
(1)

(c) Copper can be purified using the apparatus below.

Leave blank



Describe how copper can be purified, using the apparatus above.

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

(3)

(d) (i) Give **one** use of copper.

.....

(1)

(ii) State the property of copper that makes it suitable for this use.

.....

(1)

Q3

(Total 9 marks)

--

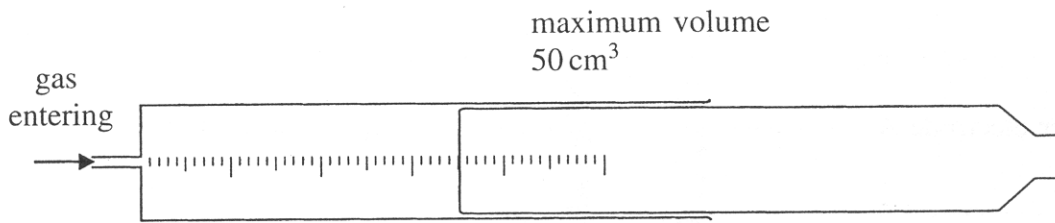
TURN OVER FOR QUESTION 4

4. (a) What is the percentage of oxygen in the air?

Leave blank

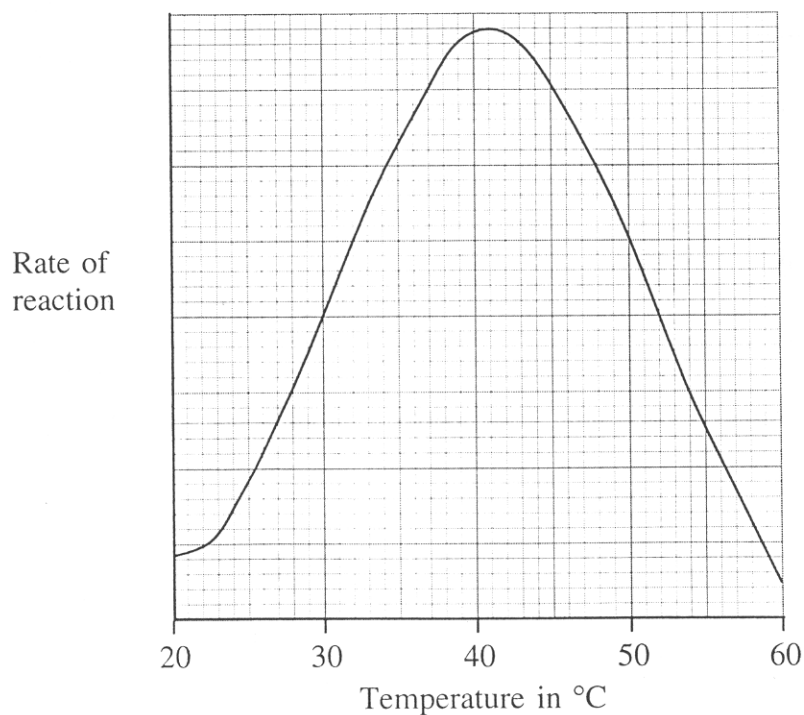
..... (1)

(b) What volume of gas is contained in the syringe?



..... (2)

(c) Hydrogen peroxide solution decomposes to form water and oxygen in the presence of an enzyme. The decomposition is carried out at different temperatures. The graph shows the initial rate of reaction at different temperatures.



(i) What is an enzyme?

.....  
..... (2)



(ii) Explain, in terms of particles, why the rate of reaction is faster at 40 °C than at 20 °C.

*Leave blank*

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

(3)

(iii) Explain why the rate of reaction decreases above 41 °C.

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

(2)

(d) Some products are manufactured using reactions involving enzymes.  
Name **one** of these products and the source of the enzyme used.

Product .....

Source of enzyme .....

(2)

**Q4**

(Total 12 marks)

--	--

**TURN OVER FOR QUESTION 5**

5. The table gives information about four chlorides.

Leave  
blank

Name	Formula	pH of solution
aluminium chloride	AlCl <sub>3</sub>	3
calcium chloride	CaCl <sub>2</sub>	6
copper chloride	CuCl <sub>2</sub>	5
sodium chloride	NaCl	7

(a) All the solutions contain chloride ions, Cl<sup>-</sup>.

(i) Deduce the formula of the metal ion present in each of the four chloride solutions.

Aluminium ion.....

Calcium ion.....

Copper ion.....

Sodium ion.....

(3)

(ii) Suggest a connection between the formula of the metal ion and the pH of the solution of its chloride.

.....  
.....

(1)

(b) Only one of the chloride solutions is coloured.

(i) Which chloride solution is coloured?

.....

(1)

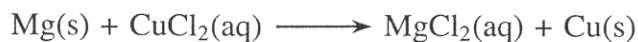
(ii) Use the periodic table to explain why you would expect this chloride solution to be coloured.

.....

(1)

- (c) Magnesium reacts with two of the chloride solutions in the table to precipitate a metal. One reaction is with copper chloride solution. The equation for this reaction is

*Leave blank*



- (i) Name the other chloride solution which reacts to precipitate a metal. Write a balanced equation, including state symbols, for its reaction with magnesium.

Name .....

Equation .....

.....

(4)

- (ii) Explain why magnesium is said to be oxidised when it reacts with these two chloride solutions.

.....

.....

(2)

- (iii) Explain why magnesium does not react with the other two chloride solutions in the table.

.....

.....

(2)

Q5

(Total 14 marks)

--	--

**TURN OVER FOR QUESTION 6**

6. The element bromine exists as a mixture of two isotopes.

Leave  
blank

(a) (i) Complete the table to show the number of protons and neutrons in the nuclei of the two isotopes of bromine.

Atomic number of isotope	Mass number of isotope	Number of protons	Number of neutrons
35	79	.....	.....
35	81	.....	.....

(3)

(ii) The relative atomic mass of bromine is 80.  
Deduce the percentage abundance of the two isotopes in bromine.

.....  
.....

(1)

(b) Bromine is extracted by blowing chlorine gas through sea water which contains bromide ions.

(i) Write an ionic equation for this reaction.

.....

(3)

(ii) Explain why iodine could **not** be used instead of chlorine in this process.

.....  
.....

(1)

(c) Bromine water is used as a test to distinguish alkenes from alkanes.

*Leave blank*

(i) Give the name and structure, showing all covalent bonds, of the alkene containing three carbon atoms.

.....

(3)

(ii) State the colour change when bromine water is shaken with an alkene.

Initial colour .....

Final colour .....

(2)

(iii) Predict what you would **see** if bromine water were added to a sample of poly(ethene).

Explain your answer in terms of the bonding in poly(ethene).

Prediction .....

.....

Explanation .....

.....

(2)

(iv) Poly(ethene) is widely used as packaging for foods.

State **two** properties of poly(ethene) which make it suitable for this use.

1 .....

2 .....

(2)

Q6

(Total 17 marks)

--	--

**TURN OVER FOR QUESTION 7**

Leave blank

7. Carbon dioxide,  $\text{CO}_2$ , and silicon dioxide,  $\text{SiO}_2$ , both occur widely in nature. Carbon dioxide sublimates at  $-78^\circ\text{C}$ . Silicon dioxide melts at  $1728^\circ\text{C}$ . The two compounds have some similar chemical properties; for example, both react with alkalis. They also have some similar physical properties; for example both are electrical insulators.

(a) (i) What change of state takes place when carbon dioxide sublimates?

.....  
(1)

(ii) In what way are the electron arrangements of a carbon atom and a silicon atom the same?

.....  
(1)

(iii) Suggest why carbon dioxide and silicon dioxide have some similar properties.

.....  
.....  
(2)

(b) (i) Suggest the type of **bonding** present in carbon dioxide and silicon dioxide. Give a reason for your answer.

Bonding .....

Reason .....

.....  
(2)

(ii) Suggest the type of **structure** present in silicon dioxide. Give a reason for your answer.

Structure .....

Reason .....

.....  
(2)

(iii) Describe the structure of **solid** carbon dioxide.

.....  
.....  
(2)

- (c) Silicon dioxide is present as a mineral in many types of igneous and metamorphic rock. Describe what causes igneous rock to change into metamorphic rock. Indicate the time scale involved.

*Leave blank*

.....

.....

.....

.....

(3)

Q7

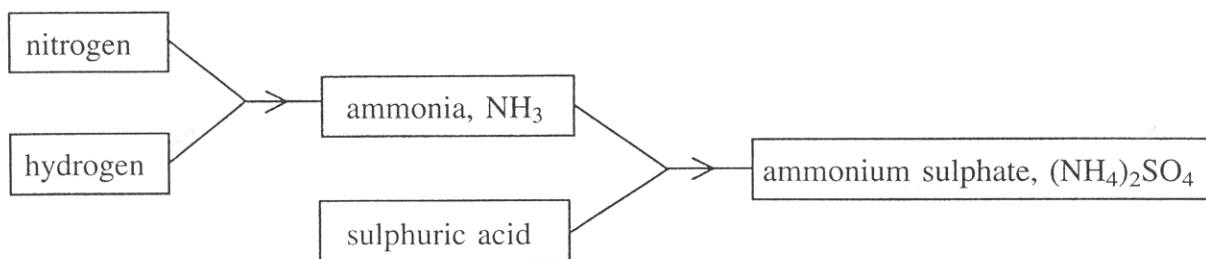
(Total 13 marks)

--	--

**TURN OVER FOR QUESTION 8**

8. The diagram shows stages in the manufacture of a fertiliser, ammonium sulphate.

Leave blank



(a) Write a balanced equation for the formation of ammonia, indicating that the reaction is reversible.

.....  
(2)

(b) Ammonia was first made by this reaction using a pressure of 25 atmospheres. Modern chemical plants use pressures of 200 atmospheres or more. State **two** advantages of using a higher pressure for this reaction. Give a reason to support each of your answers.

Advantage 1 .....

Reason .....

.....

Advantage 2 .....

Reason .....

.....  
(4)

(c) Ammonium sulphate is used to supply plants with increased levels of nitrogen. Calculate the relative formula mass of ammonium sulphate,  $(\text{NH}_4)_2\text{SO}_4$ , and hence the percentage by mass of nitrogen (N) in this compound. (Relative atomic masses: H = 1.0; N = 14; O = 16; S = 32)

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

(3) Q8

(Total 9 marks)

TOTAL FOR PAPER: 90 MARKS

END