

THE PERIODIC TABLE

Period 1 2 3 4 5 6 7 0

Group

4	He	Helium	2
---	----	--------	---

1	H	Hydrogen	1
---	---	----------	---

7	Li	Lithium	3	9	Be	Beryllium	4	11	B	Boron	5	12	C	Carbon	6	13	Al	Aluminium	13	14	Si	Silicon	14	15	P	Phosphorus	15	16	S	Sulphur	16	17	Cl	Chlorine	17	18	Ar	Argon	18				
23	Na	Sodium	11	24	Mg	Magnesium	12	27	Al	Aluminium	13	28	Si	Silicon	14	31	P	Phosphorus	15	32	S	Sulphur	16	33	P	Phosphorus	15	34	S	Sulphur	16	35.5	Cl	Chlorine	17	40	Ar	Argon	18				
39	K	Potassium	19	40	Ca	Calcium	20	45	Sc	Scandium	21	48	Ti	Titanium	22	51	V	Vanadium	23	52	Cr	Chromium	24	55	Mn	Manganese	25	56	Fe	Iron	26	59	Co	Cobalt	27	63.5	Cu	Copper	29	65	Zn	Zinc	30
86	Rb	Rubidium	37	88	Sr	Strontium	38	91	Zr	Zirconium	40	96	Mo	Molybdenum	42	99	Tc	Technetium	43	101	Ru	Ruthenium	44	103	Rh	Rhodium	45	106	Pd	Palladium	46	108	Ag	Silver	47	112	Cd	Cadmium	48	115	In	Indium	49
133	Cs	Caesium	55	137	Ba	Barium	56	139	La	Lanthanum	57	179	Hf	Hafnium	72	181	Ta	Tantalum	73	184	W	Tungsten	74	186	Re	Rhenium	75	190	Os	Osmium	76	192	Ir	Iridium	77	195	Pt	Platinum	78	201	Hg	Mercury	80
223	Fr	Francium	87	226	Ra	Radium	88	227	Ac	Actinium	89	204	Tl	Thallium	81	207	Pb	Lead	82	209	Bi	Bismuth	83	210	Po	Polonium	84	210	Po	Polonium	84	210	At	Astatine	85	222	Rn	Radon	86				

Key

Relative atomic mass
Symbol
Name
Atomic number

SECTION A

1. Atoms are made up of three types of particle: proton, neutron and electron.

(a) Which **one** of these particles has the smallest mass?

..... (1)

(b) Which **one** of these particles has a negative charge?

..... (1)

(c) Which **two** of these particles are present in the nucleus of an atom?

..... (1)

(d) Which **two** of these particles are present in equal numbers in an atom?

..... (1)

(e) Isotopes of an element have different numbers of **one** of these particles. Name this particle.

..... (1)

(Total 5 marks)

Q1

BLANK PAGE

2. Use the Periodic Table on page 2 to help answer this question.

(a) Which number increases from 3 to 10 in Period 2?

..... (1)

(b) Which number increases from 11 to 204 in Group 3?

..... (1)

(c) Which group contains elements whose ions all have a 1+ charge?

..... (1)

(d) Which group contains elements whose ions have a 2- charge?

..... (1)

(e) Give the number of a period that contains transition metals.

..... (1)

(Total 5 marks)

Q2

3. (a) Rain-water is slightly acidic because it contains dissolved carbon dioxide.

(i) What is a possible pH value for rain-water? Circle the correct value.

1 5 7 9 13

(1)

(ii) The acid formed in rain-water is carbonic acid. Write a **word** equation for its formation.

..... (1)

(b) Give **two** uses of carbon dioxide.

1

2

(2)

(c) A carbon dioxide molecule contains double bonds and has a linear shape. Draw a diagram to show the bonds in a carbon dioxide molecule.

(1)

(Total 5 marks)

Q3

4. (a) Some elements combine together to form ionic compounds. Use words from the box to complete the sentences.

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

gained	high	lost	low
medium	metals	non-metals	shared

Ionic compounds are formed between and

Electrons are by atoms of one element and by atoms of the other element.

The ionic compound formed has a melting point and a boiling point.

(6)

- (b) Two elements react to form an ionic compound with the formula $MgCl_2$.

- (i) Give the electronic configurations of the two elements in this compound **before** the reaction.

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

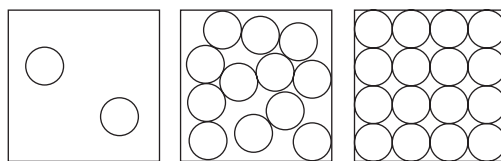
- (ii) Give the electronic configurations of the two elements in this compound **after** the reaction.

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

(Total 10 marks)

Q4

5. (a) The diagrams show the arrangement of particles in the three states of matter. Each circle represents a particle.



A **B** **C**

Use the letters **A**, **B** and **C** to give the starting and finishing states of matter of each of the changes in the table.

Change	Starting state	Finishing state
The formation of water vapour from a puddle of water on a hot day		
The formation of solid iron from molten iron		
The manufacture of poly(ethene) from ethene		
The reaction whose equation is $\text{ammonium chloride(s)} \rightarrow \text{ammonia(g)} + \text{hydrogen chloride(g)}$		

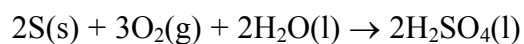
(4)

- (b) Which state of matter is the **least** common for the elements of the Periodic Table at room temperature?

.....

(1)

(c) The manufacture of sulphuric acid can be summarised by the equation



Tick one box in each line to show whether the formulae in the table represent a compound, an element or a mixture.

	Compound	Element	Mixture
2S(s)			
2S(s) + 3O ₂ (g)			
3O ₂ (g) + 2H ₂ O(l)			
2H ₂ SO ₄ (l)			

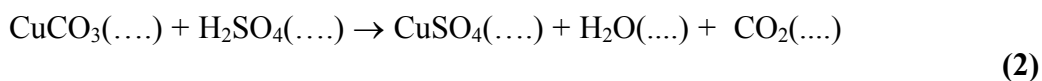
(4)

Q5

(Total 9 marks)

6. A student made some copper(II) sulphate solution by adding copper(II) carbonate to dilute sulphuric acid.

(a) (i) Complete the equation by writing the correct state symbol after each formula.



(ii) State the colours of the copper compounds in the equation.

copper(II) carbonate

copper(II) sulphate (2)

(iii) Apart from a colour change, what does the student see during the reaction?

..... (1)

(b) Use words from the box to complete the sentences. The sentences explain the method the student used to make copper(II) sulphate.

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

an acid	an alkali	a carbonate	
neutralisation	oxidation	reduction	a salt

When reacts with

the solution formed contains

The type of reaction occurring is

(4)

(c) The teacher told the student to add an excess of copper(II) carbonate and remove it after the reaction had finished.

(i) Why is an excess of copper(II) carbonate added?

.....
(1)

(ii) How is the excess copper(II) carbonate removed after the reaction has finished?

.....
(1)

(d) What method would the student use to obtain a sample of copper(II) sulphate crystals, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}(\text{s})$, from the solution formed in the reaction?

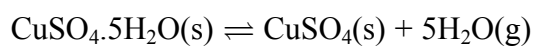
.....
(1)

(Total 12 marks)

Q6

--	--

7. (a) An experiment is carried out to illustrate a reversible reaction. The experiment uses a test tube containing a small amount of copper(II) sulphate crystals.



- (i) State how the reaction is made to go in the **forward** direction.

..... (1)

- (ii) Describe **two** observations you could make during the reaction.

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

- (iii) What type of reaction occurs when the reaction goes in the **backward** direction?

Tick **one** box.

condensing

cooling

hydration

reduction

(1)

(b) The backward reaction in (a) can be used as a chemical test for water. Solutions containing water also give a positive result in this test.

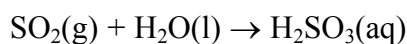
(i) State a physical test to show that an unknown liquid is pure water and not a solution containing water.

..... (1)

(ii) State the result of the test.

..... (1)

(c) Strong heating of copper(II) sulphate produces sulphur dioxide gas. Sulphur dioxide readily reacts with water as follows.



(i) Name the environmental problem caused when sulphur dioxide dissolves in water vapour in the atmosphere.

..... (1)

(ii) Describe **two** effects this produces on the environment.

.....

 (2)

(Total 9 marks)

Q7

TOTAL FOR SECTION A: 55 MARKS

BLANK PAGE

SECTION B

8. This question is about the properties and uses of some everyday materials.

Here is a list of possible uses for different materials, and a list of properties.

Use
coins injection moulding of bottles insulation on electrical wires overhead electricity cables railway tracks window frames

Property
brittle does not conduct electricity good conductor of electricity low melting point resists corrosion strong

Write **one** use for each material in the table. For each use, give a related property.

Each use and property may be used once, more than once or not at all.

Material	Use	Property
aluminium		
copper		
poly(chloroethene)		
poly(ethene)		
steel (contains iron)		

(Total 5 marks)

Q8

9. A mixture contains an insoluble compound and a soluble compound. The mixture is separated by adding hot water and then filtering. This produces a **white** solid, **A**, and a **green** solution, **B**.

The white solid and the green solution were tested to find out what they were. The tables show the tests used and the results.

Tests on white solid A	
Test	Result
Carry out flame test	The flame was coloured brick red
Add dilute hydrochloric acid Test the gas produced	Bubbles seen Found to be carbon dioxide

- (a) (i) **Name** the cation in solid A.

..... (1)

- (ii) The gas produced is carbon dioxide.

Give the test for carbon dioxide.

.....

Give the result of this test.

..... (2)

- (iii) **Name** the anion in solid A.

..... (1)

Tests on green solution B	
Test	Result
Add sodium hydroxide solution	Green precipitate
Add dilute nitric acid Then add silver nitrate solution	No change No change
Add barium chloride solution Then add dilute hydrochloric acid	White precipitate No change

(b) (i) Give the **formula** of the cation in solution B.

..... (1)

(ii) Give the **name** of the green precipitate.

..... (1)

(iii) **Name** the anion in solution B.

..... (1)

(iv) Give the **formula** of the white precipitate.

..... (1)

(c) There are three anions that give a precipitate when dilute nitric acid and silver nitrate solution are added. Name **two** of these anions.

.....
 (2)

(d) (i) Give the **formula** of solid A.

..... (1)

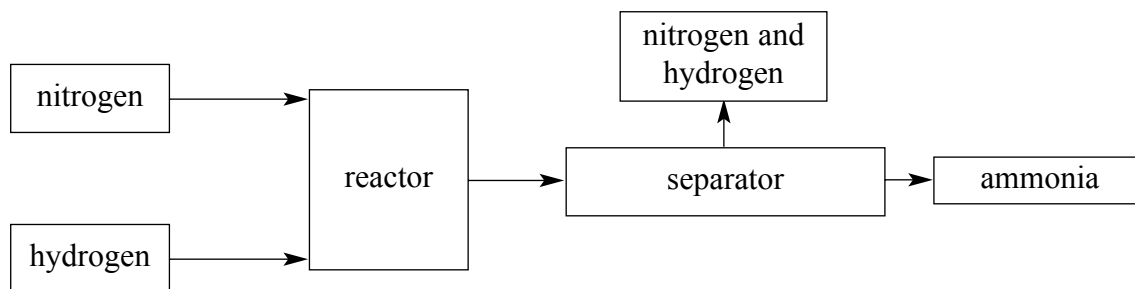
(ii) Give the **formula** of the compound in solution B.

..... (1)

(Total 12 marks)

Q9

10. (a) Ammonia is made industrially by the Haber process. In this process nitrogen is reacted with hydrogen. The flow diagram shows what happens in the Haber process.



(i) Give the names of the raw materials from which the nitrogen and hydrogen are obtained.

Raw material from which nitrogen is obtained

Raw material from which hydrogen is obtained

(2)

(ii) State the conditions used in the reactor.

.....

(3)

(iii) How is the ammonia separated from the unreacted nitrogen and hydrogen?

.....

(1)

(iv) What is done with the unreacted nitrogen and hydrogen?

.....

(1)

(b) Ammonium nitrate can be used as a fertiliser to increase plant growth. It is made by reacting ammonia solution with nitric acid. Write a chemical equation for this reaction.

.....

(2)

(Total 9 marks)

Q10

11. Crude oil is a mixture of hydrocarbons. The mixture can be separated into fractions by the process of fractional distillation.

(a) Fractional distillation of crude oil produces the fractions bitumen, diesel, fuel oil, gasoline, kerosene and refinery gases.

State **one** use of bitumen and **one** use of kerosene.

Use of bitumen

Use of kerosene

(2)

(b) Gasoline is used as a fuel for cars. When gasoline undergoes complete combustion the products are carbon dioxide and water.

(i) Write a word equation for the complete combustion of gasoline.

.....

(1)

(ii) In car engines, incomplete combustion takes place.

Why is the combustion incomplete?

.....

(1)

(iii) Explain why the incomplete combustion of gasoline can be harmful to humans.

.....

.....

.....

(3)

(c) Fractional distillation works because each fraction has a different boiling range.

Describe how you could obtain a fraction with a boiling range of 80 °C to 120 °C **in the laboratory** from a sample of crude oil. Name the items of apparatus you would need.

.....

.....

.....

.....

.....

.....

(3)

(Total 10 marks)

Q11

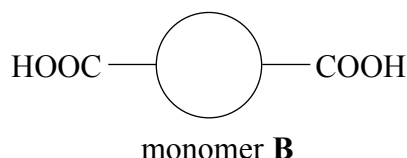
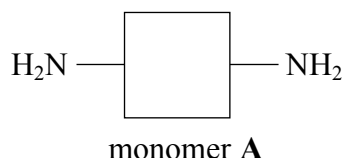
--	--

12. This question is about the synthetic polymer nylon.

(a) Poly(ethene) is an addition polymer. What type of polymer is nylon?

..... (1)

(b) Nylon can be made using the monomers **A** and **B** represented in the diagrams.



(i) What type of compound is monomer **A**?

..... (1)

(ii) What type of compound is monomer **B**?

..... (1)

(iii) Draw a diagram to show the structure of the polymer formed from **A** and **B**. You must draw enough of the structure to make the repeat unit clear.

(3)

(c) Nylon has a simple molecular structure. Use words from the box to complete the sentences.

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

ions	high	low
molecules	strong	weak

Nylon has a melting point. This is because there are forces between the that make up the structure.

(3)

(Total 9 marks)

Q12

TOTAL FOR SECTION B: 45 MARKS

END