

ANSWERS

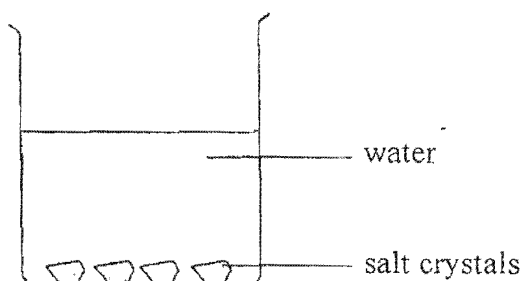
JUNE 09 04

EQ BOOKLET = PARTICLES - EQUATIONS

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A few crystals of a green salt are placed in a beaker of cold water. The crystals start to dissolve.



(a) Describe how the appearance of the contents of the beaker change over a period of time.

- all green / green at bottom / green spreads out / water is green
- crystals smaller / disappeared / disintegrate

(2)

(b) Name the process that occurs after the crystals dissolve.

diffusion

(1)

(c) How will the results of the experiment differ if hot water is used in place of cold water? Explain your answer.

- Difference ... colour spreads faster / more spread out / more is green / crystals dissolve faster / diffusion is faster
- ~~Explanation~~ EXPLANATION: particles/ions/molecules move faster / have more energy⁽²⁾

2

(a) On cooling, the $\text{H}_2\text{O}(\text{g})$ produced in the combustion of hydrogen is converted into $\text{H}_2\text{O}(\text{l})$.

Describe how the speed of, and the distance between, the particles change during this conversion.

Speed of particles ... decreases / slower

Distance between particles ... decreases / closer

(2)


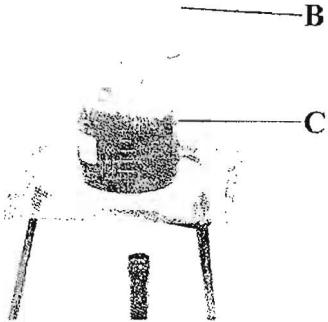
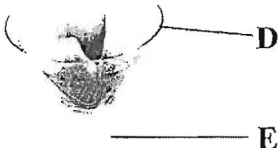
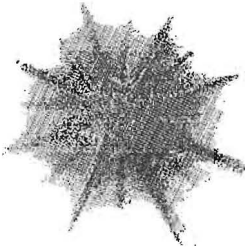
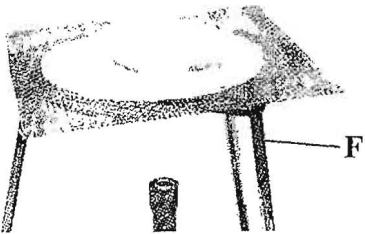
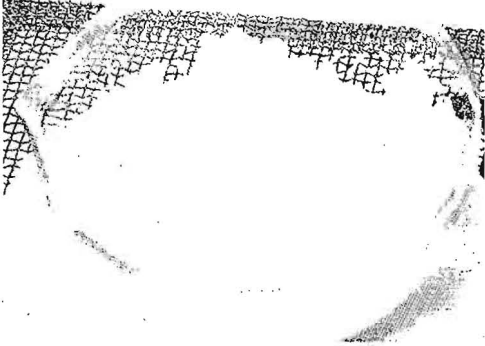
(no Q3 !!)

4.

Rock salt is a naturally occurring mineral containing sodium chloride, clay and sand. Some properties of the components of rock salt are shown in the table.

Component	Colour	Solubility in water
sodium chloride	white	soluble
clay	brown	insoluble
sand	yellow	insoluble

Pure sodium chloride can be obtained using the following method.

<p style="text-align: center;">Picture 1</p>  <p>A —</p> <p>The rock salt is ground into smaller pieces.</p>	<p style="text-align: center;">Picture 2</p>  <p>B C</p> <p>The rock salt is added to water, heated and stirred.</p>
<p style="text-align: center;">Picture 3</p>  <p>D E</p> <p>The solids are removed from the mixture.</p>	<p style="text-align: center;">Picture 4</p>  <p>The solids remain on the filter paper.</p>
<p style="text-align: center;">Picture 5</p>  <p>F</p> <p>The solution obtained is heated in an evaporating basin.</p>	<p style="text-align: center;">Picture 6</p>  <p>A white solid is left in the evaporating basin.</p>



(a) Give the names of the pieces of apparatus labelled A to F in the pictures. Use only the names given in the box.

basin	beaker	Bunsen burner	conical flask	funnel
gauze	glass rod	mortar	pipette	tripod

- A mortar
 - B glass rod
 - C beaker
 - D funnel
 - E conical flask
 - F tripod
- (6)

(b) Suggest a reason why the mixture was heated and stirred in Picture 2.

..... speed up dissolving of salt / make salt
 dissolve faster / make more salt
 dissolve (1)

(c) Name the process shown in Picture 3.

..... filtration (1)

(d) What are the solids left on the paper shown in Picture 4?

..... clay and sand (1)

(e) Name the white solid left in the evaporating basin in Picture 6.

..... sodium chloride (1)

Q1

(Total 10 marks)



SECTION A

5 (a) Complete the table of information about the three types of particle found in an atom.

Name of particle	Relative mass	Relative charge
electron	$\frac{1}{1836}$ or negligible	-1
neutron	1	0
proton	1	+1

(accept $\frac{1}{2000}$ to $\frac{1}{1800}$)

(4)

(b) An atom of chlorine can be represented by the symbol



(i) Explain the meaning of the term **mass number**. State the mass number of this chlorine atom.

• (number of) protons and neutrons

• 35

(2)

(ii) How many neutrons are in this atom of chlorine?

18 (35 - 17)

(1)

(c) There are two types of boron atoms. Some contain 5 protons and 5 neutrons while others contain 6 neutrons.

(i) How many protons do the second type of boron atoms contain?

5

(1)

(ii) What name is given to atoms of the same element with different numbers of neutrons?

Isotopes

(1)

Q1

(Total 9 marks)



SECTION B

6

- (a) The table shows the electronic configurations of atoms of the elements in Period 3 of the Periodic Table.

Element	Na	Mg	Al	Si	P	S	Cl	Ar
Electronic configuration	2.8.1	2.8.2	2.8.3	2.8.4	2.8.5	2.8.6	2.8.7	2.8.8

- (i) How is the electronic configuration of an atom of an element related to its position in the Periodic Table?

- Number of electrons in outer shell is same as group number

OR number of shells with electrons in = period⁽¹⁾ number

- (ii) Give the electronic configuration of an atom of the element directly below magnesium in the Periodic Table.

2, 8, 8, 2

(1)

- (b) Explain the meaning of the term isotopes.

- ATOMS with
- same atomic number / same number of protons / same element
- different number of neutrons / mass⁽²⁾ number

(max 1 mark if do not mention ATOMS)



(c) An element exists as three isotopes. The table gives some information about them.

Number of neutrons	Number of protons	Atomic number of isotope	Mass number of isotope	Percentage of each isotope in the element
12	12	12	24	79
13	12	12	25	10
14	12	12	26	11

(i) Complete the table for the isotopes of the element. (5)

(ii) Use the information in the table and the Periodic Table on page 2 to identify the element.

magnesium / Mg

(1)

(iii) Use the information in the table to calculate the relative atomic mass of the element. Give your answer to **three** significant figures.

•
$$RAM = \frac{(24 \times 79) + (25 \times 10) + (26 \times 11)}{100}$$

• 24.3

(3)

(iv) When a sample of the element containing only atoms with a mass number of 24 was added to dilute sulphuric acid, effervescence was seen. What would be seen if a sample of the element containing only atoms with a mass number of 26 was added to dilute sulphuric acid? Explain your answer.

Observation ... effervescence / bubbles / same / no difference

Explanation ... Same electronic config / same element / same no. of electrons / number of neutrons has no effect

(2)

Q5

(Total 15 marks)



SECTION B

7. (a) What is meant by the term **atomic number**?

Number of protons in an atom

(must mention atom or nucleus to gain the mark) (1)

(b) (i) What name is given to two atoms of the same element that contain different numbers of neutrons?

isotopes

(1)

(ii) Complete the table about two atoms of argon.

Number of protons in an atom	Number of electrons in an atom	Number of neutrons in an atom	Mass number
18	18	20	38
18	18	22	40

(4)

(iii) Explain why argon is chemically unreactive.

full OUTER shell / no need to gain or lose electrons / 8 electrons in OUTER shell

(1)

(c) (i) In a sample of copper, 69.1% of the atoms have a mass number of 63 and the remainder have a mass number of 65.

Use this information to calculate the relative atomic mass of copper. Give your answer to 3 significant figures.

• Isotope 65 = 30.9%

$$\frac{(63 \times 69.1) + (65 \times 30.9)}{100}$$

• 63.6

← correct answer scores 3. (3)

(ii) Explain why copper atoms with different numbers of neutrons have identical chemical properties.

Same electronic configuration or same number of (outer) electrons.

8.

(1)

8

(a) Lithium burns in oxygen to form the ionic compound lithium oxide.

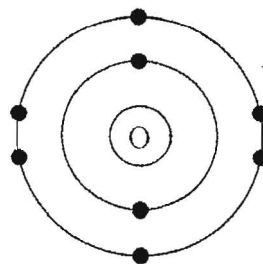
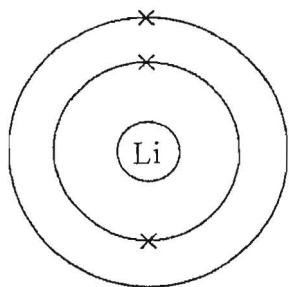
(i) State the colour of the flame when lithium burns.

(Analysis Topic)

red

(1)

(ii) The diagrams show the electron configurations of an atom of lithium and an atom of oxygen.



An explanation to include:

Describe what happens, in terms of electrons, when lithium reacts with oxygen.

- electron transfer
- from lithium to oxygen
- Li atom each lose one electron and O atom gains two electrons.

(3)

(iii) Write the formula of each of the ions in lithium oxide.

Lithium ion Li^+

Oxide ion O^{2-}

(2)

Q1



9. The reaction between magnesium and chlorine forms the ionic compound magnesium chloride, $MgCl_2$.

(a) By reference to electrons, describe how magnesium and chlorine atoms form magnesium chloride.

An explanation to include:

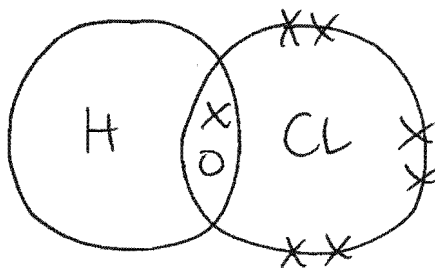
- electron transfer
- from magnesium to chlorine
- Mg loses two electrons and (each) Cl gains one electron.

All marks can be scored from a suitably annotated diagram

Zero marks if any reference to sharing (3)

10. (a) (i) A hydrogen chloride molecule contains a covalent bond.

Draw a dot and cross diagram to show the electrons in this molecule. Show only the outer electrons of each atom.



(2)

(ii) How does the covalent bond hold the hydrogen and chlorine atoms together?

- electron pair / shared electrons
- attracts / pulls both nuclei

(2)

