



Mark

Junior Lyceum Programme

FORM 3 CHEMISTRY TIME: 1h 30min

[illegible]

DO NOT WRITE ABOVE THIS LINE

Class:

Below is a copy of the periodic table.

PERIODIC TABLE

1		2																				3		4		5		6		7		0																							
																										1 H 1																												4 He 2	
7 Li 3		9 Be 4																				11 B 5		12 C 6		14 N 7		16 O 8		19 F 9		20 Ne 10																							
23 Na 11		24 Mg 12																				27 Al 13		28 Si 14		31 P 15		32 S 16		35.5 Cl 17		40 Ar 18																							
39 K 19		40 Ca 20		45 Sc 21		48 Ti 22		51 V 23		52 Cr 24		55 Mn 25		56 Fe 26		59 Co 27		59 Ni 28		63.5 Cu 29		65 Zn 30		70 Ga 31		73 Ge 32		75 As 33		79 Se 34		80 Br 35		84 Kr 36																					
85 Rb 37		88 Sr 38		89 Y 39		91 Zr 40		93 Nb 41		96 Mo 42		99 Tc 43		101 Ru 44		103 Rh 45		106 Pd 46		108 Ag 47		112 Cd 48		115 In 49		119 Sn 50		122 Sb 51		128 Te 52		127 I 53		131 Xe 54																					
133 Cs 55		137 Ba 56		139 La 57		178 Hf 72		181 Ta 73		184 W 74		186 Re 75		190 Os 76		192 Ir 77		195 Pt 78		197 Au 79		201 Hg 80		204 Tl 81		207 Pb 82		209 Bi 83		210 Po 84		210 At 85		222 Rn 86																					

a	relative atomic mass
X	symbol
b	atomic number

Section A: Answer ALL questions in this section, using the spaces provided.

This section carries 60 marks.

- 1 During our practical work you have used different items of apparatus. Some of this apparatus is drawn below.

A



B



C



D



_____	_____	_____	_____
_____	_____	_____	_____

- a) Write the name of each item of apparatus above. (4 marks)
- b) In chemical write ups we draw diagrams instead of 3-dimensional drawings. Which of the above is a correct diagram? _____ (1 mark)

- 2 a) The statements below describe the usual size and shape taken by each state of matter. Fill in the correct state of matter.

- i) _____ take any size or shape (fill all the space available).
- ii) _____ have a fixed size and keep their shape, unless a force is applied.
- iii) _____ have a fixed size but take the shape of the container that they are put in. (3 marks)

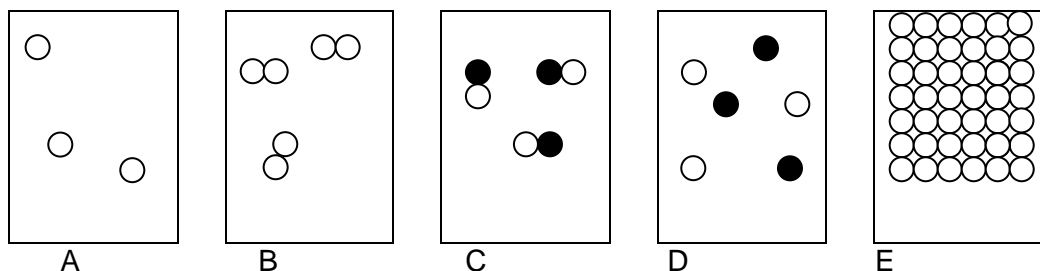
- b) i) Describe the *arrangement* and *movement* of **particles** in a solid.

- ii) Describe what happens to the particles of a solid when it melts to a liquid.

(4 marks)

3. This question is about elements, mixtures and compounds.

In the boxes below different atoms are represented by ● and ○.



Match the letter on the box to the following descriptions:

- a) a mixture of gases _____
- b) a solid _____
- c) a gaseous compound _____
- d) oxygen (O₂) _____
- e) A pure gas made up of single atoms. _____ (5 marks)

4. a) Give the correct *chemical formula* for the following compounds:

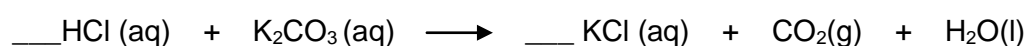
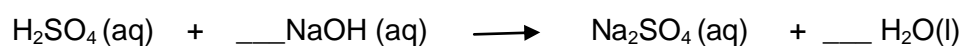
- i) sodium chloride _____
- ii) potassium bromide _____
- iii) magnesium oxide _____
- iv) calcium carbonate _____
- v) zinc nitrate _____

b) Give the correct *chemical name* for the following compounds:

- i) CuSO₄ _____
- ii) MgCO₃ _____
- iii) NaOH _____

(4 marks)

c) Balance the following equations:



(4 marks)

5. Some techniques used to separate mixtures are:

filtration distillation fractional distillation chromatography
evaporation sublimation separating funnel technique

Choose from the above list the most suitable method for each of the following separations:

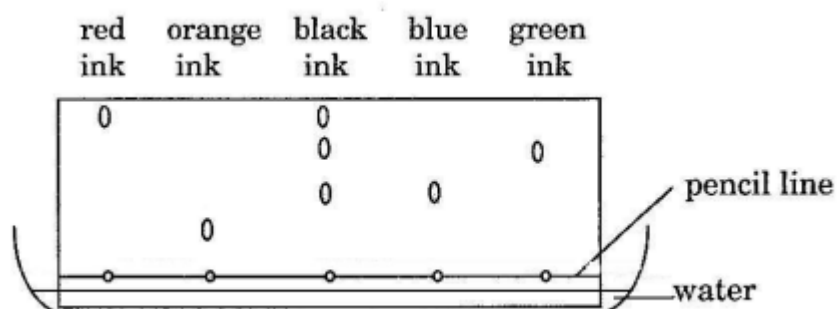
- i. to obtain common salt from sea water _____
- ii. to obtain pure water from pond water _____
- iii. separating cooking oil from water _____
- iv. get iodine from a mixture of iodine and sodium chloride _____

(4 marks)

6. A chromatogram is shown below.

(a) Which of the inks can be added together to produce black ink?

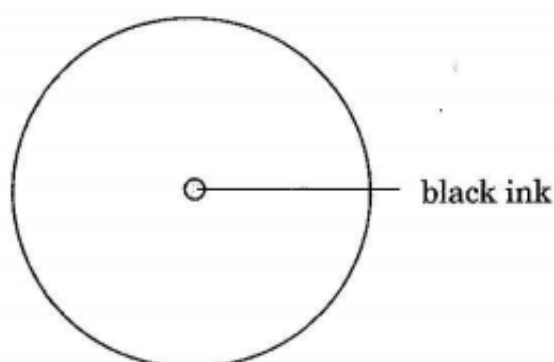
(3 marks)



(b) A spot of the same black ink was put at the centre of a filter paper, resting flat on a petri dish. Water was then slowly dripped onto the spot, one drop at a time. Show the expected results by completing the diagram given below.

Label the colours of the components clearly.

(3 marks)



c) Underline the correct answer.

From the results on the chromatogram, one can conclude that red ink is the most / least adsorbed and the most / least soluble ink, while orange ink is the most / least adsorbed and the most / least soluble. (4 marks)

7. The smallest particles that can exist on their own are atoms. The table below gives some information about atoms of some elements.

(a) Complete the table below by putting in the missing numbers.

Element Symbol	Mass Number	Number of protons	Number of neutrons	Electron configuration
Na	23	11		
Ca	40		20	
F		9	10	
Ne	20	10		
K ⁺	39	19		

(10 marks)

(b) From the elements in the table, choose an element which fits the description

- i. a metal _____
- ii. a noble gas _____
- iii. a non-metal _____
- iv. a group II metal _____
- v. a cation _____

(5 marks)

(c) Metals form ions when they react with non-metals.

Using potassium, as an example, draw diagrams showing ALL the electron shells to show:

- (i) how the protons, neutrons and electrons are arranged in an **atom** of potassium.

(3 marks)

- (ii) the electron configuration and charge of a potassium ion.

(3 marks)

**Section B: Answer TWO questions from this section on the separate sheets provided.
Each question carries 20 marks.**

8. This question is about types of bonding and related properties.

(a) The elements calcium, $_{20}\text{Ca}$, and chlorine, $_{17}\text{Cl}$, combine to form an ionic compound.

- Give the electron configurations for atoms of calcium and chlorine.
- Draw dot / cross diagrams, showing ALL electron shells, to show the structure and charge for the calcium and chlorine ions.
- Give the name of another ionic compound.
- Give two properties of ionic compounds.

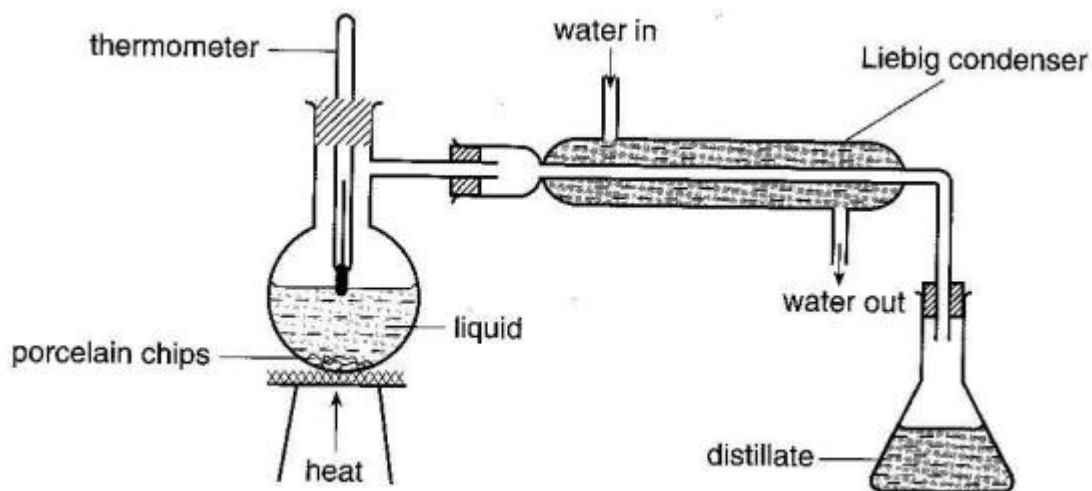
(10 marks)

(b) The elements carbon, $_{6}\text{C}$, and hydrogen, $_{1}\text{H}$, combine to form a covalent compound.

- Give the name and formula of the compound formed.
- State the number of electrons that carbon and hydrogen need to share to become stable.
- Draw a diagram, showing OUTER shell electrons only, to show the bonding in a molecule of the compound.
- Give the name of another covalent compound.
- Give two properties that are expected of covalent compounds.

(10 marks)

9. The diagram below shows an experimental set-up of a distillation process in the laboratory.



- Write down four mistakes in the experimental set-up. (4 marks)
- What is the use of the porcelain chips? (2 marks)
- The liquid in the distilling flask contains water, ethanol and butanol. The boiling points of the three liquids are shown below.

Liquid	Boiling point / °C
water	100
ethanol	78
butanol	117

- In which order are the distillates collected? Explain your answer. (4 marks)
- Although separation of the mixture can be done using the above apparatus, 100% separation does not occur. Give the name of a piece of apparatus that can be added to get a better separation. (2 marks)
 - In the laboratory you have prepared a sample of pure water from copper (II) sulphate solution using simple apparatus. Draw a well labelled diagram that shows how you have attempted to do this. (6 marks)
 - Suggest the name of another mixture, from which a sample of pure water can be obtained. (2 marks)

10. In each of the following reactions, state giving important **observations** and **reasons**, whether a 'physical' or 'chemical' change took place in each reaction.

- a) The burning of fireworks in a village feast.
- b) Breaking a glass
- c) Mixing lemonade powder in water.
- d) A piece of rusting metal.
- e) Adding a piece of sodium on the surface of water.

(20 marks)