



**HALF-YEARLY EXAMINATION – 2016**

**TIME: 1h 30min**

[illegible]

DO NOT WRITE ABOVE THIS LINE

**Name:** \_\_\_\_\_

**Class:**

Below is a copy of the periodic table.

## PERIODIC TABLE

1	2															3	4	5	6	7	0
																	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				

### Key

$$\frac{a}{X}b$$

relative atomic mass  
symbol  
atomic number

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

This section carries 60 marks.

1. a) Fill in with the words: **solvent, solute, solution**

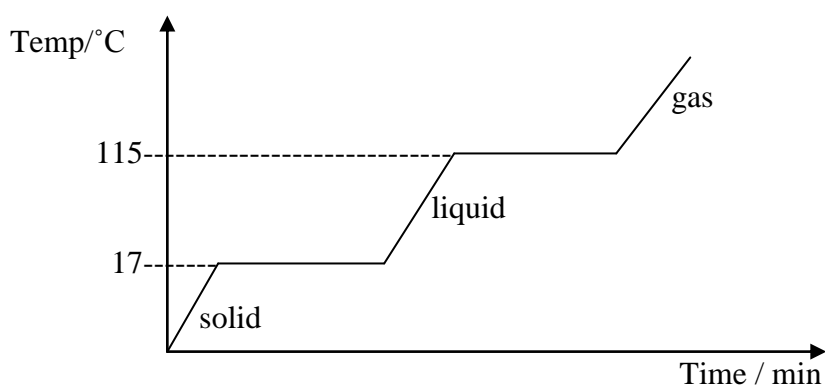
When crystals of copper sulfate are dissolved in water, the mixture formed is called a \_\_\_\_\_. Water is the \_\_\_\_\_ while copper sulfate is the \_\_\_\_\_. (3)

- b) Solids melt into liquids while liquids boil to become gases.

The temperature at which:

- (i) a solid melts is called the \_\_\_\_\_.  
(ii) a liquid becomes a gas is called the \_\_\_\_\_. (2)

2. The graph below is a heating curve for a pure substance.



- a) What is the melting point of the substance? \_\_\_\_\_  
b) What is its boiling point? \_\_\_\_\_  
c) What happens to the temperature while the substance changes state?  
\_\_\_\_\_  
d) What is the state of the substance at room temperature (24°C)? \_\_\_\_\_  
e) How can you tell the substance is not water?  
\_\_\_\_\_

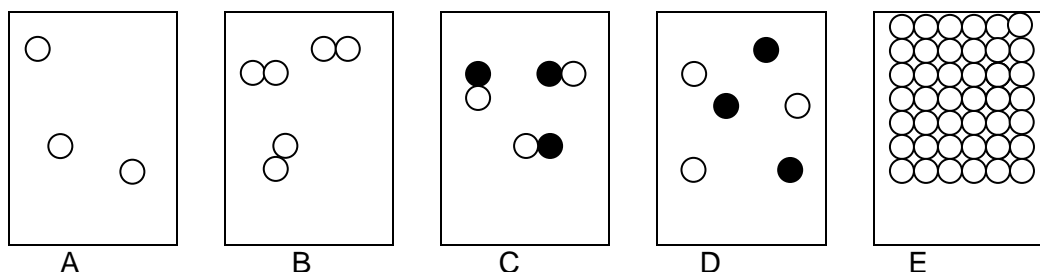
(5)

3 State whether in the following experiments, a **physical** or a **chemical** change is taking place.

- Heating a piece of magnesium ribbon in a Bunsen flame. \_\_\_\_\_
- Dissolving common salt in water. \_\_\_\_\_
- Putting some sulfur in a boiling tube and heating it **strongly**. \_\_\_\_\_
- Putting some sulfur in a boiling tube and heating it **gently**. \_\_\_\_\_ (4)

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

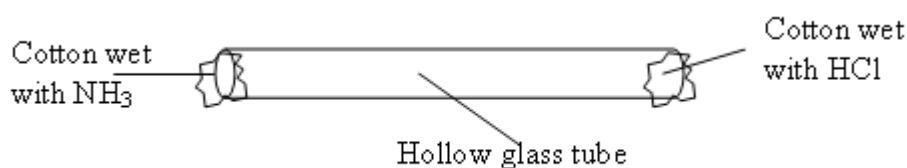
In the boxes below different atoms are represented by ● and ○.



Match the letter on the box to the following descriptions:

- a mixture of gases \_\_\_\_\_
- a solid \_\_\_\_\_
- a gaseous compound \_\_\_\_\_
- oxygen ( $O_2$ ) \_\_\_\_\_
- A pure gas made up of single atoms. \_\_\_\_\_ (5 marks)

5. The teacher sets up the following apparatus in the laboratory. She puts a cotton wool soaked in ammonia ( $NH_3$ ) into one end of the glass tube and at the same time puts another piece of cotton wool soaked in hydrochloric acid ( $HCl$ ) into the other end.



After some time, white smoke forms inside the glass tube.

- Name the process which has taken place during the experiment. \_\_\_\_\_
- On your diagram mark the position of the white smoke.
- Which is the fastest gas? Ammonia or hydrogen chloride gas? \_\_\_\_\_

(3)

6. (i) Give the correct *chemical formula* for the following compounds:

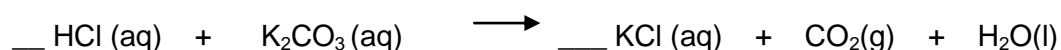
- |                             |                              |
|-----------------------------|------------------------------|
| a) potassium chloride _____ | d) magnesium carbonate _____ |
| b) calcium hydroxide _____  | e) zinc nitrate _____        |
| c) sodium sulfate _____     |                              |

(ii) Give the correct *chemical name* for the following compounds:

- NaOH \_\_\_\_\_
- $\text{Cu}(\text{NO}_3)_2$  \_\_\_\_\_
- $\text{FeSO}_4$  \_\_\_\_\_
- $\text{H}_2\text{O}$  \_\_\_\_\_
- $\text{MgCl}_2$  \_\_\_\_\_

(5)

iii) Balance the following equations:



(4)

7. Complete the following table:

Atom	Symbol of atom / ion	Number of protons	Number of electrons	Number of neutrons	Electron Configuration
$^{12}_{6}\text{C}$	C	6			
$^{35}_{17}\text{Cl}$	Cl		17		
$^{39}_{19}\text{K}$	K				
$^{16}_{8}\text{O}$	$\text{O}^{2-}$	8		8	

(12)

8. To answer this question, you can use the information given in the table above.

a) Draw the structure of a potassium atom.

(5)

b) Potassium can react with chlorine to form an ionic compound. Give the formula of such a compound. \_\_\_\_\_

(2)

c) Draw a dot –and–cross diagram to show the bonding in this compound.

(6)

9. A normal sample of chlorine includes amounts of two different atoms with symbols  $^{35}_{17}\text{Cl}$  and  $^{37}_{17}\text{Cl}$

- a) What is the name given to atoms of the same element with different mass numbers?  
\_\_\_\_\_
- b) In the book of chemical data, the mass number of chlorine is given as 35.5. Use this data to state which of the two atoms of chlorine is more abundant. \_\_\_\_\_ (4)

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

10. **A** This question is about types of bonding and related properties.

The elements magnesium,  $^{12}_{2}\text{Mg}$ , and oxygen,  $^{8}_{8}\text{O}$ , combine to form an electrovalent (ionic) compound.

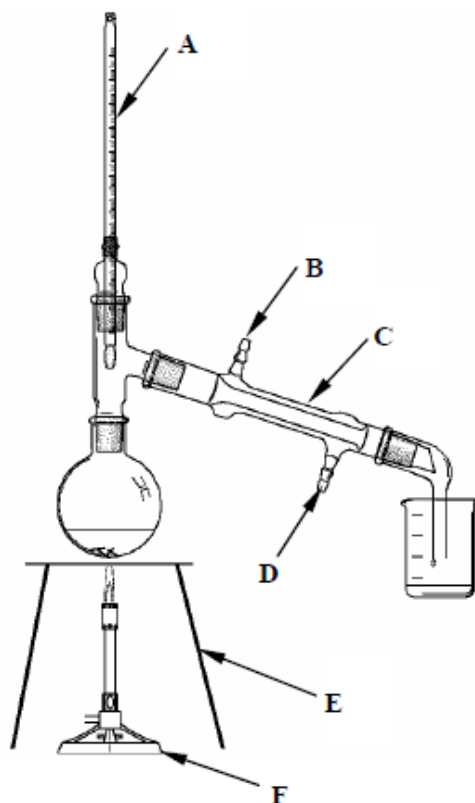
- a) Give the electron configurations for the atoms of magnesium and oxygen. (2)
- b) Draw dot/cross diagrams, showing **ALL** electron shells, for the magnesium and oxide ions. (5)
- c) Give the name of this ionic compound. (1)
- d) Give two properties of ionic compounds. (2)

**B** Oxygen,  $^{8}_{8}\text{O}$ , can also form covalent compounds with other non-metals such as carbon,  $^{6}_{6}\text{C}$ .

- a) Give the name and formula of the compound formed. (2)
- b) State the number of electrons that carbon and oxygen need to share to become stable. (1)
- c) Draw a diagram, showing OUTER shell electrons only, to show the bonding in a molecule of this compound. (4)
- d) Give the name of another covalent compound. (1)
- e) Give two properties that are expected of covalent compounds. (2)

(Total 20 marks)

11. During a practical session, a student was given a mixture of ethanol and water. He/She was asked to separate the mixture using the apparatus shown below.



- a) Give the name of this process. (1)
- b) Name the items of apparatus labeled A to F. (6)
- c) Which part of the apparatus is connected to the tap. (1)
- d) Explain why anti bumping granules should be added to the mixture before heating. (2)
- e) Give a reason why the bulb of the thermometer should be placed as shown in the diagram, not in the mixture. (2)
- f) What is the first distillate? (1)
- g) At what temperature is water collected? (1)
- h) How would you show that the water collected is pure water? (2)

Although separation of the mixture can be obtained using this technique, complete separation is difficult to obtain.

i) What other piece of apparatus must be added in order to obtain a more complete separation. (2)

j) Which liquids can be separated using this technique? (2)

(20 marks)

12. A student was asked to separate a mixture of sodium chloride, sand and iodine and collect the three substances separately. He decided to carry out the separation into 4 stages.

Stage 1: sublimation

Stage 2: solution

Stage 3: filtration

Stage 4: evaporation to dryness

(i) Explain the meaning of the word 'sublimation'. (1)

(ii) Mention another substance that can sublime. (1)

(iii) Explain why **sublimation** would be suitable to obtain iodine from the mixture. Describe what you would see while performing Stage 1 of this experiment. Include a labeled diagram of the apparatus that you would use. (6)

(iv) The remaining mixture of sodium chloride and sand can be separated by the method of solution, filtration and evaporation to dryness.

List the important **practical steps** which should be followed in each stage. Draw labeled diagrams of the last three stages of preparation. (12)

(20 marks)