



GOZO COLLEGE

BOYS' SECONDARY SCHOOL

2015-2016



Form 3

CHEMISTRY

TIME: 1h 30min

NAME: _____

CLASS: _____

Useful data: RAM of: H=1, Cl=35.5, Ca=40, S=32, O=16, Zn=65, F=19, Pb= 207, N=14, C=

Use the **Periodic table**, given below, where necessary.

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

a
X
b

relative atomic mass
symbol
atomic number

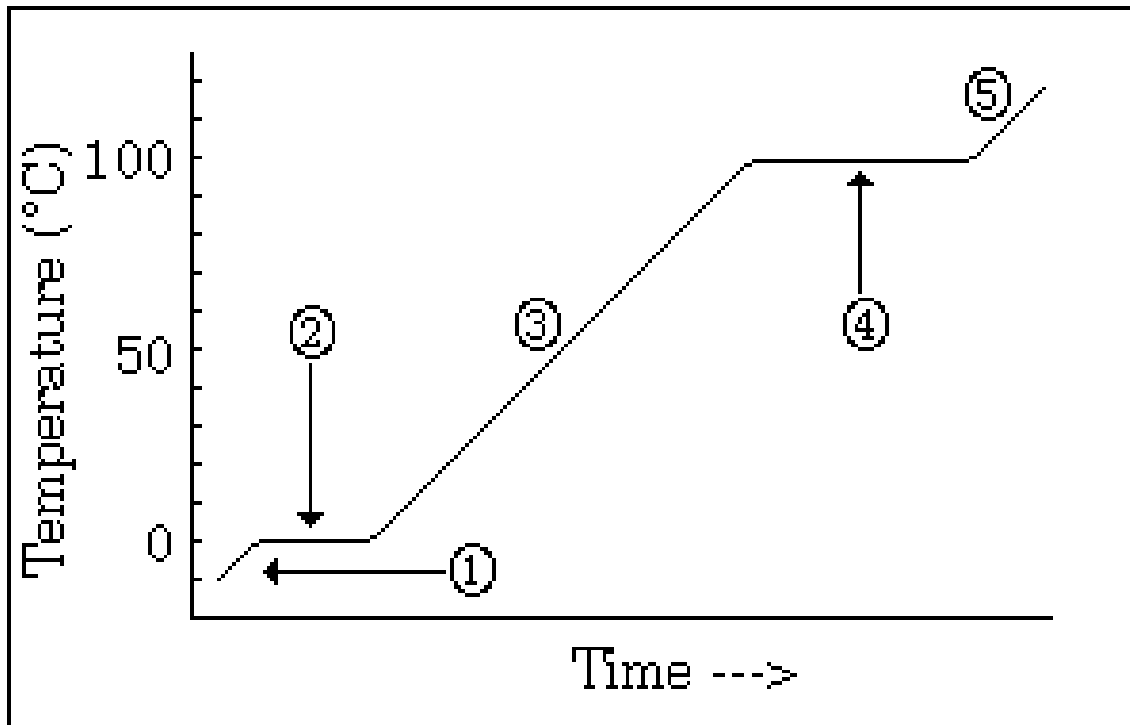
Marks Grid [For Examiners use only]

Question number	1	2	3	4	5	6	7	8	9	THEORY TOTAL
Max mark	10	10	10	10	10	10	20	20	20	
Actual mark										

Theory Paper: 85%	Practical: 15%	Final Score: 100%

Section A: Answer all the questions in this section (60 marks)

1. The diagram below is a plot of temperature vs. time. It represents the heating of a colourless substance.



a) What physical state is the substance in during segment 1 shown on the graph?

(1 mark)

b) What change of state is taking place during segment 2 of the graph?

(1 mark)

c) What physical state is the substance in during segment 3 shown on the graph?

(1 mark)

d) What change of state is taking place during segment 4 of the graph?

(1 mark)

e) What physical state is the substance in during segment 5 shown on the graph?

(1 mark)

f) Name the change of state that occurs when:

i) a solid turns directly to gas _____

(1 mark)

ii) a gas turns back to liquid _____

(1 mark)

(g) What is the melting point of this substance? _____

(1 mark)

(h) At what temperature does this substance boil? _____ (1 mark)

(i) Write the chemical formula of this substance _____ (1 mark)

2. Fill in the blanks in the following sentences.

(a) The atomic number tells the number of positively charged _____ in the nucleus of an atom. The atom is _____ because this is also the number of _____ charged _____ in the atom.

(b) The mass number tells the total number of _____ and _____ in the nucleus of an atom. These particles collectively are located in the _____.

(c) Isotopes are atoms of the same _____ with different numbers of _____ which results in different _____ numbers.

(1 mark x 10 = 10 marks)

3. Fill in the following table:

Symbol	Atomic number	Mass number	Number of protons	Number of neutrons	Number of electrons
Hg	80	201			
Mo	42	96			
Ag	47			61	
C		12	6		
Pb		207			82
P			15	16	
Ti	22		22	26	

(1/2 mark each x 20 = 10 marks)

4. (a) Carbon has a relative atomic mass of 12 and magnesium has a relative atomic mass of 24. What does this tell you about the mass of one atom of magnesium compared to one atom of carbon?

_____ (2 marks)

(b) An unknown atom Z has a mass number of 31 and 16 neutrons.

(i) Give the true symbol of this element using the periodic table. _____ (1 mark)

(ii) Write its electron configuration. _____ (2 marks)

(c) The following table shows some unknown atoms:

Imaginary symbol	Mass number	Atomic number
V	12	6
W	14	6
X	14	7
Y	11	5

(i) Which atom has the most protons? _____ (1 mark)

(ii) Which atom has the most neutrons? _____ (1 mark)

(iii) Which atom has the most electrons? _____ (1 mark)

(iv) Which two atoms are isotopes of the same element? _____ (2 marks)

5. Find the relative formula mass of:

(a) hydrogen chloride (HCl)

(b) calcium sulfate (CaSO₄)

(c) zinc fluoride (ZnF₂)

(d) lead nitrate (Pb(NO₃)₃)

(e) ethanol (C₂H₅OH)

(5 x 2 marks = 10 marks)

6. (a) Convert the following word equation into a balanced chemical equation:

(i) sodium + water \rightarrow sodium hydroxide + hydrogen

_____ (2 marks)

(ii) aluminium + oxygen \rightarrow aluminium oxide

_____ (2 marks)

(iii) potassium hydroxide + hydrochloric acid \rightarrow potassium chloride + water

_____ (2 marks)

(b) Balance the following equation:

___ C₂H₆ (g) + ___ O₂ (g) \rightarrow ___ CO₂ (g) + ___ H₂O (g) (2 marks)

(c) Insert the missing state symbols:

CaCO₃ (s) + H₂SO₄ (___) \rightarrow CaSO₄ (___s_) + CO₂ (___) + H₂O (___) (2 marks)

Section B: Answer 2 questions in this section (40 marks)

7. This question is about different types of bonding.

(a)(i) Write down the electron configuration of:

Ca = _____ O = _____ (2 marks)

(ii) What type of bonding takes place between these two elements? _____ (1 mark)

(iii) Briefly explain what happens during this type of bonding

_____ (3 marks)

(iv) Draw a dot-cross diagram showing all the electrons to represent the bonding between calcium and oxygen.

(4 marks)

(b)(i) Write down the electron configuration of:

H = _____

F = _____

(2 marks)

(ii) What type of bonding takes place between these two elements? _____ (1 mark)

(iii) Briefly explain what happens during this type of bonding

_____ (3 marks)

(iv) Draw a dot-cross diagram showing all the electrons to represent the bonding between hydrogen and fluorine.

(4 marks)

8.(a) Peter was also given a mixture of two miscible liquids, water and ethanol. His task was to separate and collect the two liquids. So he used fractional distillation.

(i)What does the word 'miscible' mean?

_____ (1 mark)

(ii) Which one of these liquids distils out first?

_____ (1 mark)

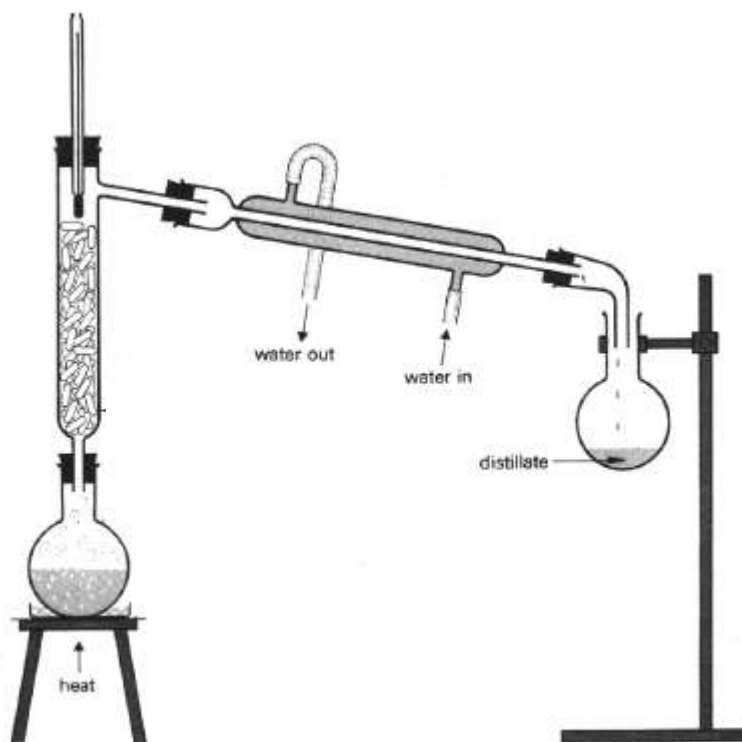
(iii) Explain why you chose this liquid.

_____ (1 mark)

(iv)In which part of the fractional distillation apparatus does the actual separation take place?

_____ (1 mark)

(b) Label the following apparatus on the diagram provided: **Liebig condenser, round bottomed flask, fractionating column, tripod, thermometer, stand.** (6 marks)



(c) Mention 2 industrial uses of fractional distillation.

(2 marks)

(d) Explain why it is better to collect the distillate in a round bottomed flask or in a conical flask, rather than in a beaker.

(2 marks)

(e) Peter is then provided with a sample of olive oil which has been contaminated with water.

Explain with the help of diagrams how Peter can obtain a pure sample of olive oil once again. You should include the method to show how the process is carried out. (6 marks)

Method: _____

Diagrams:

9. The compounds ammonium chloride, sodium chloride and calcium oxide were accidentally mixed together. A student was provided with the mixture of the above 3 compounds and was asked to separate each one of them. She was given all the necessary apparatus as well as some information about the compounds listed in the table below.

Substance	Action of heat	Solubility in water
ammonium chloride	sublimes	soluble
sodium chloride	no effect	soluble
calcium oxide	no effect	insoluble

(a) The student was going to add water to the mixture so as to separate sodium chloride (common salt) from the ammonium chloride. Explain why this method would not be suitable.

(1 mark)

(b) Describe how the student could obtain ammonium chloride from the mixture. Include a labelled diagram of the apparatus.

Method: _____

Diagram:

(6 marks)

(c) Describe briefly how the student could separate the remaining mixture of sodium chloride and calcium oxide so as to obtain pure, dry samples of each. Include fully labelled diagrams.

Method: _____

Diagrams:

(13 marks)