Class	Register Number	Name

南洋女子中学校

NANYANG GIRLS' HIGH SCHOOL

BLOCK TEST 2
Secondary Three

CHEMISTRY **1 hour**

Wednesday **4 August 2010** **0745-0845 h**

READ THESE INSTRUCTIONS FIRST

Do not open this booklet until you are told to do so.
Write your name, register number and class in the spaces at the top of this page.

Section A (15 MCQ)
This section consists of **15 multiple choice questions**. Choose the best answer and write its letter in the space provided on page 6 of the Question Paper.

Section B (Structured)
Answer **All** questions in the spaces provided on the Question Paper.

Section C (Free-Response)
Answer **All** questions in the spaces provided on the Question Paper.

Submit Sections A, B and C together.

The intended number of marks is given in the brackets [ ] at the end of each question or part question.
A copy of the Periodic Table is printed on page 13.

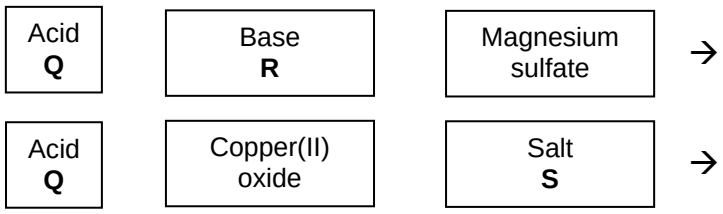
Topics:

1. Acids, Bases & Salts
2. Chemical Calculations (except Solution Concentration)

Examiner's Use	
Section A (15 marks)	
Section B (20 marks)	
Section C (10 marks)	
Total (45 marks)	

Section A (15 marks)
Choose the most suitable answer and write its letter in the answer table provided on Page 5.

1 Acid **Q** is used to prepare two soluble salts, as shown below.



Which of the following contains correct names for **Q**, **R** and **S**?

	Q	R	S
A	Hydrochloric acid	Magnesium chloride	Copper(II) chloride
B	Sulfuric acid	Magnesium nitrate	Copper(II) sulfate
C	Hydrochloric acid	Magnesium hydroxide	Copper(II) chloride
D	Sulfuric acid	Magnesium oxide	Copper(II) sulfate

2 Which of the following is the correct ratio of the number of atoms in 112 g of gaseous nitrogen to the number of atoms in 90 g of ethane (C_2H_6)?

A 1 : 1
B 1 : 3
C 1 : 6
D 1 : 12

3 The formula of a sodium compound in silica gel is $Na_2Si_4O_x$. What is the value of **x** if the relative molecular mass of the sodium compound is 302?

A 8
B 9
C 10
D 12

4 5 g of element **X** reacted with 8 g of element **Y** to form a compound with the formula $\mathbf{XY}_2$.

Given that 80 is the relative atomic mass of **Y**, what is the relative atomic mass of **X**?

A 25
B 50
C 40
D 100

5 Which of the following has the largest number of atoms?

A 0.1 mole of oxygen
B 0.2 mole of water
C 0.3 mole of carbon
D 0.4 mole of helium

6 Zinc oxide is produced by heating zinc carbonate.

$ZnCO_3 \rightarrow ZnO + CO_2$

What is the percentage yield of zinc oxide if 125 g zinc carbonate on heating produces 75 g of zinc oxide given that M_r of $ZnCO_3$ is 125 and M_r of ZnO is 81?

A 75/81 x 100
B 81/75 x 100
C 125 x 75/81 x 100
D 125 x 81/75 x 100

7 An organic compound contains 24 g of carbon, 4 g of hydrogen and 32 g of oxygen. What is the empirical formula of the compound?

A CHO
B CH_4O
C CH_2O
D $C_2H_4H_2$

8 Ammonia reacts with chlorine according to the equation below:

$2NH_3(g) + 3Cl_2(g) \rightarrow N_2(g) + 6HCl(g)$

If 90 cm^3 of ammonia is mixed with 150 cm^3 of chlorine and all the volumes are measured at the same temperature and pressure, what is the total volume of the resultant mixture?

A 315 cm^3
B 330 cm^3
C 350 cm^3
D 365 cm^3

9 The element **X** forms a gaseous molecule $\mathbf{X}_2$. One volume of $\mathbf{X}_2$ combines with two volume of hydrogen gas to form two volumes of a gaseous hydride. What is the formula for the hydride of **X**?

A H**X**
B H$\mathbf{X}_2$
C $H_2\mathbf{X}$
D $H_2\mathbf{X}_2$

10 Which of the following substances in water is most suitable to react with dilute hydrochloric acid to prepare silver chloride?

A Silver oxide
B Silver metal
C Silver nitrate
D Silver carbonate

11 Which of the following pairs of solutions when added together will produce an insoluble salt?

I Magnesium fluoride and lead(II) nitrate
II Sodium chloride and silver nitrate
III Copper(II) sulfate and barium chloride
IV Potassium carbonate and sodium nitrate

A I and II only
B I, II and III only
C I, II and IV only
D I, II, III and IV

12 An aqueous solution containing an anion has the following observation when the test is carried out on it.

Test	Observation
Add aqueous barium chloride to the solution followed by dilute hydrochloric acid	Form a white precipitate which is insoluble in dilute hydrochloric acid.

Which of the following is the correct ionic equation for the test for the anion?

A $Ba^{2+}(aq) + SO_4^{2-}(aq) \rightarrow BaSO_4(s)$
B $Ba^{2+}(aq) + 2NO_3^-(aq) \rightarrow Ba(NO_3)_2(s)$
C $Pb^{2+}(aq) + 2Cl^-(aq) \rightarrow PbCl_2(s)$
D $Ag^+(aq) + Cl^-(aq) \rightarrow AgCl(s)$

13 Which of the following contains 2 aqueous solutions that form green insoluble salts with sodium carbonate solution?

	Solution 1	*Solution 2*
A	Iron(II) sulfate	Zinc sulfate
B	Lead(II) nitrate	Iron(II) nitrate
C	Iron(II) ethanoate	Chromium(III) ethanoate
D	Aluminium chloride	Iron(II) chloride

14 Which of the following solutions when mixed together form a soluble salt?

A Aqueous silver nitrate and dilute hydrochloric acid
B Aqueous calcium chloride and aqueous silver nitrate
C Aqueous lead(II) ethanoate and dilute sulfuric acid
D Aqueous potassium hydroxide and dilute nitric acid

15 If 0.0100 mole aqueous sodium chloride is added to 0.0200 mole aqueous silver nitrate, which of the following ions are present in the solution produced?

I Na^+
II Cl^-
III Ag^+
IV NO_3^-

A I and IV only
B I, II and IV only
C I, III and IV
D I, II, III and IV

Section A (15 Marks)
Answer the questions (1-15) by filling the answer in the table below.

1		**6**		**11**	
2		**7**		**12**	
3		**8**		**13**	
4		**9**		**14**	
5		**10**		**15**	

Section B (20 marks)
Answer all questions in this section in the spaces provided

B1 Sodium forms 2 compounds with chlorine and oxygen.

(a) One mole of NaClO**x** (one of the compounds) decomposes at room temperature and pressure, according to the equation below to produce 36 dm^3 of oxygen. [3]

$2NaClO\boldsymbol{x} \rightarrow 2NaCl + \boldsymbol{x}O_2$

What is the formula of this compound? (Show all the essential working)

(b) One mole of NaClO**y** (the other compound) reacts with 73.0 g of dilute hydrochloric acid to form 58.5 g of sodium chloride, 18 g of water and 24 dm^3 of chlorine at room temperature and pressure.

(i) Calculate the number of moles of hydrochloric acid reacted and sodium chloride, water and chlorine formed. [1]

(ii) Give the chemical equation for the reaction for NaClO**y.** [1]

(iii) Hence give the formula of this compound. [1]

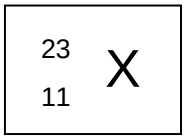
B2 In an experiment, 2.76 g of sodium react with an excess amount of gaseous element **E**. At the end of the experiment, 12.36 g of compound Na**E** is obtained.

(a) Calculate the mass of gas **E** reacted with sodium. [1]

(b) Determine the relative atomic mass of element **E**. [3]

(c) Identify element **E**. [1]

B3 The diagram below shows the symbol of the atom of element **X**.



(a) **X** forms a compound with sulfur and oxygen. 12.34 g of this compound contains 5.00 g of sulfur and 3.75 g of oxygen. If the molar mass of the compound is 158 g/mol. What is the molecular formula of the compound? [4]

(b) An aqueous solution of this compound reacts with aqueous hydrochloric acid to form an aqueous solution of chloride of **X**, sulfur, sulfur dioxide and water.

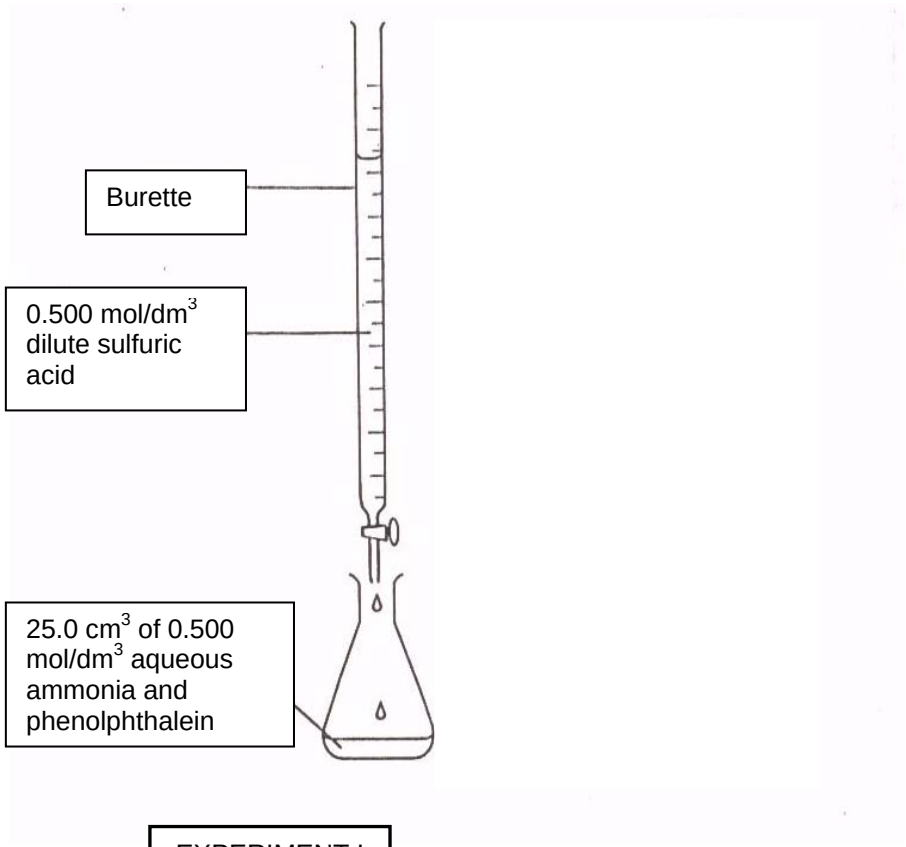
(i) Write the chemical equation including the state symbols for this reaction. [2]

(ii) Calculate the maximum mass of sulfur deposited when 4 g of the compound is added to 0.0400 mole aqueous hydrochloric acid. [3]

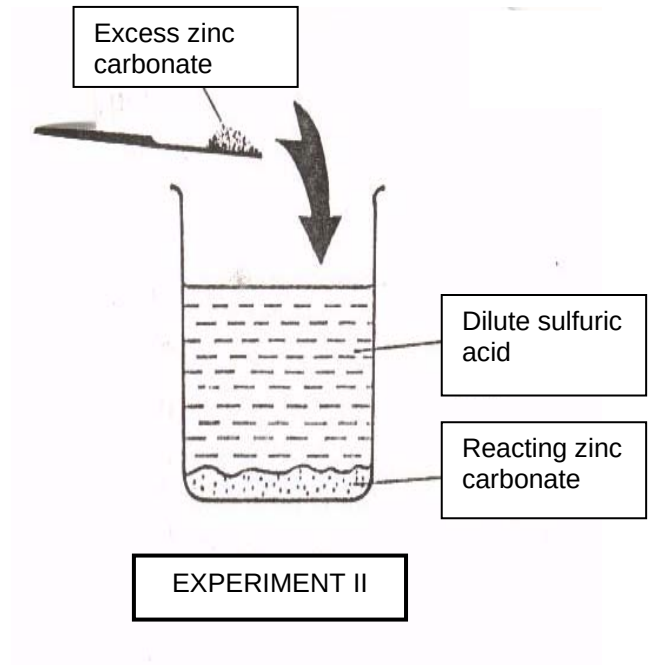
END OF SECTION B

Section C (10 marks)

C1 Sulfuric acid is used to prepare salt **S** in Experiment I and salt **T** in Experiment II as shown in the diagram below.



EXPERIMENT I



EXPERIMENT II

(a) Name **S** and **T** in Experiment I and Experiment II respectively. [2]

(b) Write the chemical equation for reaction in Experiment I. [1]

(c) If 0.213 g of aqueous ammonia is found in the conical flask, what is the number of moles of dilute sulfuric acid required to react completely with the aqueous ammonia. [2]

(d) Assuming that 12.50 cm^3 of sulfuric acid is found in the number of moles in (c). Describe how you would use the answer in (c) to prepare pure and dry salt **S**. [3]

(e) How do you know that zinc carbonate is added in excess in Experiment II? [1]

_____

(f) Zinc carbonate is also a salt. State the method used to prepare it. [1]

_____

☺END OF TEST☺

DATA SHEET
The Periodic Table of the Elements

	Group																	
	I	II									III	IV	V	VI	VII	0
																4 He Helium 2
							1 H Hydrogen 1				11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
	7 Li Lithium 3	9 Be Beryllium 4									27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
	23 Na Sodium 11	24 Mg Magnesium 12									70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
	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	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	112 Cd Cadmium 48	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
	85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	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	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
	133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57 *	178 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	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	Po Polonium 84	At Astatine 85	Rn Radon 86
	Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 †															

*	140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
†	232 Th Thorium 90	Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103

*58-71 Lanthanoid series
†90-103 Actinoid series

Key: a = relative atomic mass; X = atomic symbol; b = proton (atomic) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).