Class	Register Number	Name

南洋女子中学校

NANYANG GIRLS' HIGH SCHOOL

BLOCK TEST 2
Secondary Three

CHEMISTRY **1 hour**

Thursday **4 August 2011** **1015-1115 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 2 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 10.

TEST TOPICS:

- Qualitative Analysis
- Acids and Bases
- Salt Preparation
- Ionic Equations
- Mole Concept

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

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 In an experiment, a sample of iron powder was oxidized to form a certain oxide of iron.

(a) Calculate the empirical formula of the oxide if it contained 30% by mass of oxygen. [3]

(b) 0.5 mole of the oxide of iron produced in **B1(a)** completely reacted with 109.5 g of dilute hydrochloric acid to form a salt of iron and water.

(i) Calculate the number of moles of hydrochloric acid reacted. [2]

(ii) Write down a balanced chemical equation for this reaction, complete with the state symbols. [2]

(ii) Describe the observations that will be obtained when excess aqueous sodium hydroxide was added gradually to the salt of iron obtained from the reaction. [2]

B2 **(a)** When nitrogen gas was reacted with hydrogen gas at a certain temperature and pressure, ammonia gas was produced. If there were 120 dm^3 (measured at r.t.p) of ammonia gas produced,

(i) determine the mass of ammonia gas produced. [1]

(ii) calculate the mass of nitrogen present in the ammonia gas produced. [1]

(iii) calculate the number of ammonia molecules produced. [1]

(b) The empirical formula of a certain gas is $\mathbf{XY_2}$.
The relative atomic mass of **X** and **Y** are 12 and 1 respectively.

(i) If the relative molecular mass of the gas is 42, determine the molecular formula of the gas. [1]

(ii) A sealed cylinder contains 36 dm^3 (measured at r.t.p) of the gas mentioned in **(b)(i)**. [2]
Calculate the mass of **Y** present in the gas.

B3 When excess aqueous sodium hydroxide is added gradually to an aqueous solution **X**, a dirty green precipitate which is insoluble in excess aqueous sodium hydroxide is formed.
The reaction also forms aqueous chloride **Y**.

(a) State the chemical name of aqueous solution **X** and **Y** respectively. [2]

_____

_____

(b) For every mole of **X** reacted, 2 moles of **Y** are formed. Calculate the mass of **X** reacted if 11.7g of **Y** is produced. [3]

END OF SECTION B

Section C (10 marks)

C1 **(a)** **(i)** Name a suitable reagent, which when reacted with dilute hydrochloric acid will give aluminium chloride. [1]

_____

(ii) Write the ionic equation for the preparation of aluminium chloride salt in part **(a)(i)** [1]

_____

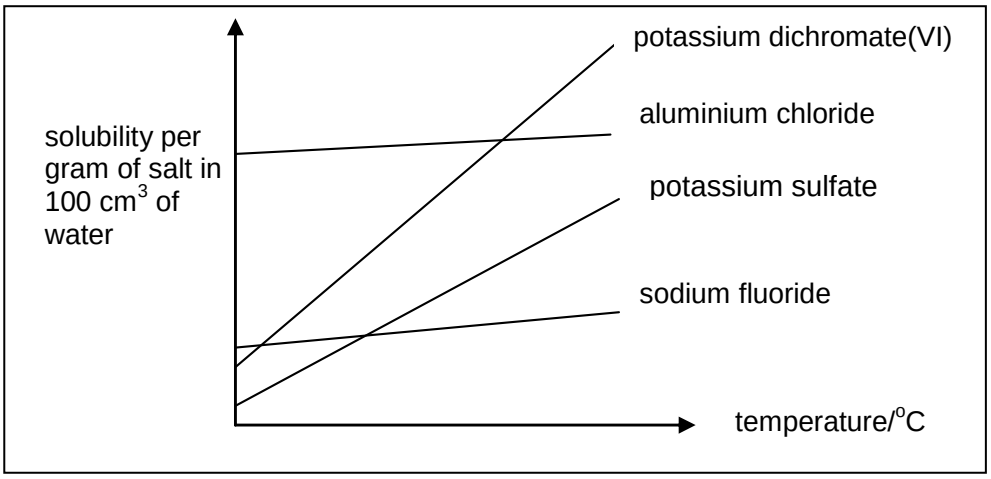
(b) **(i)** Name a suitable reagent which when reacted with dilute sulfuric acid will give potassium sulfate. [1]

_____

(ii) Name the suitable method used to prepare the salt mentioned in part **(b)(i)** [1]

_____

(c) The graph below shows the solubility curves of some salts.



(i) With the help of the graph above, describe how a pure dry sample of aluminium chloride can be obtained with the proposed reagents in **(a)(i)**. [3]

_____

_____

_____

_____

_____

_____

_____

(ii) With the help of the graph above, describe how a dry sample of potassium sulfate can be obtained from its aqueous solution? Explain your answer. [3]

☺END OF TEST☺

Section A (15 marks)
Choose the most suitable answer and write its letter in the answer table provided on Page 2.

1 When heated, the anhydrous solid **X** gives off a gas **Y** which turns acidified potassium dichromate(VI) from orange to green. The reddish brown residue reacts with dilute acid to form salt and water.

What are the identities of **X** and **Y**?

	X	**Y**
A	copper (II) carbonate	carbon doxide
B	copper (II) sulfate	sulfur dioxide
C	iron (II) chloride	chlorine
D	iron (II) sulfate	sulfur dioxide

2 Dilute nitric acid is added to a colourless solution **P** followed by aqueous barium nitrate to give a white precipitate. What could **P** be?

A copper(II) sulfate
B sodium sulfate
C copper(II) iodide
D sodium iodide

3 1 cm^3 of solution **Q** was added into two separate test tubes.

To one of the test tubes, an excess of aqueous sodium hydroxide was added gradually. White precipitate which was soluble in excess aqueous sodium hydroxide was obtained.

To the other test tube, an excess of aqueous ammonia was added gradually. White precipitate which was insoluble in excess aqueous ammonia was obtained.

What could solution **Q** contain?

A lead(II) chloride
B aluminium chloride
C calcium chloride
D ammonium chloride

4 Excess dilute nitric acid was added to compound **R** to give a gas and a colourless solution **S**. Aqueous ammonia was then added to the solution **S** to give white precipitate which was soluble in excess aqueous ammonia.

What could compound **R** be?

A calcium oxide
B aluminium carbonate
C sodium hydroxide
D zinc carbonate

5 Which of the following reagents when added separately to dilute nitric acid and dilute sulfuric acid will be able to distinguish the two solutions?

A aqueous barium nitrate
B magnesium carbonate
C aqueous sodium nitrate
D silver chloride

6 Which observation is true when an alkaline solution of potassium nitrate is warmed with aluminium powder?

A Colourless and odourless gas is evolved. Gas relights glowing splinter.
B Colourless and pungent gas is evolved. Gas turns moist red litmus paper blue.
C Colourless and odourless gas is evolved. Lighted splinter extinguishes with 'pop' sound.
D Colourless and pungent gas is evolved. Gas turns acidified potassium dichromate(VI) from orange to green.

7 Under suitable conditions, sulfuric acid reacts with each of the following substances. Which reaction gives a colourless solution **ONLY**?

A barium carbonate
B copper(II) oxide
C sodium oxide
D iron metal

8 2 drops of methyl orange are added to 15 cm^3 of dilute nitric acid in a conical flask. 10 cm^3 of aqueous potassium hydroxide are then added gradually to the flask. Which changes occurs in the mixture in the conical flask?

A Methyl orange changes colour from orange to red.
B The concentration of the H^+ ion decreases.
C The pH value is lowered.
D White precipitate is formed.

9 Which two reagents, when added together, are the most suitable to prepare calcium sulfate?

A calcium oxide and lead(II) sulfate in water
B aqueous calcium chloride and aqueous potassium sulfate
C calcium and dilute sulfuric acid
D calcium and aqueous sodium sulfate

10 Which is the best method to prepare silver chloride?

A Reaction of silver carbonate with dilute hydrochloric acid.
B Reaction of silver metal with dilute hydrochloric acid.
C Reaction of silver oxide with dilute hydrochloric acid.
D Reaction of aqueous silver nitrate with dilute hydrochloric acid.

11 Which of the following pairs of reagents when added together will have the following ionic equation:

$Pb^{2+}_{(aq)} + 2Cl^-_{(aq)} \rightarrow PbCl_{2\ (s)}$

I lead(II) oxide and aqueous potassium chloride
II aqueous lead(II) nitrate and aqueous sodium chloride
III aqueous lead(II) nitrate and dilute hydrochloric acid
IV lead(II) hydroxide and hydrochloric acid

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

12 A 2.5 g sample of liquid bromine contains the same number of atoms as 10 g of element **X**.

What is the relative atomic mass, *Ar*, of **X**?

A 20
B 80
C 160
D 320

13 What is the mass of lead in 334.5 g of lead(II) oxide?

A 289.7 g
B 304.8 g
C 310.5 g
D 332.8 g

14 What is the ratio of the volume of 3 g of oxygen to the volume of 12 g of methane, both volumes are measured at r.t.p.?

A 1 to 1
B 1 to 2
C 1 to 4
D 1 to 8

15 A gaseous alkane (C_nH_{2n+2}) burns in oxygen according to the following chemical reaction:

$p\ C_nH_{2n+2\ (g)} + q\ O_{2\ (g)} \rightarrow r\ CO_{2\ (g)} + t\ H_2O_{(l)}$

When 28 cm^3 of a gaseous alkane burns in an excess oxygen, 84 cm^3 of carbon dioxide gas are formed. Both volumes are measured at r.t.p.

What is the molecular formula of the alkane?

A CH_4
B C_2H_6
C C_3H_8
D C_4H_{10}

☺END OF SECTION A☺

DATA SHEET
The Periodic Table of the Elements

																		4 He Helium 2
												11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
												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
												70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
												115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
												204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	209 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86

7 Li Lithium 3	9 Be Beryllium 4																	
23 Na Sodium 11	24 Mg Magnesium 12																	
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							
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	99 Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48							
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							
226 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	X
b = proton (atomic) number	a / b

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

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