

Class	Register Number	Name
-------	-----------------	------



南洋女子中學校
NANYANG GIRLS' HIGH SCHOOL

BLOCK TEST 1
Secondary Three

CHEMISTRY

1 hour

Monday

02 April 2012

1115-1215 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 12.

Topics to be tested:

Acids and Bases
Salt preparation
Ionic equations
Qualitative analysis

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** Choose from the following list of substances and write the chemical name of the substance that best match the identities of substances **L-Q**. You may choose to use any substance only once, more than once, or not at all.

ammonia

carbon dioxide

copper(II) nitrate

iron(III) carbonate

hydrogen

nitrogen monoxide

potassium carbonate

sodium hydroxide

zinc

- (a)** Upon addition of aqueous **L** to aqueous **M**, a blue precipitate which is soluble in excess aqueous **M** was observed. [2]

L:

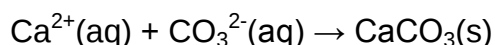
M:

- (b)** An acidic oxide **N** was produced upon reaction of insoluble **O** and dilute hydrochloric acid. [2]

N:

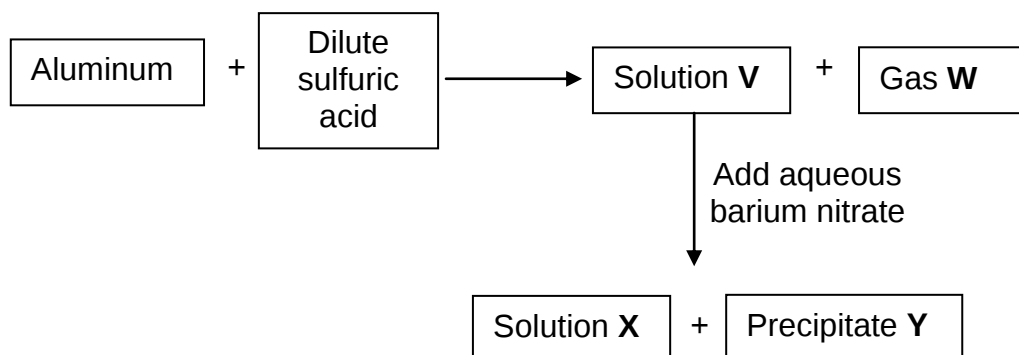
O:

- (c)** The ionic equation for the reaction of aqueous **P** with aqueous calcium chloride is: [1]



P:

B2 (a) The following reactions were carried out according to the following pathway:



(i) Write the ionic equation for the reaction that produced **V** and **W**. [2]

.....

(ii) Describe what will be observed when aqueous sodium [2]
hydroxide is added to solution **V**.

.....

.....

(iii) How would you confirm the identity of the anion in **X**? Describe [3]
the test and state its observations.

.....

.....

.....

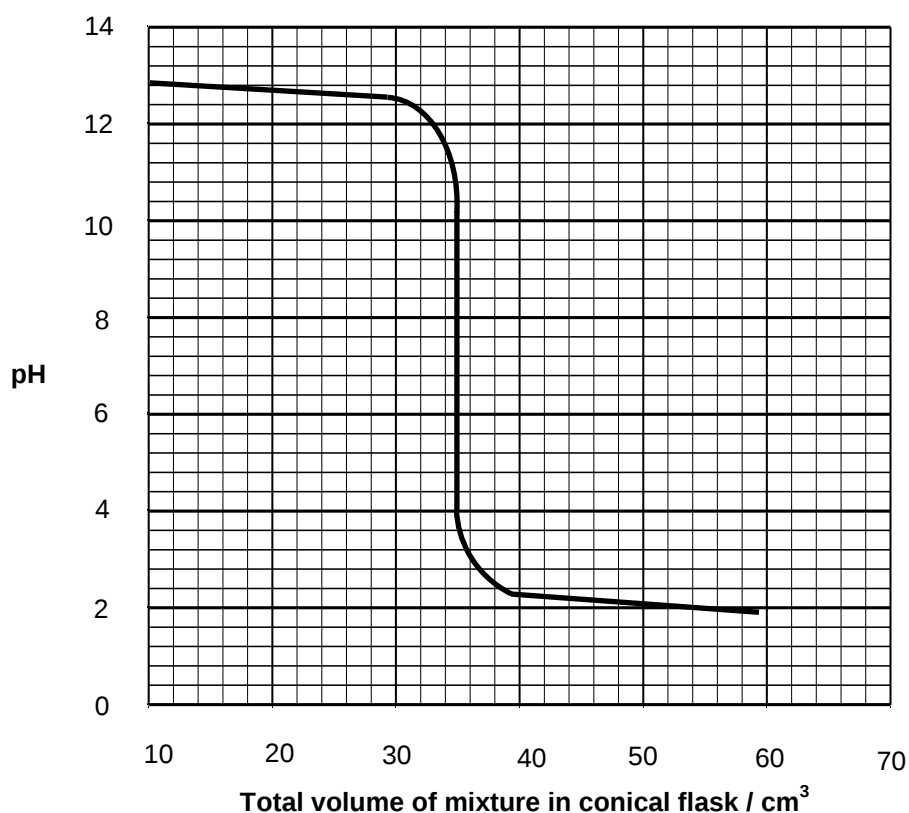
(b) A student added aqueous silver nitrate to a colourless solution to test [2]
for chloride ion. She observed that a white precipitate was formed and
concluded that chloride is present. Explain whether her conclusion is
valid.

.....

.....

.....

- B3 (a)** The following pH curve was obtained in a titration between aqueous sodium hydroxide and dilute nitric acid.



- (i) What was the burette filled with? [1]

.....

- (ii) What is the volume of aqueous sodium hydroxide used for the titration? [1]

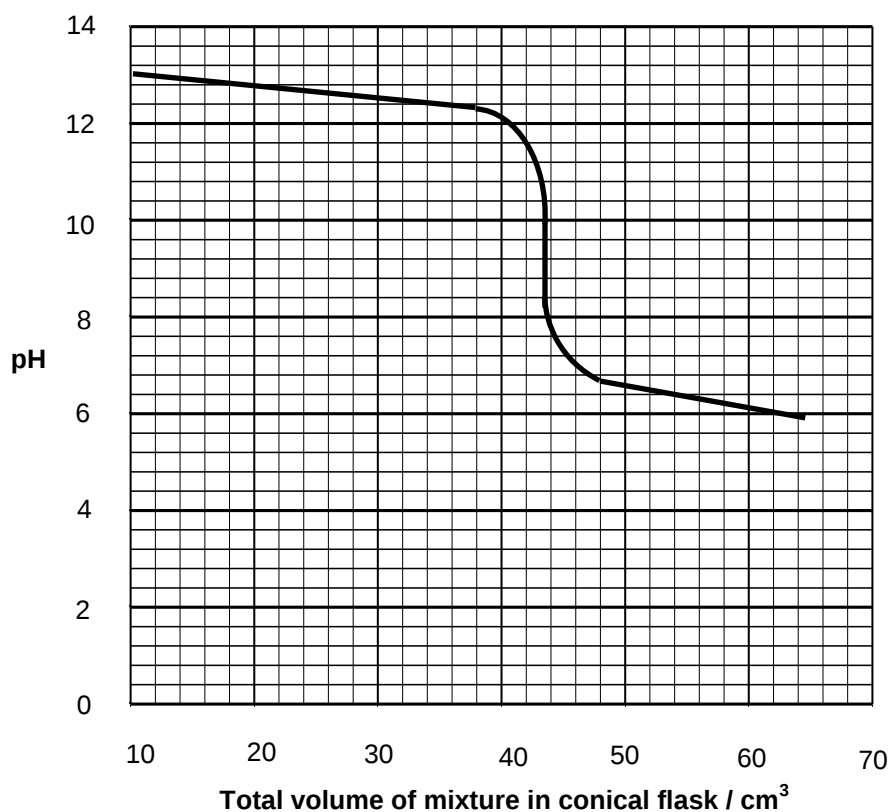
.....

.....

- (b) Another titration was carried out. The end point was reached when 20.00 cm³ of sulfuric acid was added to a conical flask filled with 25.0 cm³ of sodium hydroxide.

Assuming that the pH of dilute sulfuric acid was 2 and the pH of aqueous sodium hydroxide was 14, sketch the pH curve for this titration on the same graph in (a). [3]

- c) The following pH curve was obtained when aqueous sodium hydroxide was titrated with ethanoic acid.



Given the following information, choose a suitable indicator for the titration between sodium hydroxide and ethanoic acid.

Indicator	pH range at which colour change occurs
Methyl orange	3.1-4.4
Phenolphthalein	8.3-10.0
Bromomethyl blue	6.0-7.6

Suitable indicator:

[1]

Section C (10 marks)

Answer all questions in this section in the spaces provided

- C1 (a)** A student carried out the following steps to prepare pure and dry crystals of a hydrated salt using the method of acid reaction with excess insoluble carbonate.

Step 1: 30cm³ of a hot acid was measured and poured into a beaker

Step 2: Excess solid carbonate was added to the acid in the beaker until it no longer dissolves in the acid.

Step 3: The mixture was heated for a while and filtered to collect the residue as product.

- (i)** Identify two mistakes in the student's procedures to prepare the hydrated salt. [2]

.....

.....

.....

.....

.....

- (ii)** Suggest a possible identity for the salt prepared. [1]

.....

- (iii)** State the respective acid and carbonate that should be used to prepare your suggested salt in **a(ii)**. [2]

.....

.....

(b) Another student wants to prepare pure calcium sulfate salt.

- (i)** Are the procedures in part **(a)** suitable for the preparation of pure dry calcium sulfate? Explain your answer. [3]

.....

.....

.....

.....

.....

.....

- (ii)** Write a balanced chemical equation with state symbols for a suitable reaction that can be used in the preparation of a pure dry sample of calcium sulfate. [2]

.....

.....

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 We say that an acid is a weak acid when

- A** it has a high pH.
- B** it has a low pH.
- C** it dissociates partially in water to form H^+ ions.
- D** only one H^+ ion is produced per acid molecule.

2 When zinc oxide is added to water, what are the aqueous ions present in its solution?

- I** Zn^{2+}
- II** O^{2-}
- III** H^+
- IV** OH^-

- A** I and II only
- B** III and IV only
- C** I, II and IV only
- D** All of the above

3 When two aqueous solutions, **P** and **Q**, were added together, a green solution was obtained. What could **P** and **Q** be?

	P	Q
A	FeCl_2	Na_2SO_4
B	KCl	$\text{Fe}(\text{NO}_3)_3$
C	FeSO_4	BaCl_2
D	$\text{Pb}(\text{NO}_3)_2$	CuSO_4

4 Which of the following ionic equations represent the reaction that produces a pungent gas that turns moist red litmus blue?

- A** $\text{NH}_4^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{NH}_3(\text{g}) + \text{H}_2\text{O}(\text{l})$
- B** $\text{NH}_4\text{Cl}(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{Cl}^-(\text{aq}) + \text{NH}_3(\text{g}) + \text{H}_2\text{O}(\text{l})$
- C** $\text{CO}_3^{2-}(\text{aq}) + 2\text{H}^+(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$
- D** $\text{CO}_3^{2-}(\text{s}) + 2\text{H}^+(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l}) + \text{CO}_2(\text{g})$

5 A cation test was carried out on a solution **M** and the cation was found to be Ca^{2+} . Which anion cannot be present in **M**?

- A** SO_4^{2-}
- B** NO_3^-
- C** Cl^-
- D** I^-

- 10** A student found out that an unknown solution contains iodide ions.

What was the test that was carried out and observation that was made to allow the student to draw the conclusion?

	Test carried out	Observations
A	Add $\text{Ba}(\text{NO}_3)_2(\text{aq})$ followed by $\text{HNO}_3(\text{aq})$	Yellow precipitate
B	Add $\text{Pb}(\text{NO}_3)_2(\text{aq})$ followed by $\text{HNO}_3(\text{aq})$	Bright yellow precipitate
C	Add $\text{NH}_3(\text{aq})$ and $\text{Al}(\text{s})$ and heat	Effervescence
D	Add $\text{AgNO}_3(\text{aq})$ followed by $\text{HNO}_3(\text{aq})$	White precipitate

- 11** Which of the following reactions will produce a gas?

- A** $\text{Ca}(\text{OH})_2(\text{aq}) + \text{NH}_4\text{Cl}(\text{aq})$
B $\text{HCl}(\text{g}) + \text{FeCO}_3(\text{s})$
C $\text{H}_2\text{SO}_4(\text{aq}) + \text{Ag}(\text{s})$
D $\text{HNO}_3(\text{aq}) + \text{ZnO}(\text{s})$

- 12** When testing for cation by adding aqueous ammonia only, which pair of cations cannot be differentiated?

- A** Zn^{2+} and Al^{3+} **C** Pb^{2+} and Zn^{2+}
B Ca^{2+} and NH_4^+ **D** Cu^{2+} and Zn^{2+}

- 13** Which of the following pair of reactants can be used to prepare pure a pure and dry sample of silver nitrate?

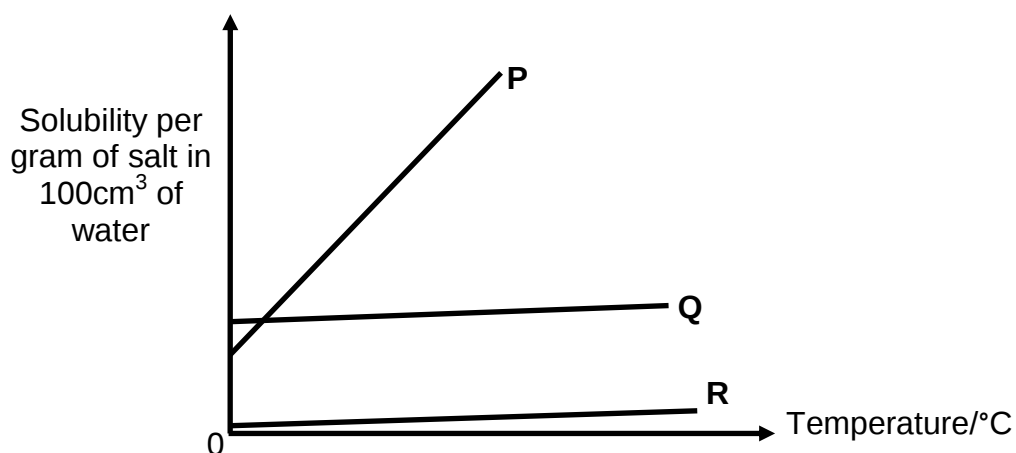
- A** AgCl and HNO_3 **C** HNO_3 and AgOH
B Ag and HNO_3 **D** HNO_3 and Ag_2SO_4

- 14** Sulfur dioxide gas will not have any effect on

- I** Moist red litmus paper
II Moist blue litmus paper
III Acidified potassium dichromate solution
IV Cobalt(II) chloride paper

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

- 15** The graph below shows how the solubilities of three salts are affected by temperature.



Which is the best method to recover each salt?

	P	Q	R
A	Crystallization	Filtration	Heat to dryness
B	Crystallization	Heat to dryness	Filtration
C	Filtration	Crystallization	Heat to dryness
D	Heat to dryness	Crystallization	Filtration

END OF SECTION A

DATA SHEET

The Periodic Table of the Elements

Group																			
I	II											III	IV	V	VI	VII	0		
												1 H Hydrogen 1							4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10		
23 Na Sodium 11	24 Mg Magnesium 12											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		
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	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36		
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	101 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	210 Po Polonium 84	210 At Astatine 85	210 Rn Radon 86		
87 Fr Francium	88 Ra Radium	89 Ac Actinium																	
*58-71 Lanthanoid series †90-103 Actinoid series																			
140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	146 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	232 Pa Protactinium 91	238 U Uranium 92	238 Np Neptunium 93	244 Pu Plutonium 94	244 Am Americium 95	244 Cm Curium 96	247 Bk Berkelium 97	247 Cf Californium 98	251 Es Einsteinium 99	252 Fm Fermium 100	258 Md Mendelevium 101	259 No Nobelium 102	259 Lr Lawrencium 103						

a

X

b

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

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).