

Class	Register Number	Name
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南洋女子中學校
NANYANG GIRLS' HIGH SCHOOL

BLOCK TEST 1
Secondary Three

CHEMISTRY

1 hour

Monday

08 April 2013

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 11.

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 State the formulae of compounds **E** to **G**.

- (a) Aqueous sodium hydroxide was added dropwise to an aqueous solution of **E**. A white precipitate which was insoluble in excess aqueous sodium hydroxide was observed. When a mixture of aqueous silver nitrate and dilute nitric acid was added to another sample of an aqueous solution of **E**, a white precipitate was formed. [2]

E: _____

- (b) When aqueous sodium hydroxide was added to an aqueous solution of **F**, a pungent gas was evolved upon warming the mixture which turned moist red litmus blue. When dilute hydrochloric acid was added to another sample of an aqueous solution of **F**, a colourless and odourless gas, which formed a white precipitate in limewater, was evolved. [2]

F: _____

- (c) Aqueous ammonia was added dropwise to an aqueous solution of **G**. A blue precipitate which was soluble in excess aqueous ammonia was observed. When a mixture of aqueous lead(II) nitrate and dilute nitric acid was added to another sample of an aqueous solution of **G**, a yellow precipitate was formed. [2]

G: _____

- (c) Aqueous ammonia was added dropwise to an aqueous solution of **H**. [2]
A white precipitate which was soluble in excess aqueous ammonia was observed. When aqueous sodium hydroxide and a piece of aluminium foil were added to another sample of an aqueous solution of **H**, a gas was evolved upon warming the mixture which turned moist red litmus blue.

H: _____

B2 (a) Sulfuric acid is a dibasic acid.

- (i) Define the term "dibasic". [1]

- (ii) State the formulae of the two possible salts formed when dilute [2]
sulfuric acid reacts with aqueous sodium hydroxide.

- (b) A student immerses a pH meter into 25.0 cm³ of an acid. He obtained [2]
a pH reading of 2.5 and concluded that the acid is strong. Comment on the validity of his conclusion.

- (c) Describe a chemical test to distinguish between aqueous lead(II) [3]
nitrate and aqueous aluminium nitrate and state the expected observations.

- B3** **P**, **Q** and **R** are elements of the Periodic Table that belong to the same period. The table below shows the formulae of the oxide compounds of these elements.

Element	Mass Number of Element	Formula of oxide
P	24	PO
Q	27	Q₂O₃
R	32	RO₂

- (a) Which of the above elements form oxides that react with alkalis? [1]

- (b) Which of the above elements form oxides that are soluble in water? [1]

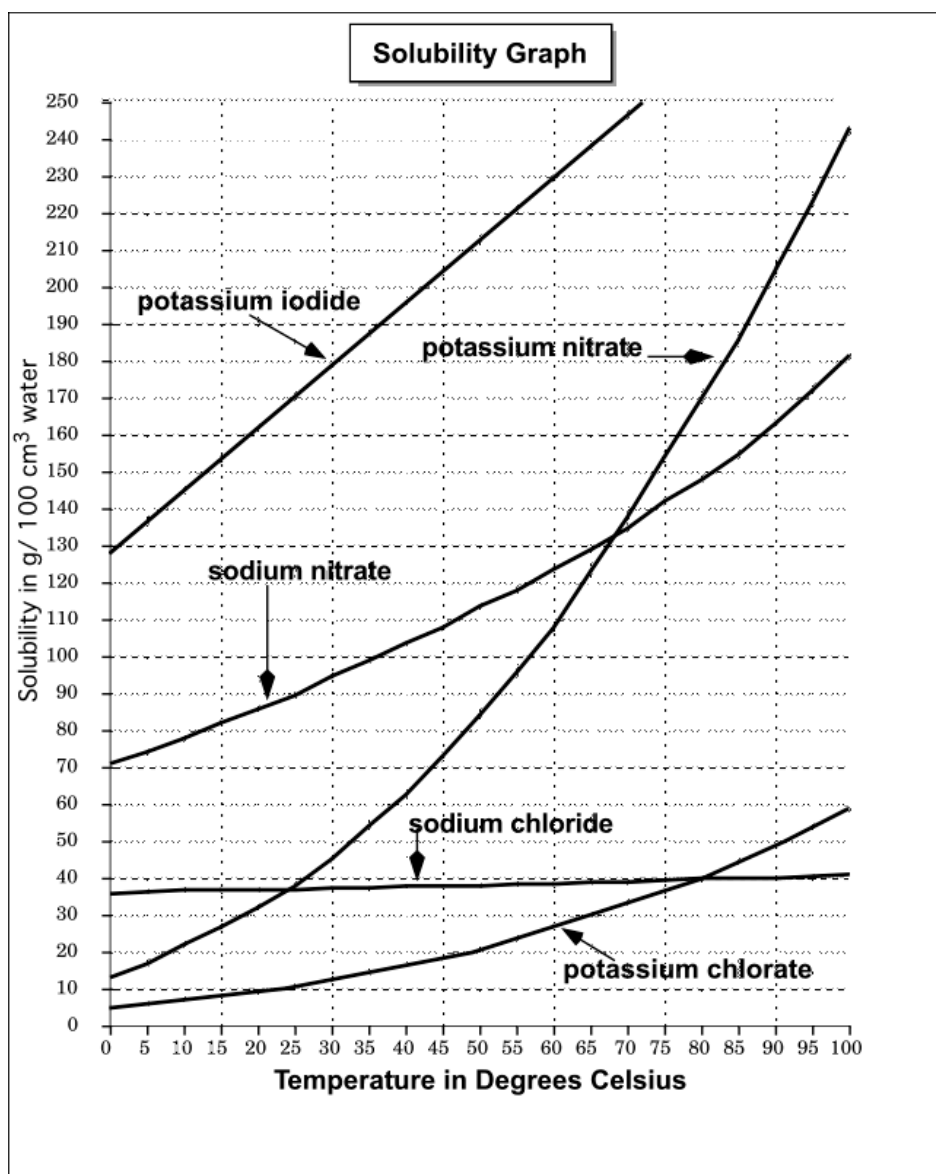
- (c) Write the ionic equation for the reaction between the oxide of **P** and hydrochloric acid. [2]

END OF SECTION B

Section C (10 marks)

Answer all questions in this section in the spaces provided

- C1** A student prepared a pure and dry sample of potassium nitrate crystals using the titration method. The solubility versus temperature graphs of various compounds are as shown below.



Source: http://faculty.uml.edu/james_hall/84124/solubility.htm

- (a) State two suitable reagents that can be used to prepare a pure and dry sample of potassium nitrate. [2]

- (b) Write the ionic equation for the reaction between the reagents in (a). [2]

- (c) Explain whether potassium metal is a suitable reagent in the preparation of potassium nitrate. [1]

- (d) Describe the procedure used to obtain dry potassium nitrate crystals. [3]

- (e) Another student wants to prepare pure sodium chloride salt. With reference to the solubility versus temperature graph above, explain why evaporation to dryness is preferred to crystallization as the final step? [2]

END OF SECTION C

Section A (15 marks)

Choose the most suitable answer and write its letter in the answer table provided on Page 2.

- 1 Which of the following is not a product when ammonium carbonate reacts with potassium hydroxide?

A ammonia gas
B carbon dioxide gas
C potassium carbonate
D water

- 2 Which of the following does not react with acids to produce hydrogen gas?

I silver
II gold
III zinc
IV copper

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, **R** and **S**, were added together, a colourless solution was obtained. What could **R** and **S** be?

	R	S
A	CaCl_2	NaOH
B	KCl	$\text{Fe}(\text{NO}_3)_3$
C	CuSO_4	NaCl
D	NH_4NO_3	KOH

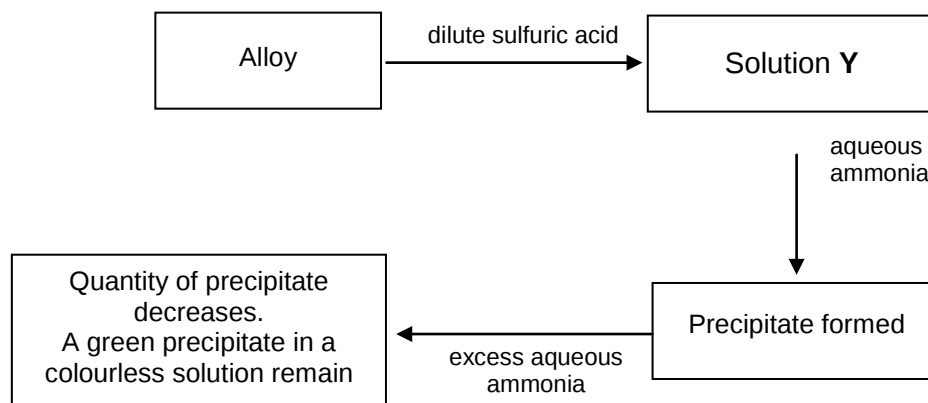
- 4 Which of the following reagents could be used to distinguish between aqueous ammonium sulfate and aqueous zinc sulfate?

A dilute hydrochloric acid
B dilute aqueous sodium hydroxide
C aqueous barium chloride
D aqueous silver nitrate

- 5 A reddish-brown precipitate was formed after aqueous ammonia was added to aqueous iron(II) chloride and the mixture was left to stand. What is the chemical formula of the precipitate?

A Fe_2O_3
B FeO
C $\text{Fe}(\text{OH})_2$
D $\text{Fe}(\text{OH})_3$

- 12** A sample of an alloy containing two metals was subjected to the following tests.



What are the two metals present in the alloy?

- A** copper and zinc
B iron and copper
C iron and lead
D iron and zinc
- 13** The table shows the observations made when an aqueous solution of **X** was tested.

reagent	colour of precipitate
acidified aqueous silver nitrate	pale yellow
aqueous sodium hydroxide	green

Which ions are present in an aqueous solution of **X**?

- A** Cu^+ and Cl^-
B Cu^{2+} and NO_3^-
C Fe^{2+} and I^-
D Fe^{3+} and SO_4^{2-}
- 14** When crystals of copper(II) sulfate are heated, the colour changes from blue to white. This is caused by
- I Loss of water of crystallization
 II Loss of sulfur trioxide
 III Loss of sulfur dioxide
 IV Loss of oxygen
- A** I only
B I and III only
C I and II only
D I, III and IV only

15 Which set is correctly arranged according to the nature of the oxides?

	Acidic	Basic	Neutral
A	barium oxide	carbon monoxide	carbon dioxide
B	nitric oxide	nitrogen dioxide	carbon monoxide
C	carbon dioxide	aluminium oxide	water
D	nitrogen dioxide	potassium oxide	carbon monoxide

END OF SECTION A

DATA SHEET
The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
1 H Hydrogen																	
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 Ru Ruthenium 44	101 Rh Rhodium 45	103 Pd Palladium 46	106 Ag Silver 47	108 Cd Cadmium 48	112 In Indium 49	115 Sn Tin 50	119 Sb Antimony 51	122 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		At Astatine 85	86 Rn Radon
87 Fr Francium	226 Ra Radium	227 Ac Actinium															
*58-71 Lanthanoid series †90-103 Actinoid series																	
140 Ce Cerium 58 141 Pr Praseodymium 59 144 Nd Neodymium 60 150 Sm Samarium 62 152 Eu Europium 63 157 Gd Gadolinium 64 162 Dy Dysprosium 66 165 Ho Holmium 67 169 Tm Thulium 69 173 Yb Ytterbium 70 175 Lu Lutetium 71 232 Th Thorium 90 238 Pa Protactinium 91 238 U Uranium 92 238 Np Neptunium 93 238 Pu Plutonium 94 238 Am Americium 95 238 Cm Curium 96 238 Bk Berkelium 97 238 Cf Californium 98 238 Es Einsteinium 99 238 Fm Fermium 100 238 Md Mendelevium 101 238 No Nobelium 102 238 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.).

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