

Class	Register Number	Name
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南洋女子中學校
NANYANG GIRLS' HIGH SCHOOL
End-of-Year Examination 2012
Secondary Three

CHEMISTRY

Paper 1

Thursday

Additional materials: Multiple Choice Answer Sheet

Multiple Choice
11 October 2012

45 minutes

0800 to 0845

READ THESE INSTRUCTIONS FIRST

Do not open this booklet until you are told to do so.

Write in soft pencil.

Do not use staples, paper clips, highlighters, glue or correction fluid.

Write your name, class and register number on the Multiple Choice Answer Sheet provided.

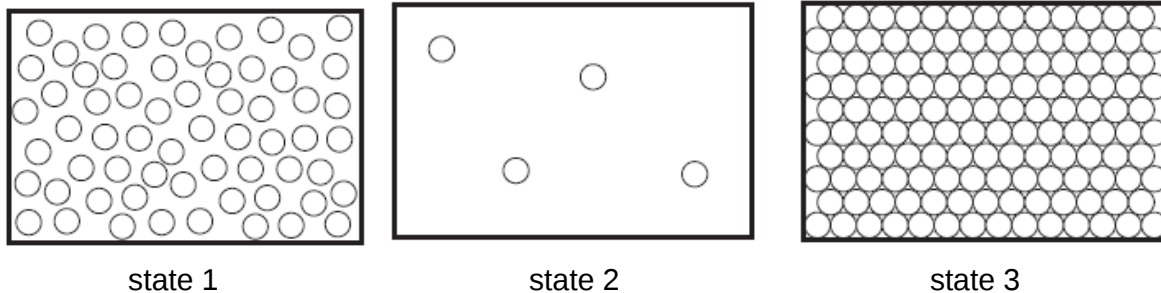
There are **thirty** questions in this paper. Answer **all** questions. For each question there are four possible answers, **A, B, C** and **D**. Choose the **one** you consider correct and record your choice in **soft pencil** on the answer sheet.

INFORMATION FOR CANDIDATES

Each correct answer will score one mark. A mark will not be deducted for a wrong answer. Any rough working should be done in this booklet.

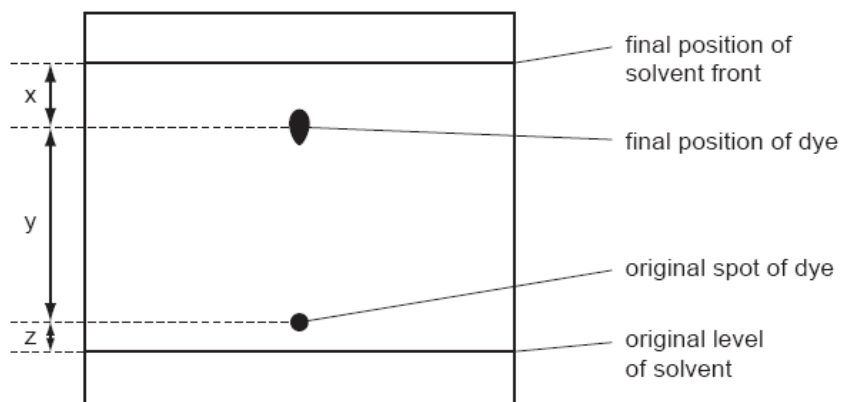
The periodic table can be found on **page 12**.

- 1 The diagram shows the arrangement of particles in three different states of substance **X**.



Which statement best describes the physical states of substance **X**?

- A** State 1 changes to state 2 by diffusion.
 - B** Particles in state 1 vibrate about fixed positions.
 - C** State 2 changes directly to state 3 by sublimation.
 - D** Substance in state 1 has a fixed volume.
- 2 The diagram shows the chromatogram obtained by analysis of a single dye. Three measurements are shown.



What is the distance travelled by the dye?

- A** y
- B** z
- C** $x + y$
- D** $y + z$

- 3 The table shows some information about three substances.

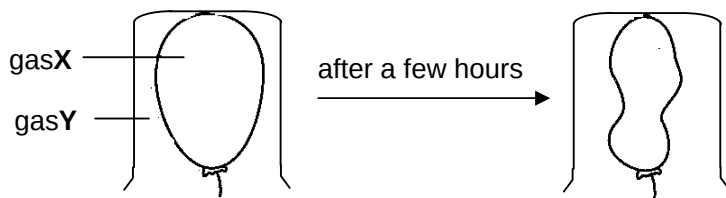
Substance	Melting point / °C	Boiling point / °C	Solubility in water
P	6.5	178	Soluble
Q	- 14	85	Soluble
R	125	350	Insoluble

The following operations could be carried out to separate a mixture of **P**, **Q** and **R**.

1. filtration;
2. fractional distillation;
3. evaporation;
4. add water.

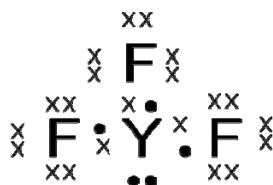
In which order should the operations be carried out?

- A** 4, 1, 2 (omit stage 3)
B 2, 4, 3 (omit stage 1)
C 2, 4, 1 (omit stage 3)
D 4, 1, 2, 3
- 4 A balloon filled with gas **X** is placed inside a beaker. The beaker is filled with gas **Y**. The balloon shrinks in size after a few hours.



Which pair of gases would give the observation as shown in the diagram?

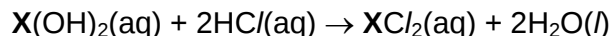
- | | | |
|----------|--------------|----------------|
| | gas X | gas Y |
| A | air | nitrogen |
| B | argon | carbon dioxide |
| C | oxygen | nitrogen |
| D | ammonia | methane |
- 5 The bonding electrons of a compound formed between **Y** and fluorine is shown below:



What is the formula of the compound formed between calcium and **Y**?

- A** CaY
B Ca₅Y₂
C Ca₂Y₃
D Ca₃Y₂

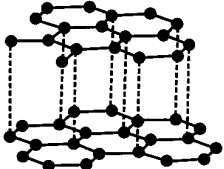
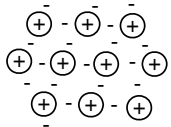
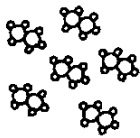
- 6 The equation shows the reaction between hydroxide of the metallic element **X** and dilute hydrochloric acid.



Which particles are responsible for the electrical conductivity in **X**, **X(OH)₂** and **XCl₂**?

	X	X(OH)₂	XCl₂
A	electrons	electrons	cations and anions
B	electrons	cations and anions	cations and anions
C	cations	electrons	electrons
D	cations and anions	anions	cations

- 7 The diagram below shows the particle arrangements of four different substances.

			
i	ii	iii	iv

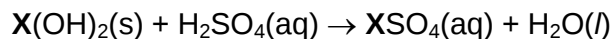
Which one of the following descriptions most likely identify with the above substances?

	i	ii	iii	iv
A	have strong covalent bonds	have delocalized electrons	have van der Waals' forces	have strong covalent bonds
B	have van der Waals' forces	have strong ionic bonds	Have strong covalent bonds	have van der Waals' forces
C	have van der Waals' forces	have delocalized electrons	have van der Waals' forces	have strong ionic bonds
D	have delocalized electrons	have van der Waals' forces	have delocalized electrons	have strong ionic bonds

- 8 A solution of a fertilizer was analyzed. When excess aqueous sodium hydroxide was added to the solution, a green precipitate was observed. When the mixture was further warmed, a gas that turned moist red litmus blue was given off.
Which ions are present in the fertilizer solution?

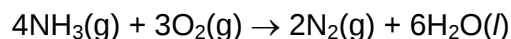
- A** Fe^{2+} and NH_4^+
B Fe^{2+} and NO_3^-
C NH_4^+ and NO_3^-
D Fe^{2+} and Cu^{2+}

- 9 The chemical reaction below shows the reaction between $X(OH)_2$ and dilute sulfuric acid.



What could $X(OH)_2$ be?

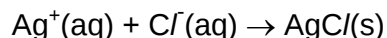
- A calcium hydroxide
 - B iron(II) hydroxide
 - C barium hydroxide
 - D aluminium hydroxide
- 10 What is the mass of one molecule of ethane, C_2H_6 ?
- A 3×10^{-23} g
 - B 5×10^{-23} g
 - C 0.03 g
 - D 30 g
- 11 Ammonia burns in oxygen according to the following equation.



What is the total volume of gas left in the final mixture when 40 cm^3 of ammonia reacts with 60 cm^3 of oxygen? (All volumes measured at room temperature and pressure)

- A 20 cm^3
 - B 30 cm^3
 - C 50 cm^3
 - D 110 cm^3
- 12 The concentration of hydroxide ions, OH^- , can be determined by titration with sulfuric acid, H_2SO_4 , or nitric acid, HNO_3 . An analyst found that a sample of hydroxide solution required 20.0 cm^3 of 0.100 mol/dm^3 of sulfuric acid for complete reaction. If the analysis had been carried out with 0.200 mol/dm^3 of nitric acid, what possible volume of nitric acid would have been required for complete reaction with the hydroxide solution?
- A 10.0 cm^3
 - B 15.0 cm^3
 - C 20.0 cm^3
 - D 25.0 cm^3

- 13** The ionic equation for the reaction of silver ions and chloride ions is shown below.



It was found that 50.0 cm^3 of 0.05 mol/dm^3 of silver nitrate was needed to react completely with 25.0 cm^3 of 0.05 mol/dm^3 of chloride solution of metal **M**. What is the molecular formula of metal **M**?

- A** MCl
- B** MCl_2
- C** M_2Cl
- D** MCl_3

- 14** When chlorine gas is passed over a heated metal **M**, a reaction occurs to produce a compound **Q**. Some information about **M** and **Q** is given below.

- Formula of **Q** is M_xCl_y .
- A_r of **M** is 56.
- $\frac{\text{Mass of chlorine}}{\text{Mass of M}} = 1.90$

What are the values of **x** and **y**?

- | | x | y |
|----------|----------|----------|
| A | 1 | 3 |
| B | 3 | 1 |
| C | 1 | 2 |
| D | 3 | 2 |

- 15** Which of the following statements are true for Mg^{2+} and F^- ?

- i. They have the same number of electrons.
- ii. They have the same mass number.
- iii. Magnesium ion has more neutrons than fluoride ion.

- A** i and ii only.
- B** i and iii only.
- C** i only
- D** i, ii and iii

- 16** Which of the following does **not** have the same number of electrons as a sulfide ion, S^{2-} ?

- A** BeF_2
- B** Ar
- C** H_2S
- D** P^{3-}

- 17** The labels from three bottles of solutions, **A**, **B** and **C** which contain either lead(II) nitrate, zinc sulfate or aluminium chloride have dropped. Which of the following group of reagents when used separately, can be used to identify the three solutions?

A aqueous ammonia and potassium iodide solution
B silver nitrate solution and sodium hydroxide solution
C aqueous ammonia and barium nitrate
D aqueous ammonia and sodium hydroxide solution

- 18** The atoms ^{14}C and ^{14}N

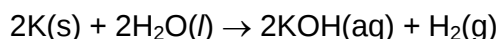
A have the same chemical properties.
B are isotopes.
C have the same total number of electrons and neutrons.
D have the same total number of electrons and protons.

- 19** A student was given an unknown solid sample of **X**. He did a melting point determination and obtained 121°C . He looked up the chemistry data book and found a substance, benzoic acid, that melts at 121°C . To check whether **X** was benzoic acid, he mixed one part of **X** to 4 parts of benzoic acid and found that the melting point of the mixture was 116°C .

What can he deduce about substance **X**?

A **X** is benzoic acid.
B **X** is not benzoic acid.
C **X** may be benzoic acid.
D **X**'s melting point is actually 116°C and not 121°C .

- 20** Potassium reacts with water according to the following equation:



What volume of hydrogen is produced at r.t.p when 0.200 moles of potassium reacts completely?

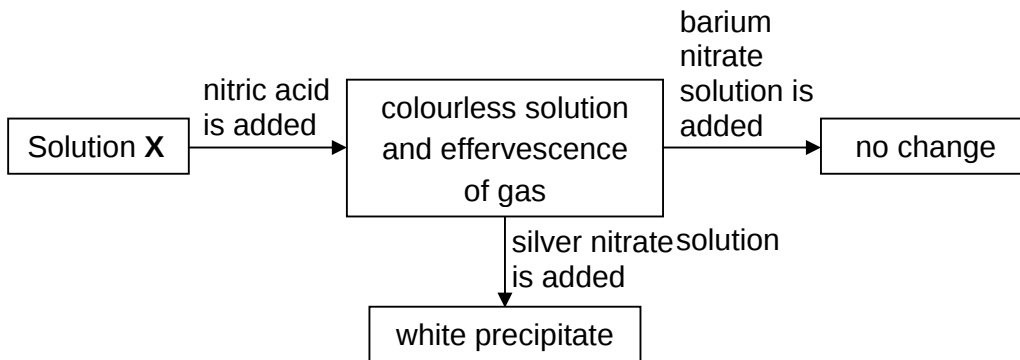
A 3.60 dm^3
B 2.40 dm^3
C 1.20 dm^3
D 24.0 dm^3

- 21** What type of bond(s) is/are found in the compound $(\text{NH}_4)_3\text{PO}_4$?

A covalent only
B ionic only
C neither ionic nor covalent
D both ionic and covalent

- 22** A salt always contains
- A** ionic bonds.
 - B** covalent bonds.
 - C** metallic bonds.
 - D** van der Waals' forces.
- 23** A solid is insoluble in water but dissolves in aqueous acid and in aqueous alkali without evolution of a gas in either case.
- What could the solid be?
- A** potassium oxide
 - B** zinc oxide
 - C** calcium carbonate
 - D** sodium carbonate
- 24** Which of the following solutions when mixed will produce a visible change?
- A** aqueous aluminium nitrate and aqueous ammonia
 - B** aqueous ammonia and aqueous ammonium nitrate
 - C** aqueous copper(II) sulfate and aqueous magnesium chloride
 - D** aqueous potassium chloride and aqueous sodium hydroxide
- 25** Which of the following oxides react with aqueous sodium hydroxide to give a salt?
- A** copper(II) oxide
 - B** magnesium oxide
 - C** carbon monoxide
 - D** aluminium oxide

- 26** Solution X contains two anions. Tests are carried out as shown in the diagram below.



What anions are found in solution X?

- A** sulfate ions and carbonate ions
B carbonate ions and chloride ions
C sulfate ions and chloride ions
D nitrate ions and carbonate ions
- 27** Five students each dissolved an indigestion tablet in 100 cm³ of distilled water. They each filled a conical flask with 25.0 cm³ of their solutions and titrated it with dilute hydrochloric acid, using the same indicator. The results are shown in the table below.

<i>Student number</i>	1	2	3	4	5
<i>Titration value / cm³</i>	20.40	20.50	20.45	20.55	19.40

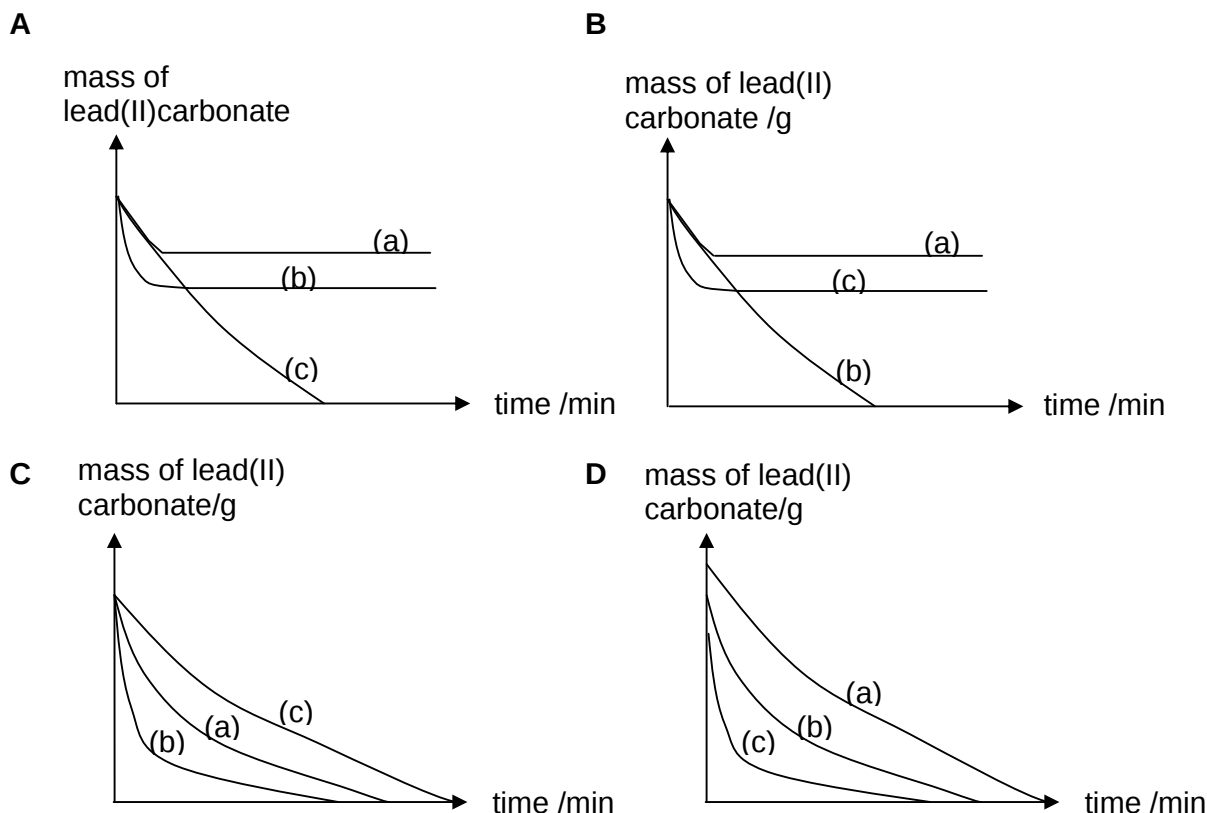
Which one of the following statements could explain the results obtained by student **5**?

- A** The pipette was rinsed with the tablet solution.
B The conical flask was rinsed with distilled water.
C The conical flask was rinsed with dilute hydrochloric acid.
D The student took the reading from the bottom of the meniscus of the burette.

- 28 Equal masses of lead(II) carbonate were reacted with three different acids of the same concentration, all other conditions being kept constant. The acids were added in excess. The mass of lead(II) carbonate was measured at regular time intervals and results for each experiment plotted.

Experiment	Reagent
(a)	hydrochloric acid
(b)	sulfuric acid
(c)	nitric acid

Which graph represents the results from the three experiments?



- 29 What is the most appropriate way to prepare magnesium carbonate?

- A** Mix aqueous magnesium hydroxide with aqueous sodium hydroxide and then bubble carbon dioxide through the reaction mixture.
- B** Mix magnesium sulfate with aqueous sodium hydroxide and then bubble carbon dioxide through the reaction mixture.
- C** Mix magnesium solid, calcium carbonate and water.
- D** Dissolve magnesium sulfate solid in water and mix the mixture with aqueous sodium carbonate.

- 30** In an accident in the school chemistry lab, some acid was spilt all over the floor. Which substance, when added in excess, would neutralise the acid without leaving an alkaline solution?
- A** aqueous sodium chloride
 - B** powdered calcium carbonate
 - C** aqueous sodium hydroxide
 - D** powdered sodium hydroxide

----- End Of Paper -----

The Periodic Table of the Elements

Group																		
I	II											III	IV	V	VI	VII	0	
7 Li lithium 3	9 Be beryllium 4											1 H hydrogen 1						4 He helium 2
Key relative atomic mass atomic symbol name atomic number																		
23 Na sodium 11	24 Mg magnesium 12											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10	
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	— 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	— Ra radium 88	— Ac actinium 89																

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

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