Class	Register Number	Name

南洋女子中学校

NANYANG GIRLS' HIGH SCHOOL

BLOCK TEST 1
Secondary Three

CHEMISTRY **1 hour**

Tuesday **4 May 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 11.

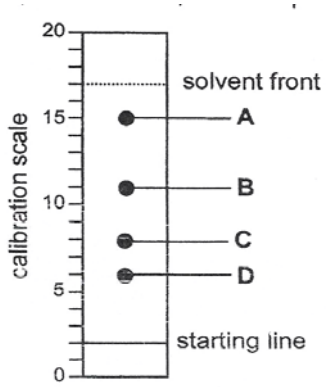
Examiner's Use	
Section A (15 marks)	
Section B (20 marks)	
Section C (10 marks)	
Total (45 marks)	

Section A (15 marks)
Choose the most suitable answer and write its letter in the answer table provided on Page 6.

1 Copper(II) sulfate crystals can be separated from sand using the four processes listed below. The order in which these processes should be used is

	1st	2nd	3rd	4th
A	filtration	solution	crystallization	evaporation
B	solution	evaporation	filtration	crystallization
C	filtration	solution	evaporation	crystallization
D	solution	filtration	evaporation	crystallization

2 A drug was tested for purity through chromatography using propanol as the solvent. If the drug has an R_f value of 0.60, at which point should the spot be found?



3 The elements **T**, **X** and **Y** have consecutive, increasing atomic numbers. If element **T** is noble gas, what will be the symbol for the ion of element **Y** in its compounds?

A Y^{3+}
B Y^{2-}
C Y^{+}
D Y^{2+}

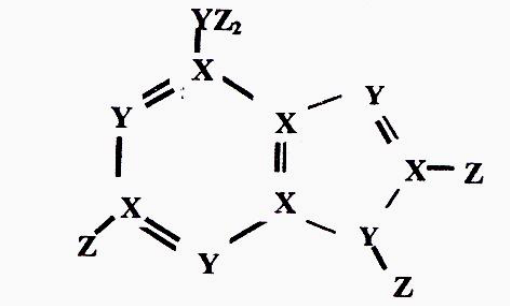
4 The number of valence electrons of atoms of elements **W**, **X**, **Y**, **Z** are 7, 1, 6, and 2 respectively. Which of the following represents the correct chemical formulae when these elements react?

A W_2Z, Y_2X
B Z_2W, X_2Y
C ZW_2, X_2Y
D WZ_2, YX_2

5 In which one of the following sets do all 3 particles have the same total number of electrons?

A $C\ell^-$, Br^-,I^-
B F^-, Ne, Na^+
C H^-, H, H^+
D S^{2-}, SO_3, SO_3^{2-}

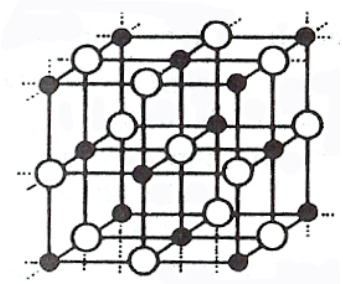
6 A stable molecule containing atoms of the elements **X**, **Y** and **Z** has the following structure.



What are the elements **X**, **Y** and **Z**?

	X	**Y**	**Z**
A	Sulfur	Aluminium	Hydrogen
B	Nitrogen	Carbon	Hydrogen
C	Carbon	Nitrogen	Chlorine
D	Silicon	Phosphorus	Oxygen

7 The diagram shows the arrangement of ions in a compound. The metal ions (**M**) are represented by ● and the non-metal ions (**X**) by O.



What is the **simplest** formula of this compound?

A $M_{14}X_{13}$
B M_2X
C MX
D MX_6

8 What is the number of shared electrons in a carbon dioxide molecule?

A 8
B 4
C 2

D 0

9 What is formed when an element **X** of atomic number 19 reacts with an element **Y** of atomic number 17?

A a covalent compound of formula XY
B a covalent compound of formula XY_2
C an ionic compound of formula XY
D an ionic compound of formula X_2Y

10 Which structural feature of graphite best accounts for its use as a lubricant?

A delocalized electrons
B hexagonal arrangement of carbon atoms
C strong covalent bonds within layers
D weak Van der Waals' forces between layers

11 The labels fell off from two bottles, each containing a colourless solution, one of which was aqueous lead(II) nitrate and the other was aqueous aluminium nitrate. Which of the following reagents could be used to distinguish between the two solutions?

i addition of dilute hydrochloric acid
ii addition of aqueous ammonia
iii addition of aqueous potassium iodide
iv addition of aqueous sodium hydroxide

A i and ii
B ii and iii
C i and iii
D i, ii and iii

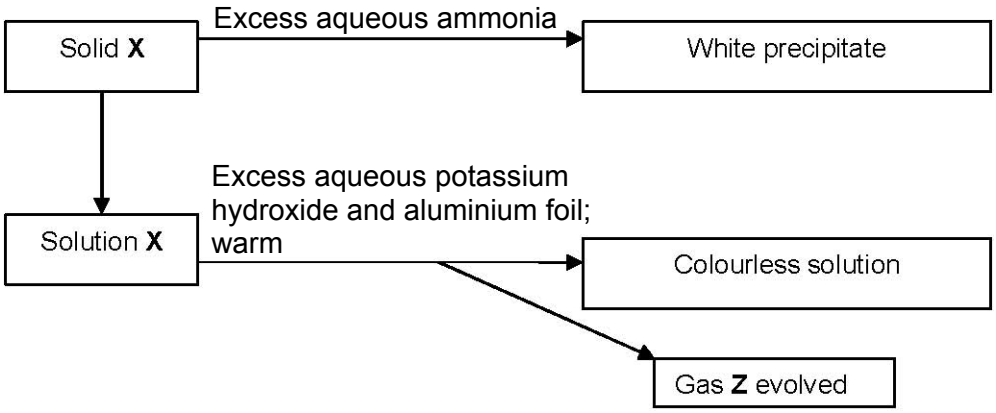
12 **Solution X** contains a simple salt. The table shows the results of some tests on **solution X**.

Test	Observation
addition of aqueous sodium hydroxide	green precipitate formed
addition of acidified barium nitrate	white precipitate formed

What is the name of the salt in **solution X**?

A iron(II) chloride
B iron(III) chloride
C iron(II) sulfate
D iron(III) sulfate

13 Refer to the scheme below to identify the unknown.



Which of the following could be solid **X**?

	Solid **X**	Gas **Z**
A	Sodium hydroxide	Water vapour
B	Calcium hydroxide	Water vapour
C	Zinc nitrate	Ammonia
D	Aluminium nitrate	Ammonia

14 Which one of the following statements about the reactions of dilute hydrochloric acid, dilute nitric acid and dilute sulfuric acid is correct for all three acids?

A They react with copper to produce hydrogen gas.
B They react with zinc hydroxide to produce hydrogen gas.
C They react with aqueous sodium carbonate to produce carbon dioxide gas.
D They react with aqueous silver nitrate to give a precipitate.

15 Four particles are present in dilute sulfuric acid.

Which particle is present in the lowest concentration?

A the hydroxide ion, $OH^-(aq)$
B the hydrogen ions, $H^+(aq)$
C the sulfate ion, $SO_4^{2-}(aq)$
D the water molecule, $H_2O(l)$

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 Use the following information to answer the questions below about the elements **A**, **B**, **C**, **D** and **E**.

Substances	Atomic Number	Mass Number	Electronic Structures
A	3	7	2.1
B	18	40	2.8.8
C	8	16	2.6
D	12	24	2.8.2
E	19	39	2.8.8.1

(a) Which element has 22 neutrons in each atom? _____ [1]

(b) Is the bonding between C and E ionic or covalent?

_____ [1]

(c) Which element is a noble gas? _____ [1]

(d) Which two elements form ions with the same electronic structure as neon (2.8)? _____ [2]

(e) Which two elements are in the same Group in the Periodic Table of the elements? _____ [2]

B2 **(a)** Draw a 'dot-and-cross' diagram *(showing only valence electrons)* to show the bonding in

(i) sodium fluoride [2]

(ii) fluorine [2]

(b) Explain why sodium fluoride has a higher melting point than fluorine. [2]

B3 The following table summarizes the results of tests which were carried out on aqueous solutions of compounds **C** and **D**.

Test \ Compound	C	D
Dilute sodium hydroxide solution	No visible change. On warming, a gas was given off which turned moist red litmus paper blue.	Green precipitate was formed. On standing, the green precipitate turned red-brown.
Acidified barium chloride solution	White precipitate was formed.	No visible change
Acidified silver nitrate solution	No visible change	A white precipitate was formed

(a) **Name** the compounds **C** and **D**.

C: _____ [1]

D: _____ [1]

(b) Write a balanced chemical equation, including state symbols, for the reaction between compound **C** and sodium hydroxide solution. [2]

_____

B4 An unknown element **Y** has a relative atomic mass of 9.42 and exists as **ONLY** two isotopes; **Y-8** and **Y-10**.

(a) Define the term 'isotopes'. [1]

_____

_____

(b) Calculate the relative abundances (%) of **Y-8** and **Y-10**, showing all relevant workings. [2]

END OF SECTION B

Section C (10 marks)

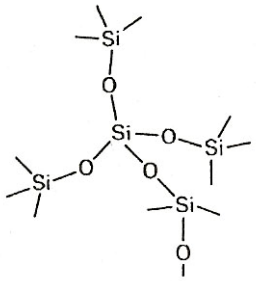
C1 Silicon and carbon are both in Group IV of the Periodic Table.

(a) Draw a diagram of an atom of silicon showing how the electrons are arranged and the numbers of protons and neutrons in the nucleus. [3]

(b) Both carbon and silicon form oxides in which the bonding between the atoms is covalent. Carbon dioxide has a simple molecular structure whereas silicon(IV) oxide (silicon dioxide) has a macromolecular structure.

(i) Draw a dot-and-cross diagram (*showing only valence electrons*) to show the bonding in a molecule of carbon dioxide. [2]

(ii) The structure of silicon(IV) oxide is as drawn below



Silicon(IV) oxide is a solid whereas carbon dioxide is a gas. [3]
Explain this difference in terms of the structures of the two oxides.

(iii) Does silicon(IV) oxide, conduct electricity? [2]
Explain your answer with reference to its structure.

☺END OF TEST☺

DATA SHEET
The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 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	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 †															

58	140 Ce Cerium	141 Pr Praseodymium	144 Nd Neodymium	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	232 Th Thorium	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	a = relative atomic mass
X	X = atomic symbol
b	b = proton (atomic) number

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