

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

BLOCK TEST 2
Secondary Three

CHEMISTRY

1 hour

Thursday

5th July 2012

1030 - 1130

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.

Please note that if you do not write your answers in the spaces provided specially for that purpose, that section of the paper will be awarded ZERO marks.

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:

Particulate nature of matter/ Kinetic particle theory
Atomic structure and separation technique
Chemical bonding
Mole concept

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

This document consists of **12** printed pages.

Setter: C.W.

NANYANG GIRLS' HIGH SCHOOL

[Turn over]

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 (a) State the structure of diamond and tin(IV) iodide in the table above. [2]

Substance	Structure of substance
Diamond	
Carbon dioxide	Simple molecular structure
Tin(IV) iodide (SnI_4)	
Copper	Metal lattice

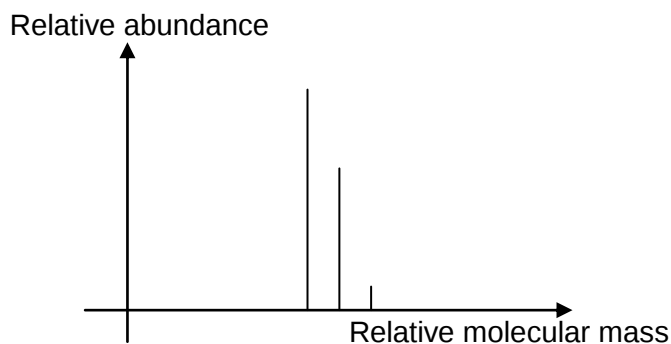
(b) Explain why carbon dioxide has a low melting point while diamond has a high melting point. [3]

- (c) Explain why copper conducts electricity in the solid state. [1]

- (d) Draw the "dot-and-cross" diagram to show the bonding in tin(IV) iodide. Show only the valence electrons. [1]

- (e) Draw the "dot-and-cross" diagram to show the bonding in carbon dioxide. Show only the valence electrons. [1]

B2 Dichloromethane (CH_2Cl_2) was detected on a fibre found in a crime scene. A mass spectrometer was used to analyze the dichloromethane and it showed that the two chlorine isotopes, chlorine-35 and chlorine-37, were present. The mass spectrum also showed three peaks corresponding to different relative molecular masses of dichloromethane and the intensities of the peaks from the smallest relative molecular mass to highest relative molecular mass are in the ratio of 9:6:1.



(The intensities of the peak show the relative abundance.)

- (a) State the three relative molecular mass of dichloromethane in the mass spectrum. [1]
-

- (b) A piece of clothing contaminated with dichloromethane was obtained from a suspect and analyzed using the mass spectrometer. The average relative molecular mass of dichloromethane found on the piece of clothing is 85. Explain clearly, showing relevant working, if the suspect is the criminal. [3]

- (c) Draw the "dot-and-cross" diagram to show the bonding in dichloromethane. Show only the valence electrons. [1]

- B3** A student wants to investigate the diffusion rates of two gases, ammonia and sulfur dioxide. Suggest a method whereby she is able to scientifically determine which gas has a higher diffusion rate.

[3]

B4 The empirical formula of a gas is PQ_3 . The relative atomic masses of **P** and **Q** are 12 and 1 respectively.

(a) If the relative molecular mass of the gas is 30, determine the molecular formula of the gas. [1]

(b) A sealed cylinder contains 48 dm^3 of the gas in **B4(a)** at room temperature and pressure. What is the mass of the gas in the cylinder? [2]

(c) What is the number of gas particles present in the cylinder? [1]

Section C (10 marks)

Answer all questions in this section in the spaces provided.

C1 Antimony, Sb, forms an oxide with the formula, Sb_xO_y .
Numerical answers are to be given to three significant figures.

(a) (i) Calculate the number of moles present in 40.0 g of antimony. [1]

(ii) Calculate the number of moles present in 7.90 g of oxygen gas. [1]

(iii) Write the chemical equation with state symbols when 40.0 g of antimony reacts completely with 7.90 g of oxygen gas to form antimony oxide. [4]

- (b) What is the mass of 0.200 mol of antimony oxide as determined from **C1(a)(iii)**? [2]

- (c) A student referred to a data booklet and concluded that the formula of antimony oxide is $\text{Sb}_{2x}\text{O}_{2y}$ and not Sb_xO_y . Explain whether you agree with the student's conclusion. [2]

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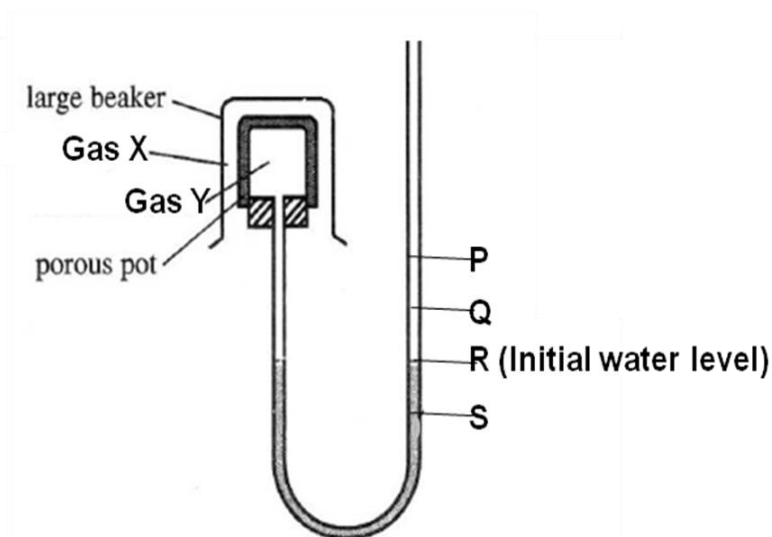
END OF TEST

Section A (15 marks)

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

- 1 Which method can be used to test the purity of a dye before it is used in food flavouring?
- A Solubility in ethanol
 - B Boiling point
 - C Electrical conductivity
 - D Ductility

Please refer to the diagram below to answer **Question 2** and **3**. The initial water level is at **R**.



- 2 Choose the correct combination of gases that will cause the water level on the right to increase initially to **Q**.

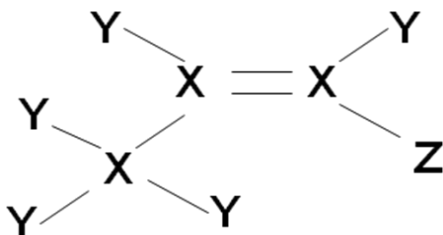
Gas X	Gas Y
A Sulfur dioxide	Argon
B Methane	Oxygen
C Argon	Water vapour
D Oxygen	Ammonia

- 3 Which position will the water level be at after a day if gas **X** is carbon dioxide and gas **Y** is ammonia?

A	P
B	Q
C	R
D	S

- 4** Which covalent substance conducts electricity?
- A** Graphite
 - B** Diamond
 - C** Brass
 - D** Fluorine
- 5** Element **X** has atomic number 6 and element **Y** has atomic number 17. Which of the following statements is correct?
- A** The two elements will form an ionic compound with the formula, XY_2 .
 - B** The two elements will form an ionic compound with the formula, XY_4 .
 - C** The two elements will form a covalent compound with the formula, XY_2 .
 - D** The two elements will form a covalent compound with the formula, XY_4 .
- 6** Which of the following substances will be a good conductor of electricity when added to water?
- A** Calcium carbonate
 - B** Silver
 - C** Sodium hydroxide
 - D** Chlorine
- 7** Element **X** and Element **Y** formed an ionic compound with the formula XY_3 . What are the possible proton numbers of **X** and **Y**?
- | | | |
|----------|----------|----------|
| | X | Y |
| A | 1 | 3 |
| B | 7 | 1 |
| C | 15 | 17 |
| D | 31 | 9 |
- 8** Which substance has both ionic and covalent bonds?
- A** Sodium carbonate
 - B** Sodium oxide
 - C** Sulfur dioxide
 - D** Sodium

- 9 The formula of a monomer containing element X, Y and Z is shown below.



Which one of the following is a possible combination of the elements?

- | | X | Y | Z |
|---|------------|----------|----------|
| A | Phosphorus | Hydrogen | Fluorine |
| B | Silicon | Hydrogen | Hydrogen |
| C | Lead | Hydrogen | Chlorine |
| D | Carbon | Hydrogen | Bromine |
- 10 28.4 g of anhydrous sodium sulfate combines with 36.0 g of water to form hydrated sodium sulfate. What is the formula of hydrated sodium sulfate?
- A $\text{Na}_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$
 B $\text{Na}_2\text{SO}_4 \cdot 8\text{H}_2\text{O}$
 C $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$
 D $\text{Na}_2\text{SO}_4 \cdot 12\text{H}_2\text{O}$
- 11 Which of the following has the same relative molecular mass as calcium carbonate, CaCO_3 ?
- A K_2CO_3
 B CaSO_3
 C Al_2O_3
 D MgSiO_3
- 12 If the number of particles in one mole of solid lithium is x, what is the number of oxygen molecules in 16.0 g of oxygen gas?
- A 0.5 x
 B 2 x
 C x
 D 16 x
- 13 What is the ratio of the volume of 5.1 g of ammonia to the volume of 44.8 g of sulfur dioxide at room temperature and pressure?
- A 1:3
 B 1:9
 C 3:7
 D 5:9

- 14** A compound formed by potassium, chromium and oxygen has a total mass of 6.00 g. This compound contained 2.41 g of potassium and has a composition with 33.0 % oxygen by mass. What is the empirical formula of the compound?
- A** $\text{K}_2\text{Cr}_2\text{O}_7$
B KCr_2O_3
C KCrO_2
D K_2CrO_4
- 15** What is the molecular formula of a hydrocarbon, C_xH_y , which contains 14.3% of hydrogen by mass?
- A** C_4H_{10}
B C_3H_8
C C_2H_4
D CH_3

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																		
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	4 He Helium 2
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	209 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86	
223 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89																
* 58–71 Lanthanoid series † 90–103 Actinoid series																		
140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	147 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	259 No Nobelium 102	258 Md Mendelevium 101	260 Lr Lawrencium 103		
a = relative atomic mass X = atomic symbol b = atomic (proton) number																		
aXb																		
Key																		

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

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