HWA CHONG INSTITUTION
C1 Promotional Examination
Higher 2

CANDIDATE NAME		**CT GROUP**	**16S**

CHEMISTRY

9729/01

Paper 1 Multiple Choice

30 September 2016

40 min

Additional Materials: Multiple Choice Answer Sheet
Data Booklet.

READ THESE INSTRUCTIONS FIRST

Write in soft pencil.

Complete the information on the Multiple Choice Answer Sheet as shown below.

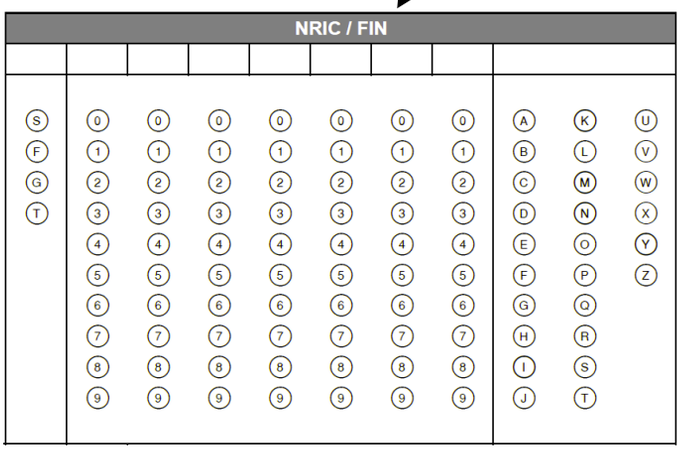
1. Enter your **NAME** (as in NRIC).
2. Enter the **SUBJECT TITLE**.
3. Enter the **PAPER NUMBER.**
4. Enter your **CT GROUP.**
5. **Date.**

Write your **name**

Write your **CT group**

Write and shade
your **NRIC**
or **FIN number**

6. Enter your **NRIC NUMBER** or **FIN Number**
7. Now **SHADE** the corresponding circles in the grid for **EACH DIGIT** or **LETTER**



8. **INSTRUCTIONS FOR RECORDING ANSWERS**
Suggested answers to each question are given in the question paper. Choose an answer and shade the corresponding circle- A, B, C or D, accordingly.

There are **twenty** questions on 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 Multiple Choice Answer Sheet.

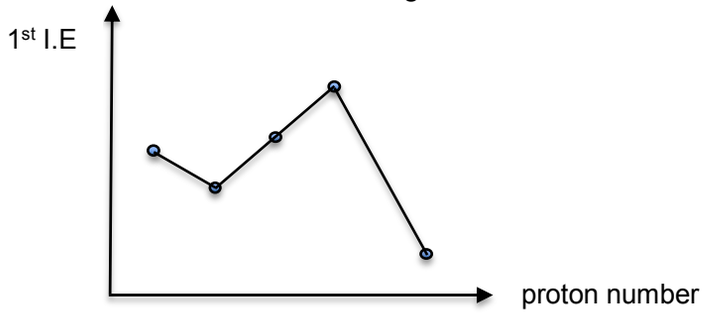
Each correct answer will score one mark. A mark will **not** be deducted for a wrong answer.

Any rough working should be done in this booklet.

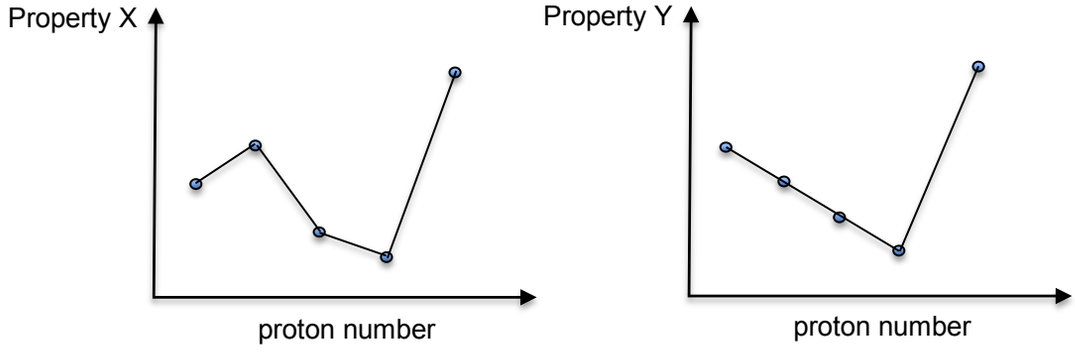
The use of an approved scientific calculator is expected, where appropriate.

SECTION A

1 The first ionization energies of five consecutive elements in the Periodic Table with proton number less than 20 are shown in the diagram.



The sketches below represent two other properties of the same elements.



What are properties **X** and **Y**?

	property **X**	property **Y**
A	Electronegativity	Atomic radius
B	Ionic radius	Electronegativity
C	Melting point	Atomic radius
D	Second ionization energy	Effective nuclear charge

2 Which one of the following pairs has permanent dipole - permanent dipole interactions between molecules?

A	$CHCl_3$	CH_4
B	CCl_4	$CClF_3$
C	$CClF_3$	$CHCl_3$
D	C_2H_5Cl	C_2Cl_4

3 Three substances, **X**, **Y** and **Z** have physical properties as shown.

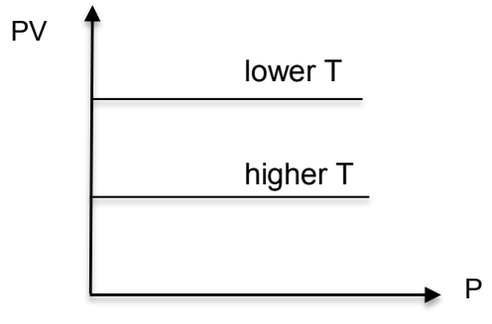
substance	melting point / °C	boiling point / °C	electrical conductivity	
			of solid	of liquid
X	801	1413	poor	good
Y	2852	3600	poor	good
Z	3550	4827	good	not known

What could be the identities of **X**, **Y**, and **Z**?

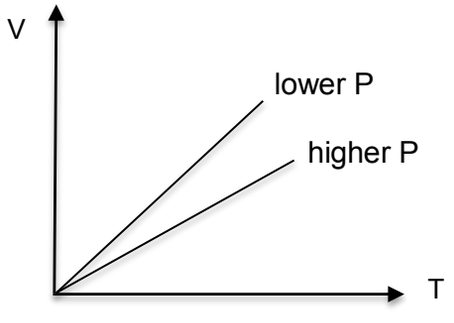
	X	**Y**	**Z**
A	NaF	$BeCl_2$	Si
B	NaCl	MgO	graphite
C	NaBr	CaO	SiO_2
D	NaI	Al_2O_3	diamond

4 Each of the following graphs represents plots for a fixed mass of ideal gas at two different conditions. Which of the following graphs is correct?

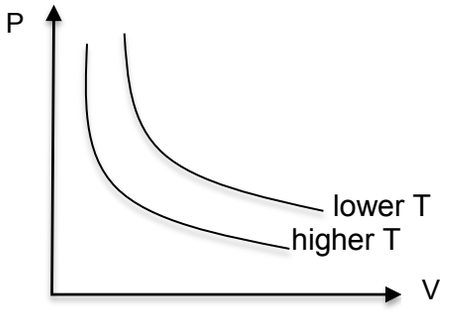
A



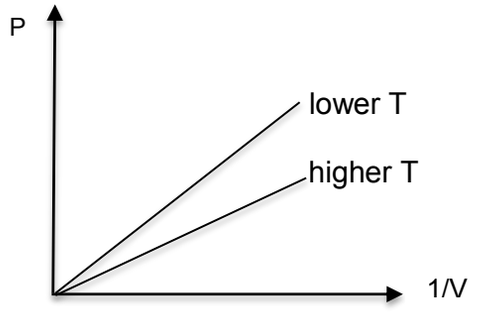
B



C



D



5 In a redox experiment, 20.0 cm^3 of 0.125 mol dm^{-3} KIO_4 was used to oxidize 25 cm^3 of 0.8 mol dm^{-3} K_2MnO_4 to $KMnO_4$.

Which of the following formulae correctly represents the reduction product of the IO_4^- ion?

A I^- **B** IO^- **C** IO_2^- **D** IO_3^-

6 Excess chlorine was bubbled through 250 cm^3 of aqueous sodium thiosulfate ($Na_2S_2O_3$), oxidising thiosulfate to sulfate ions. 25.0 cm^3 of the resultant solution was found to give 0.583 g of barium sulfate precipitate when treated with an excess of aqueous barium nitrate.

What is the concentration, in mol dm^{-3}, of sodium thiosulfate in the 250 cm^3 solution used?

A 0.005 **B** 0.050 **C** 0.100 **D** 0.243

7 Consider the following reactions:

$Mg\,(s) + 2HCl\,(aq) \rightarrow MgCl_2\,(aq) + H_2\,(g)$ $\quad \Delta H_{rxn} = -464\ kJ\ mol^{-1}$
$MgO\,(s) + 2HCl\,(aq) \rightarrow MgCl_2\,(aq) + H_2O\,(l)$ $\quad \Delta H_{rxn} = -48\ kJ\ mol^{-1}$

Given that the enthalpy change of formation of water is –285 kJ mol^{-1}, what is the enthalpy change of formation of magnesium oxide?

A – 897 kJ mol^{-1}
B – 701 kJ mol^{-1}
C – 327 kJ mol^{-1}
D – 316 kJ mol^{-1}

8 Which of the following has the same value as the standard enthalpy change of formation of carbon monoxide?

1 ΔH_c (graphite) − ΔH_c (CO)
2 ΔH_f (CO_2) − ΔH_c (graphite)
3 ΔH_f (CO_2) − ½ΔH_{atm} (O)
4 ΔH_{atm} (graphite) − ΔH_{atm} (CO) + ΔH_{atm} (O)

A **1** only
B **1** and **2** only
C **1** and **4** only
D **3** and **4** only

9 The equation for the reduction of nitrogen monoxide is shown below.

$$2H_2 + 2NO \longrightarrow N_2 + 2H_2O$$

From initial rates experiments the following rate equation was derived.

$$\text{Rate} = k[H_2][NO]^2$$

The results of the initial rates experiments are shown.

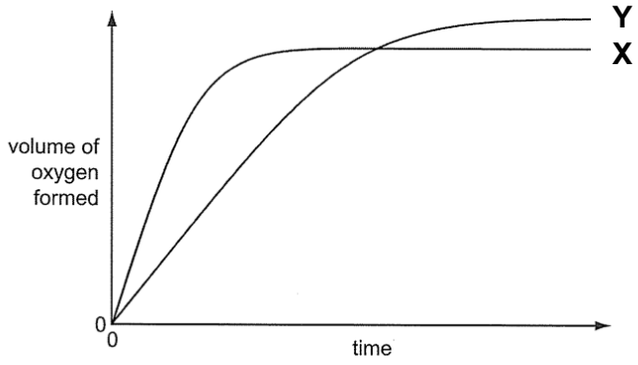
Initial $[H_2]$ / mol dm^{-3}	Initial [NO] / mol dm^{-3}	Initial rate / mol dm^{-3} min^{-1}
0.5	2.0	6.0
0.5	1.0	**x**
1.0	1.0	**y**
1.0	**z**	0.75

What are the missing values, **x**, **y** and **z**?

	x	**y**	**z**
A	1.5	3.0	0.500
B	1.5	3.0	0.250
C	3.0	6.0	0.250

D	3.0	6.0	0.125

10 In the diagram, curve **X** was obtained by observing the decomposition of 100 cm^3 of 1.0 mol dm^{-3} hydrogen peroxide, catalyzed by manganese (IV) oxide.



Which alteration to the original experimental conditions on its own would produce curve **Y**?

1 Add more water
2 Lower the temperature
3 Use less manganese (IV) oxide
4 Add some 0.1 mol dm^{-3} hydrogen peroxide

A **2** only
B **4** only
C **3** and **4** only
D **1**, **2** and **3** only

11 For which one of the following equilibria does K_c have units?

A $C(s) + S_2(g) \rightleftharpoons CS_2(g)$

B $2CH_3CO_2H(aq) + Ba(OH)_2(aq) \rightleftharpoons Ba(CH_3CO_2)_2(aq) + 2H_2O(l)$

C $CH_3CO_2H(l) + CH_3CH_2OH(l) \rightleftharpoons CH_3CO_2CH_2CH_3(l) + H_2O(l)$

D $CO_2(g) + CF_4(g) \rightleftharpoons 2COF_2(g)$

12 Consider the following reaction:

$$Ag_2CO_3(s) \rightleftharpoons Ag_2O(s) + CO_2(g) \qquad \Delta H > 0$$

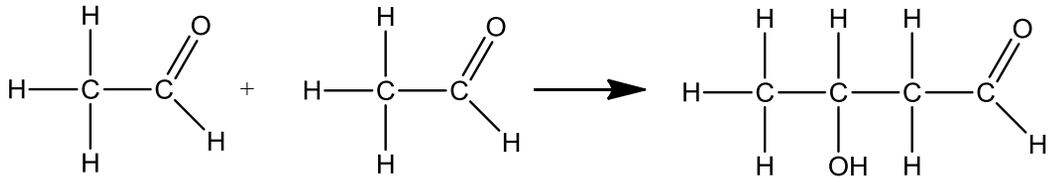
What can be concluded from the above information?

1 Increasing pressure decreases the equilibrium yield of CO_2.
2 The value of K_p increases with decreasing pressure.
3 The forward reaction is favoured at high temperatures.
4 Increasing the mass of Ag_2CO_3 increases the equilibrium yield of CO_2.

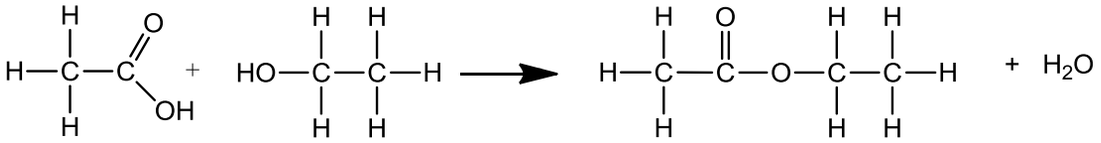
A **1** and **3** only
B **1** and **4** only
C **1**, **2** and **3** only
D **2, 3** and **4** only

13 The following shows two separate reactions I and II.

I



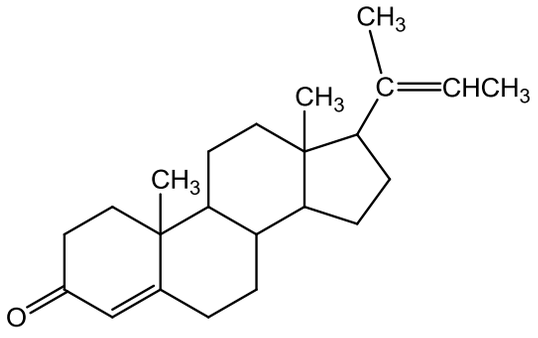
II



Which of the following best describes reactions I and II?

	I	II
A	addition	condensation
B	addition	elimination
C	elimination	condensation
D	substitution	elimination

14 How many stereoisomers are there in the molecule shown below?

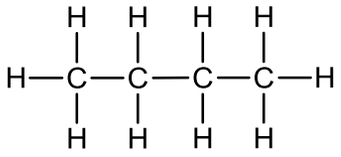


A 2^5 **B** 2^6 **C** 2^7 **D** 2^8

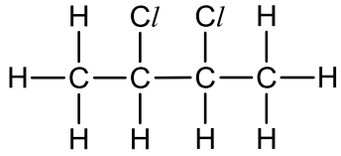
15 In the free radical chlorination of chloroethane, which of the following would be formed in the termination step?

A H_2 **B** HC*l*

C



D



16 In the free radical substitution of 2-methylbutane with limited bromine in the presence of *uv* light, a mixture of mono-brominated products were obtained. Which of the following is the correct combination of the products obtained (ignore stereoisomers)?

A 5 possible products in the ratio of 3:3:3:2:1

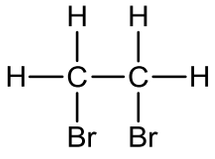
B 4 possible products in the ratio of 3:3:3:2

C 4 possible products in the ratio of 6:3:2:1

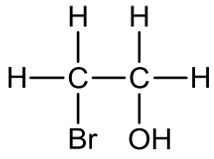
D 3 possible products in the ratio of 9:2:1

17 Which of the following compounds is an addition product of the reaction between ethene with aqueous chlorine in the presence of a trace amount of KBr?

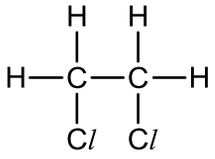
1



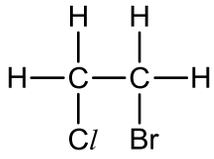
2



3



4



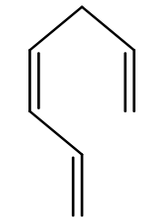
A **1**, **2** and **4** only

B **2**, **3** and **4** only

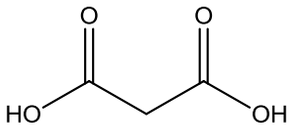
C **1** and **2** only

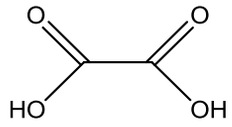
D **3** and **4** only

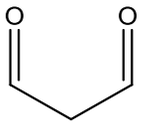
18 When the molecule of compound **Q** is treated with excess acidified hot concentrated manganate (VII) ions, which of the following compounds are obtained at the end of the reaction?



Compound **Q**

1 

2 

3 

4 CO_2

A **1**, **2** and **4** only
B **2**, **3** and **4** only
C **2** and **3** only
D **1** and **4** only

19 Which of the following statements about the benzene molecule is correct?

A It can conduct electricity.
B It is susceptible to attack by nucleophilic reagents.
C It tends to undergo addition reactions rather than substitution reactions.
D A carbon-carbon bond in benzene is stronger than a carbon-carbon bond in cyclohexane.

20 Which of the following statements about the nitration of benzene by concentrated nitric acid and concentrated sulfuric acid are correct?

1 If concentrated sulfuric acid is replaced with dilute sulfuric acid, the reaction will still proceed at the same rate.
2 The attacking electrophile is the nitronium ion, NO_2^+.
3 The shape about the carbon atom where electrophilic attack occurs is different in the intermediate and product.
4 The intermediate has 5 electrons delocalized over 6 carbon atoms.

A **1**, **2** and **3** only
B **1** and **2** only
C **2** and **3** only
D **3** and **4** only

– END OF PAPER –