



Catholic Junior College
JC 2 Preliminary Examinations
Higher 1

CHEMISTRY

Paper 1 Multiple Choice

8872/01

Tuesday 29 August 2017

50 minutes

Additional Materials: Multiple Choice Answer Sheet
Data Booklet

READ THESE INSTRUCTIONS FIRST

Write your name, HT group and NRIC/FIN number on the Answer Sheet in the spaces provided.

Write in soft pencil.

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

There are **thirty** 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 separate Answer Sheet.

Read the instructions on the Answer Sheet very carefully.

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

For each question there are four possible answers, **A**, **B**, **C** and **D**. Choose the **one** you consider to be correct.

- 1** A giant molecule contains a large amount of carbon; mainly of isotopes ^{12}C and ^{13}C . It was found that the relative atomic mass of carbon in the molecule is 12.2.
What is the ratio of ^{12}C to ^{13}C ?

A 4:1 **B** 3:1 **C** 3:4 **D** 1:4

- 2** 10 cm³ of a pure hydrocarbon **X** was completely burnt in 80 cm³ of excess oxygen to give carbon dioxide gas and water vapour. After cooling to room temperature, the volume of gaseous mixture decreased from 105 cm³ to 55 cm³. A further reduction of 40 cm³ was observed when the residual gas was passed through aqueous sodium hydroxide.
All gas volumes were measured at the same temperature and pressure.
What is the formula of **X**?

A C₂H₆ **B** C₃H₈ **C** C₄H₁₀ **D** C₅H₁₂

- 3** A plasma is a gaseous mixture in which atoms have been completely stripped of their electrons, leaving bare nuclei. When passed through an electric field, the ^1H nucleus is deflected at an angle of +4°. What will be the angle of deflection for the ^3H nucleus in the same plasma?

A +0.75° **B** +1.3° **C** +4° **D** +12°

- 4** *Use of the Data Booklet is relevant to this question.*

What do the ions $^{23}\text{Na}^+$ and $^{24}\text{Mg}^{2+}$ have in common?

- A** Both ions have more electrons than neutrons.
B Both ions have 12 neutrons in their nuclei.
C Both ions contain the same number of nucleons in their nuclei.
D Both ions have an outer electronic configuration of $3s^2 3p^6$.

- 5 Use of the Data Booklet is relevant to this question.

Which of the following particles would, on losing an electron, have a half-filled set of p orbitals?

A C^- B N C N^- D O^+

- 6 The first seven successive ionisation energies (in kJ mol^{-1}) of an element J are given below:

1020 1950 2730 4580 6020 12300 15400

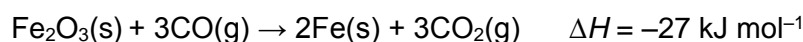
Which of the following statements about J is correct?

- A It has a valence shell electronic configuration of $ns^2 np^4$
 B Its atomic radius is larger than its ionic radius.
 C It has a lower second ionisation energy than that of its preceding element.
 D It can form a chloride that has a trigonal pyramidal shape.
- 7 In which of the following pairs of compounds is the bond angle in particle I greater than that in particle II?

	I	II
A	PH_3	BH_3
B	NO_3^-	ClO_2^-
C	SF_6	I_3^-
D	ClF_3	BeCl_2

- 8 Which one of the following statements about aluminium chloride is correct?
- A AlCl_3 is pyramidal.
 B AlCl_3 has a higher melting point than Al_2O_3 .
 C The Al_2Cl_6 dimer contains hydrogen bonding.
 D The AlCl_3 is known as a halogen carrier in the chlorination of benzene.
- 9 Which of the following processes is endothermic?
- A $\text{H}_2\text{O(l)} \rightarrow \text{H}^+(\text{aq}) + \text{OH}^-(\text{aq})$
 B $\text{SO}_2(\text{g}) + \frac{1}{2}\text{O}_2(\text{g}) \rightarrow \text{SO}_3(\text{g})$
 C $2\text{KOH(aq)} + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{K}_2\text{SO}_4(\text{aq}) + 2\text{H}_2\text{O(l)}$
 D $\text{Li}^+(\text{g}) + \text{Cl}^-(\text{g}) \rightarrow \text{LiCl(s)}$

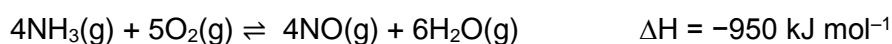
- 10 Iron can be obtained by the reduction of its oxide by carbon monoxide:



By using the data (enthalpy change of formation) given in the table, find the enthalpy change of formation of $\text{Fe}_2\text{O}_3(\text{s})$.

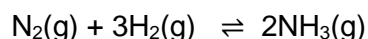
	$\Delta H_f / \text{kJ mol}^{-1}$
$\text{CO}(\text{g})$	-111
$\text{CO}_2(\text{g})$	-394

- A -310 kJ mol^{-1}
 B -411 kJ mol^{-1}
 C -822 kJ mol^{-1}
 D -849 kJ mol^{-1}
- 11 Which of the following options is correct for the following equilibrium?



	Condition	Position of equilibrium	K_c
A	Increase in temperature	Right	Increase
B	Addition of catalyst	Right	No change
C	Addition of $\text{HCl}(\text{g})$	No change	No change
D	Decrease in pressure	Right	No change

- 12 The Haber process is the industrial manufacture of ammonia. The following equilibrium exists at the expected conditions needed for the Haber process:



Which of the following changes would increase both the proportion of ammonia present at equilibrium and the value of equilibrium constant, K_c ?

- A adding more finely divided iron
 B changing the temperature to 100 °C.
 C changing the temperature to 600 °C.
 D setting the total pressure to 400 atm

- 13 0.100 moles of HCl was mixed with 0.300 moles of NaOH and the total volume was 2 dm^3 . What is the pH of the resulting solution?

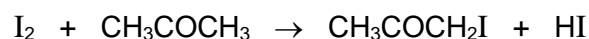
A 13.3 B 13.0 C 1.0 D 0.7

- 14 For the reaction $\text{L}(\text{aq}) + 2\text{M}(\text{aq}) \rightarrow \text{N}(\text{aq})$, the rate equation is

$$\text{Rate} = k [\text{H}^+][\text{M}]^2$$

Which of the following is **false**?

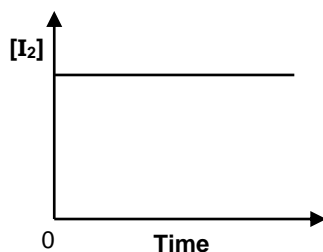
- A H^+ is a catalyst in the reaction.
 B When the concentration of **L** is halved, the rate remains unchanged.
 C The unit for the rate constant is $\text{mol}^{-2} \text{ dm}^6 \text{ s}^{-1}$.
 D If the concentration of **M** is doubled, the rate of the experiment increases by two times.
- 15 Iodine reacts with propanone according to the following equation.



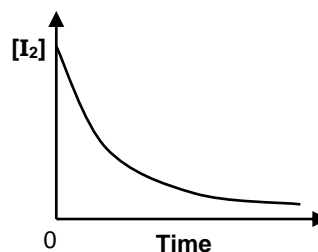
The reaction of iodine with propanone is found to be zero order with respect to iodine.

Which graph correctly shows how the $[\text{I}_2]$ changes with time?

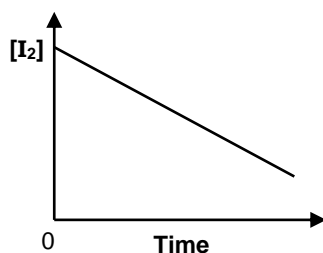
A



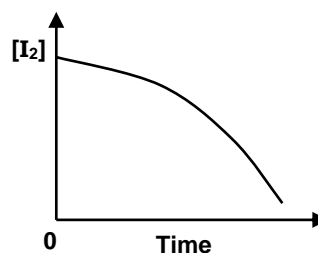
C



B



D



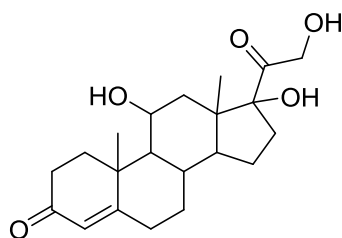
- 16 An unknown element **X** undergoes radioactive decay to form element **Y**. The radioactive decay is a first-order reaction with a half-life of 47.0 minutes. How long will it take for the molar proportion of **X** to **Y** to be 1:7?

A 23.5 min **B** 47.0 min **C** 94.0 min **D** 141.0 min

- 17 The proton number of the element **E** is less than 20. When the chloride of **E** is dissolved in water, a slightly acidic solution is obtained. When the oxide of **E** is dissolved in water, an alkaline solution is obtained. In which Group of the Periodic Table is **E** likely to be found?

A 1 **B** 2 **C** 13 **D** 14

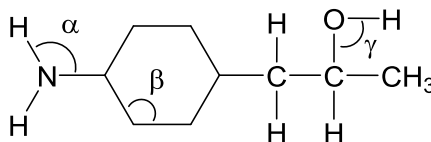
- 18 Cortisol is a hormone that can increase blood sugar and aids in the metabolism of fat, protein, and carbohydrates.



cortisol

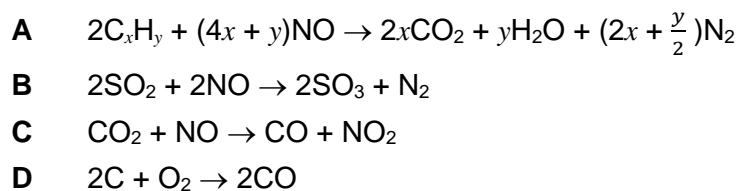
Which of the following will not react with cortisol?

- A** solid sodium carbonate
B red phosphorus and excess Br_2
C cold, alkaline potassium manganate(VII)
D 2,4-dinitrophenylhydrazine
- 19 What are the angles α , β and γ in the following molecule?

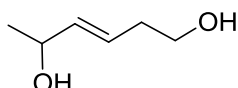


	α	β	γ
A	120	120	90
B	109	109	107
C	107	120	105
D	107	109	105

- 20 A catalytic converter is part of the exhaust system of many modern cars. Which one of the following reactions occurs in the catalytic converter?



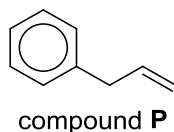
- 21 Hex-3-en-1,5-diol has the following structure.



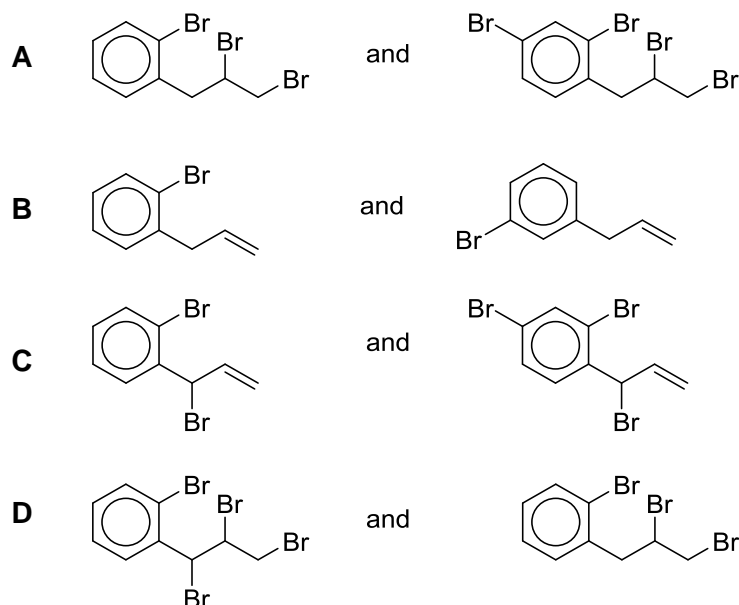
How many moles of PCl_5 will react with the products formed from heating 1 mole of hex-3-en-1,5-diol in the presence of acidified potassium manganate(VII)?

- A** 1 **B** 2 **C** 3 **D** 4

- 22 Bromine, along with iron(III) bromide, is dissolved in compound **P** and left to stand in the dark.



Which of the following pairs is likely to be the major products formed?



- 23** Chlorofluorocarbons (CFCs) have been widely used in aerosol sprays, refrigerators and in making foamed plastics, but are now known to destroy ozone in the upper atmosphere. Which of the following will not destroy ozone, and therefore can be used as a replacement for CFCs?

A $\text{CHBr}_2\text{CH}_2\text{CH}_2\text{CCl}_3$
B $\text{CH}_3\text{CHFCH}_2\text{CH}_2\text{F}$
C $\text{CH}_2\text{ClCH}_2\text{CHFCH}_3$
D $\text{CHF}_2\text{CH}_2\text{CH}_2\text{CHBr}_2$

- 24** A glass of wine was exposed to air for a period of time. This causes the wine to have a sour taste. A student proposed that a portion of ethanol present in the wine has been oxidised, thus giving rise to the sour taste.

Which of the following reagents can be used to confirm the above hypothesis?

A Na **B** NaOH **C** K_2CO_3 **D** KMnO_4

- 25** Butanoic acid was heated under reflux with a mixture of ethanol and propanol in the presence of concentrated sulfuric acid. Which of the following is a possible product of this reaction?

A ethyl propanoate
B propyl butanoate
C butyl butanoate
D propyl ethanoate

Section B

For each of the questions in this section, one or more of the three numbered statements 1 to 3 may be correct.

Decide whether each of the statements is or is not correct (you may find it helpful to put a tick against the statements that you consider to be correct).

The responses **A** to **D** should be selected on the basis of

A	B	C	D
1, 2 and 3 are correct	1 and 2 only are correct	2 and 3 only are correct	1 only is correct

No other combination of statements is used as a correct response.

- 26** Chlorine gas reacts with sodium hydroxide according to the following equation.



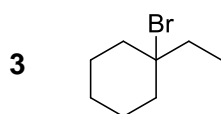
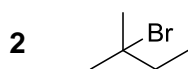
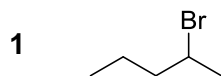
Which of the following statements is true for this reaction?

- 1** Cl is oxidised.
 - 2** Cl is reduced.
 - 3** Oxidation state of O does not change.
- 27** Which of the following shows a correct example of a conjugate acid / base pair?
- 1** $\text{CH}_3\text{CO}_2\text{H}$, $\text{CH}_3\text{CO}_2^-\text{Na}^+$
 - 2** CH_3NH_2 , $\text{CH}_3\text{NH}_3^+\text{Cl}^-$
 - 3** H_2O , OH^-
- 28** *Use of the Data Booklet is relevant to this question.*

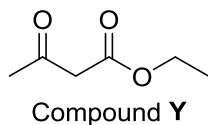
Based on its position in the Periodic Table, which properties will element **X** (atomic number 14) have?

- 1** Its oxide has a simple molecular structure.
- 2** Its chloride hydrolyses in water to give an acidic solution.
- 3** Element **X** has high melting and boiling point.

- 29 An unknown halogen derivative, **Q**, was heated with alcoholic potassium hydroxide. A product that exhibits geometric isomerism is obtained. Which of the following is a possible identity of compound **Q**?



- 30 Compound **Y** is reacted with aqueous hydrogen cyanide in alkaline condition at 20 °C to produce compound **Z**. Compound **Z** is then heated under reflux with dilute sulphuric acid and the products isolated.



Which of the following are the possible products from the above reaction?

