

YISHUN JUNIOR COLLEGE

JC2 PRELIMINARY EXAMINATION 2014

CHEMISTRY

8872/01

HIGHER 1

Paper 1 Multiple-Choice Questions

50 minutes

Additional materials:

Optical Mark Sheet, Data Booklet

SHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE
SHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE
SHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE
SHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE
SHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE
SHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE
SHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE
SHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE
SHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE
SHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE
SHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE
SHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE
SHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE
SHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE
SHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE YISHUN JUNIOR COLLEGE



INSTRUCTIONS TO CANDIDATES

Section A & B: Multiple Choice Questions

Write in soft pencil.

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

Write your name and CTG on the Answer Sheet. Shade your NRIC number in the spaces provided in the Optical Mark Sheet.

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 Optical Mark 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.

Section A

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

- 1 How many carbon atoms are present in 4.0 g of ethane? [L = Avogadro constant]

A $\frac{4L}{15}$ **B** $\frac{2L}{15}$ **C** $\frac{4}{15L}$ **D** $\frac{2}{15L}$

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

There are three naturally occurring isotopes of carbon: 12, 13, and 14.

How many neutrons are present in a carbon atom of the most abundant isotope?

A 6 **B** 7 **C** 8 **D** 9

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

Sodium hydroxide reacts with phosphoric acid to form the ionic compound, sodium phosphate, which contains the phosphate ion, PO_4^{3-} .

What is the percentage by mass of sodium present in sodium phosphate?

A 14.0% **B** 28.0% **C** 42.1% **D** 56.2%

- 4 A weedkiller can be prepared by heating bleach solution, NaClO . One other side product of this reaction is sodium chloride.

In this reaction, the oxidation number of chlorine increases by 6 and the oxidation numbers of sodium and oxygen remain unchanged. Identify the formula of the weedkiller.

A NaClO **B** NaClO_2 **C** NaClO_3 **D** NaClO_4

- 5 Which of the following particles has more protons than neutrons and more electrons than protons?

[$\text{H} = {}^1\text{H}$; $\text{D} = {}^2\text{H}$; $\text{O} = {}^{16}\text{O}$; $\text{S} = {}^{32}\text{S}$]

A OH^- B S^{2-} C D_3O^+ D SD_2

- 6 Graphite can be used as a writing device while diamond cannot. Which of the following statements explains this?

A Graphite has mobile ions throughout its layers.
B Graphite has delocalised electrons throughout its layers.
C Graphite has weak van der Waals' attraction between layers.
D Graphite has a flat hexagonal arrangement of atoms in its layers.

- 7 Which of the following statements **cannot** be explained by the existence of hydrogen bonding?

A Ammonia acts as a base.
B HF has higher boiling point than HCl.
C Ethanoic acid dimerises in non-polar solvent.
D Ice has a lower density than water at 0 °C due to its open structure.

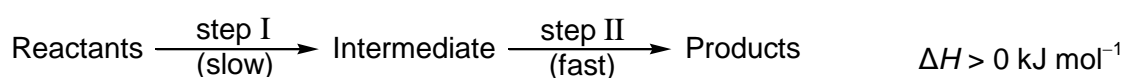
- 8 Which of the following compounds is planar?

A NH_4^+ B H_3O^+ C PCl_3 D C_2H_2

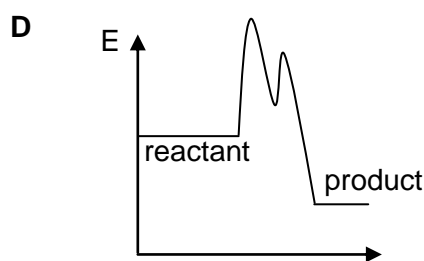
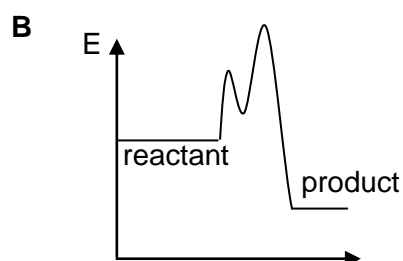
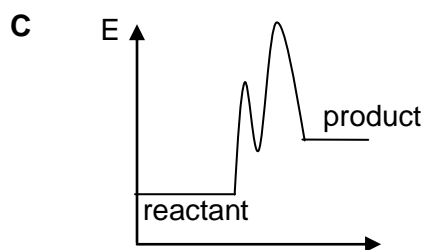
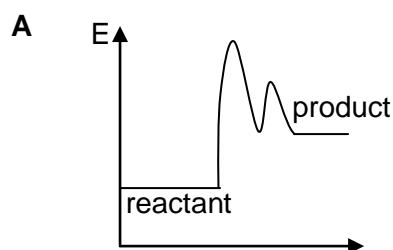
- 9 Which equation describes the standard enthalpy change of formation of propanone at 298 K?

- A $3\text{C (g)} + 6\text{H (g)} + \text{O (g)} \rightarrow \text{CH}_3\text{COCH}_3\text{(l)}$
 B $3\text{C (s)} + 3\text{H}_2\text{(g)} + \frac{1}{2}\text{O}_2\text{(g)} \rightarrow \text{CH}_3\text{COCH}_3\text{(l)}$
 C $\text{C}_3\text{(s)} + 3\text{H}_2\text{(g)} + \frac{1}{2}\text{O}_2\text{(g)} \rightarrow \text{CH}_3\text{COCH}_3\text{(l)}$
 D $3\text{C (s)} + 3\text{H}_2\text{(g)} + \text{O (g)} \rightarrow \text{CH}_3\text{COCH}_3\text{(l)}$

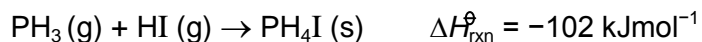
- 10 The following reaction proceeds by two stages:



Which of the following reaction pathway diagrams correctly represents the energy changes in the above reaction?



- 11 Phosphine reacts with hydrogen iodide to form phosphonium iodide by the following reaction:

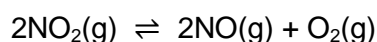


Given that ΔH_f^{\ominus} for $\text{PH}_3(\text{g}) = +5.4 \text{ kJ mol}^{-1}$ and ΔH_f^{\ominus} for $\text{HI}(\text{g}) = +26.5 \text{ kJ mol}^{-1}$, calculate the enthalpy change of formation of phosphonium iodide.

- A $-56.5 \text{ kJ mol}^{-1}$
B $-70.1 \text{ kJ mol}^{-1}$
C $-123.1 \text{ kJ mol}^{-1}$
D $-133.9 \text{ kJ mol}^{-1}$
- 12 The conjugate base of HSO_4^- is

- A SO_4^{2-}
B HSO_2^-
C H_2SO_4
D H_2SO_3

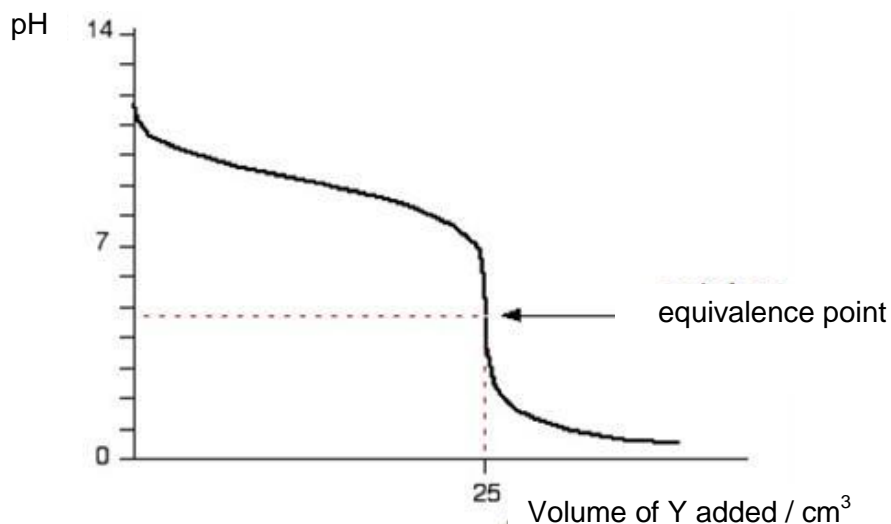
- 13 Nitrogen dioxide decomposes according to the following equation at 600 K:



Which statement correctly describes the establishment of this dynamic equilibrium?

- A At equilibrium, nitrogen dioxide is being formed at the same rate as it decomposes.
B Half of the original amount of nitrogen dioxide is present at equilibrium.
C The equilibrium constant increases at equilibrium.
D The amount of nitrogen dioxide present is constantly changing at equilibrium.

- 14 The diagram below shows the change of pH produced by gradually adding aqueous Y to a certain volume of aqueous X. The concentration of each constituent of the aqueous solutions X and Y is 0.1 mol dm^{-3} .



What could X and Y be?

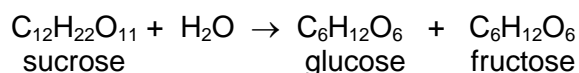
	X	Y
A	KOH	HCl
B	NH ₃	HCl
C	NH ₃	KOH
D	HCl	KOH

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

Neon, sodium and magnesium are 3 consecutive elements in the Periodic Table. In which order does their radii increase?

	smallest radius \longrightarrow largest radius		
A	Ne	Na ⁺	Mg ²⁺
B	Ne	Mg ²⁺	Na ⁺
C	Ne	Na	Mg
D	Ne	Mg	Na

- 16 Sucrose undergoes hydrolysis as shown in the following equation.



This reaction can be catalysed by either dilute acid or by the enzyme sucrase, which is found in yeast.

In the investigations of this reaction catalysed by acid, the following results were obtained.

Experiment	Initial concentration of reactants / mol dm ⁻³		Initial rate of formation of glucose / mol dm ⁻³ s ⁻¹
	[sucrose]	[H ⁺]	
1	0.10	0.10	0.024
2	0.15	0.10	0.036
3	0.10	0.20	0.048

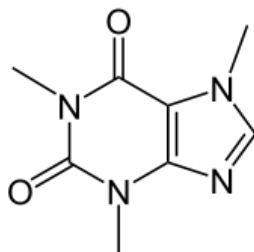
Which of the following statements is **not** correct?

- A** The reaction is first order with respect to sucrose.
- B** The numerical value of the rate constant is 2.4.
- C** The reaction is zero order with respect to acid.
- D** The overall order of the reaction is 2.
- 17 Which of the statements regarding elements in Period 3 (sodium to chlorine) and their compounds is **not** correct as atomic number increases?
- A** The oxides become increasingly acidic.
- B** The chlorides become increasingly covalent.
- C** The melting points of elements increase.
- D** The atomic radii of the elements decrease.

- 18 An element **J** does not react with cold water. However **J** reacts with chlorine gas to give an ionic chloride which reacts with water to form an acidic solution.

What is element **J**?

- A sodium
 - B magnesium
 - C aluminium
 - D phosphorus
- 19 Caffeine is found in coffee. It acts as a stimulant, temporarily warding off drowsiness and restoring alertness.



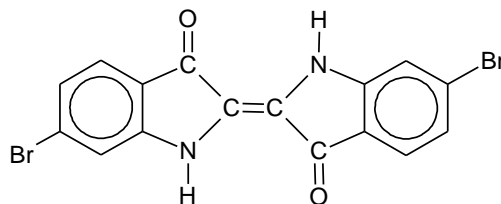
caffeine

Which statement about this compound is **not** correct?

- A It has molecular formula $C_8H_{10}N_4O_2$.
 - B It will decolourise cold, dilute $KMnO_4$.
 - C It has no reaction with 2,4-dinitrophenylhydrazine.
 - D It can exhibit geometrical isomerism around a double bond.
- 20 CH_3COOCH_3 and CH_3CH_2COOH have the same molecular formula. What isomerism do they exhibit?

- | | |
|--------------------|-------------|
| A chain | C position |
| B functional group | D geometric |

- 21 Tyrian purple was a highly prized dye in the days of the Roman Empire. It has the structure shown below.



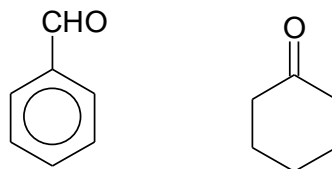
Tyrian purple

Under laboratory conditions, what type of reaction will tyrian purple **not** likely undergo?

- | | |
|--------------------|-----------------------|
| A reduction | C substitution |
| B oxidation | D elimination |
- 22 Halogenoalkane **K** reacts with ethanolic sodium hydroxide to produce an alkene that has geometric isomer.

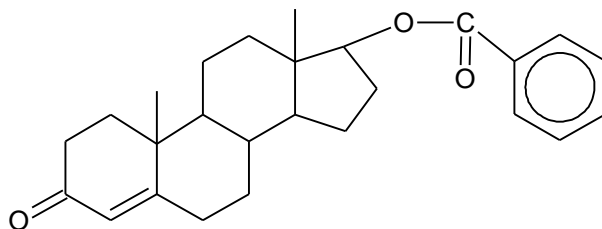
Which of the following compounds is **K**?

- | |
|-------------------------|
| A 1-bromobutane |
| B 1-bromopropane |
| C 2-bromobutane |
| D 2-bromopropane |
- 23 Which of the following reagents can be used to distinguish between the following two compounds?



- | |
|--|
| A 2,4-dinitrophenylhydrazine |
| B Fehling's solution |
| C Tollen's reagent |
| D LiAlH ₄ in dry ether |

- 24 What is the number of sp^2 hybridised carbon in Nendrolone?



Nendrolone

- A 7 B 8 C 9 D 10
- 25 The volatile liquid, Fluothane, $CF_3CHBrCl$, is a widely used anaesthetic. Which statement about Fluothane is **not** correct?
- A It has a simple molecular structure.
- B It may cause depletion of ozone layer.
- C It may undergo substitution with chlorine.
- D It can form hydrogen bonds between its molecules.

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 pick 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 Which of the following pairs of substances have the same type of structure and bonding?

- 1** SiC and diamond
- 2** SiO₂ and CO₂
- 3** SiCl₄ and SiO₂

27 Lipase is an enzyme for hydrolysing fats and lipids.

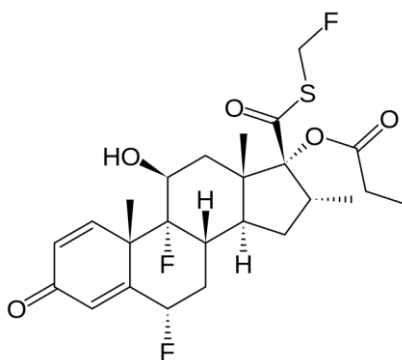
Which of the following are characteristic of lipase?

- 1** It can only be used for hydrolysing fats and lipids.
- 2** Only a small amount of lipase is needed for the reaction.
- 3** It operates most effectively at temperature above 50 °C.

- 28** A $0.100 \text{ mol dm}^{-3}$ propanoic acid ($K_a = 1.34 \times 10^{-5} \text{ mol dm}^{-3}$) is titrated against a $0.100 \text{ mol dm}^{-3}$ NaOH solution at 25°C . Which indicator is suitable for this titration?

	Indicator	pH range and colour change	
1	Bromothymol blue	6.0 yellow	7.6 blue
2	Phenolphthalein	8.3 colourless	10.0 red
3	Cresolphthalein	8.2 colourless	9.8 purple

- 29** Fluticasone propionate is used to treat asthma.



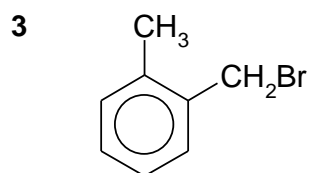
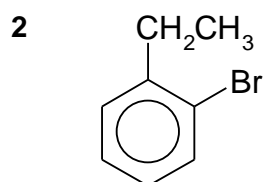
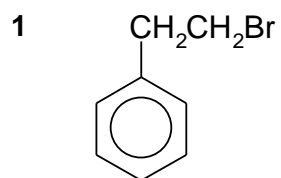
Fluticasone propionate

Which reagents will react with this compound?

- 1** Tollen's reagent
- 2** HCOOH in the presence of H^+ ions
- 3** PCl_5

- 30 One mole of **Q**, $\text{C}_8\text{H}_9\text{Br}$ reacts with hot acidified KMnO_4 to produce one mole of carbon dioxide gas.

Given that **Q** is aromatic, what could **Q** be?



END OF PAPER

2014 H1 Preliminary Examination Solution

Paper 1 MCQ

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10
A	A	C	D	A	C	A	D	B	A
Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18	Q19	Q20
B	A	A	B	D	C	C	B	D	B
Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29	Q30
D	C	C	D	D	D	B	C	C	B