

INNOVA JUNIOR COLLEGE
JC2 PRELIMINARY EXAMINATION
in preparation for General Certificate of Education Advanced Level
Higher 1

CANDIDATE
NAME

CLASS

INDEX NUMBER

CHEMISTRY

8872/01

Paper 1 Multiple Choice Questions

15 September 2017

50 minutes

Additional Materials: *Data Booklet*
Multiple Choice Answer Sheet

READ THESE INSTRUCTIONS FIRST

Write your name and class on all the work you hand in.
Write in soft pencil.
Do not use staples, paper clips, highlighters, 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.

This document consists of **11** printed pages and **1** blank page.



1 How many neutrons are present in 0.13 g of ^{13}C ?
[L = the Avogadro constant]

- | | | | |
|----------|-------|----------|-------|
| A | 0.06L | C | 0.13L |
| B | 0.07L | D | 0.91L |

- 2** Which factor helps to explain why the first ionisation energies of the Group 1 elements decrease from lithium to rubidium?
- A** The nuclear charge of the elements increases.
- B** The outer electron is in an 's' subshell.
- C** The repulsion between spin-paired electrons increases.
- D** The distance between the nucleus and the valence electron increases.

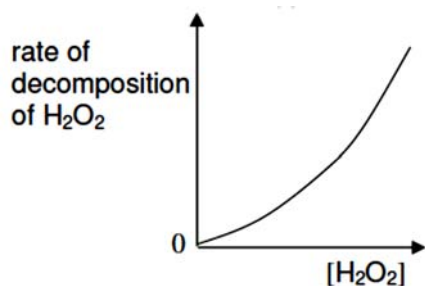
-
- A graph showing the first ionisation energy (Y-axis) versus the proton number (X-axis). The curve shows a general upward trend with a sharp drop at point X, which corresponds to the element with atomic number 19 (Potassium).

A	Mg	C	Si
B	Al	D	P

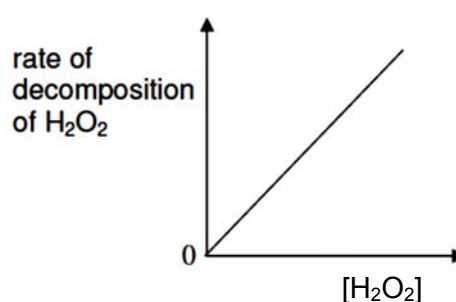
- 4 Which orbital must an electron with the principal quantum $n = 2$ occupy?
- A a spherically-shaped orbital
- B either an s or p orbital
- C the orbital closest to the nucleus
- D a dumb-bell shaped orbital

- 5 Which of the following statements describes a phenomenon which **cannot** be explained by hydrogen bonding?
- A Ice floats on water.
 - B The boiling point of carboxylic acids increase with increasing relative molecular mass.
 - C 2-nitrophenol is more volatile than 4-nitrophenol.
 - D Ethanoic acid molecules forms dimers when dissolved in benzene.
- 6 Ammonia, NH_3 reacts with boron trifluoride, BF_3 to give an addition product. Which of the following statements about the addition product is **not** true?
- A The boron atom is electron deficient.
 - B It contains a dative covalent bond.
 - C It is polar.
 - D There are seven sigma bonds.
- 7 Which graph would confirm that the rate of decomposition of hydrogen peroxide is first order with respect to the concentration of hydrogen peroxide?

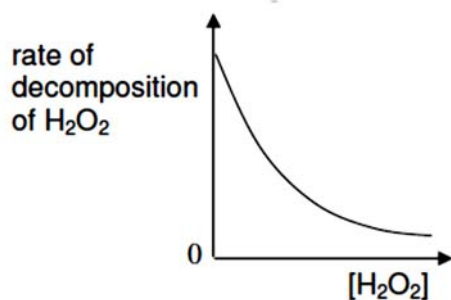
A



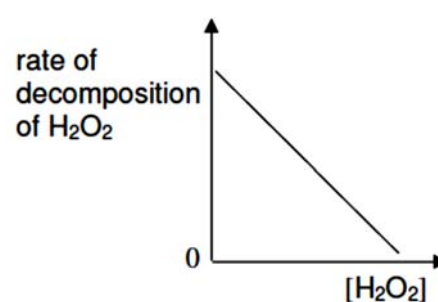
B



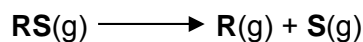
C



D



- 8 The reaction of a compound **RS** is shown below.



The rate equation for the reaction is $\text{rate} = k[\text{RS}]$ and the rate constant is found to be $3.6 \times 10^{-3} \text{ s}^{-1}$. If the initial concentration of **RS** is $2.0 \times 10^{-2} \text{ mol dm}^{-3}$, what will be the concentration of **RS** after 385 seconds?

- A $1.0 \times 10^{-2} \text{ mol dm}^{-3}$
B $5.0 \times 10^{-3} \text{ mol dm}^{-3}$
C $2.5 \times 10^{-3} \text{ mol dm}^{-3}$
D $2.0 \times 10^{-3} \text{ mol dm}^{-3}$
- 9 Which one of the following is a correct statement about the effect of a catalyst on a reaction at equilibrium?
- A It provides an alternative route with a lower E_a for the reaction to take place.
B It increases the equilibrium constant for the forward reaction.
C It increases the yield of product in equilibrium.
D It increases the rate of the forward reaction only.
- 10 Which of the following statements does **not** describe a reaction at equilibrium?
- A Forward and backward reactions occur at equal rate.
B The reaction takes place in a closed system.
C K_c increases as the reaction progresses.
D Concentrations of reactants and products are constant.
- 11 Which of the following enthalpy changes is positive?
- A $\text{H}_2\text{O(l)} \longrightarrow \text{H}_2\text{O(s)}$
B $2\text{C}_2\text{H}_6\text{(g)} + 7\text{O}_2\text{(g)} \longrightarrow 4\text{CO}_2\text{(g)} + 6\text{H}_2\text{O(l)}$
C $2\text{Br(g)} \longrightarrow \text{Br}_2\text{(g)}$
D $\text{Na(g)} \longrightarrow \text{Na}^+\text{(g)} + \text{e}^-$

- 12** The energy cycle below shows the reaction pathways between Compounds **J** – **M**.

- | | | | |
|----------|---|----------|---|
| A | 3 | C | 5 |
| B | 4 | D | 6 |

- | | | | |
|----------|---|----------|----|
| A | 4 | C | 6 |
| B | 5 | D | 14 |

-
- chem>O=C1CC[C@H]2[C@@H]3CC[C@H]4[C@H]3CC(=O)CC[C@]4(C)[C@H]2[C@@H]1CC(=O)C
- cortisone

Given that no carbon-carbon σ bond is broken in this process, how many C=O double bonds will there be in the structure of the final product?

- | | | | |
|----------|---|----------|---|
| A | 3 | C | 5 |
| B | 4 | D | 6 |

- $$\text{H}_2\text{C}=\text{CHCH}=\text{O} \xrightarrow[\text{then H}_2\text{O}]{\text{NaBH}_4 \text{ in CH}_3\text{OH}} \text{P} \xrightarrow[\text{heat}]{\text{K}_2\text{Cr}_2\text{O}_7/\text{H}^+} \text{Q}$$

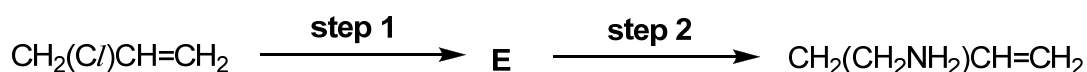
- A** CH_2CHCOOH
B $\text{CH}_3\text{CH}_2\text{COOH}$
C $\text{HOCH}_2\text{CH}(\text{OH})\text{CH}_2\text{OH}$
D $\text{HO}_2\text{CCOCO}_2\text{H}$

- 20** The table shows the results of simple chemical tests on a compound **U**.

Reagents	Observations
2,4-dinitrophenylhydrazine	Orange ppt
Fehling's reagent	Brick red ppt
Alkaline aqueous iodine	Yellow ppt

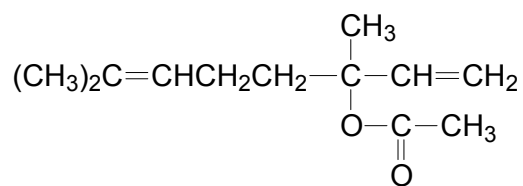
What could compound **U** be?

- A** CH_3CHO **C** $\text{CH}_3\text{CH}(\text{OH})\text{CH}_3$
B $\text{CH}_3\text{CH}_2\text{CHO}$ **D** CH_3COCH_3
- 21** Which of the following options shows the correct reagents and conditions for step 1 and 2?



- | | Step 1 | Step 2 |
|---|----------------------------------|---------------------|
| A | KCN in ethanol, heat | H ₂ , Pt |
| B | KCN in ethanol, heat | LiAlH ₄ |
| C | HCN, trace NaOH(aq), cold | LiAlH ₄ |
| D | NH ₃ in ethanol, heat | H ₂ , Pt |
- 22** Which alcohol is used to manufacture the ester, CH₃CH₂CH(OH)CO₂CH(CH₃)₂?
- | | | | |
|---|---------------------------------------|---|--|
| A | CH ₃ CO ₂ H | C | CH ₃ CH ₂ CH ₂ OH |
| B | CH ₃ CH(OH)CH ₃ | D | CH ₃ OH |

- 23** Linalyl acetate is a naturally-occurring compound and it is a principal component of the essential oils of lavender.



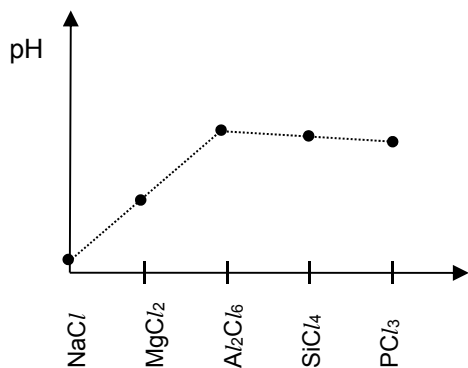
Linalyl acetate

Which of the following statements about linalyl acetate is not true?

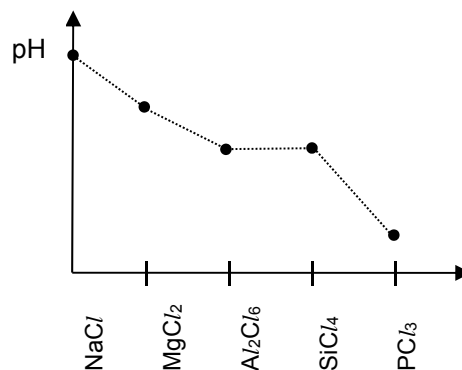
- A** It exhibits cis-trans isomerism.
 - B** It does not react with 2,4-dinitrophenylhydrazine.
 - C** It decolourises bromine water.
 - D** It reacts with hot acidified potassium dichromate(VI) to give CH_3COOH as one of the products.
- 24** Which of the following forms an oxide that is soluble in both water and aqueous sodium hydroxide?
- A** magnesium
 - B** silicon
 - C** aluminium
 - D** phosphorus

- 25 The chlorides of the elements sodium to phosphorus are separately added to water. Which of the following diagrams best represents the pH of the solutions produced?

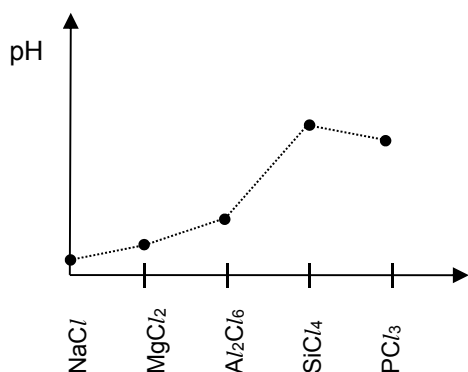
A



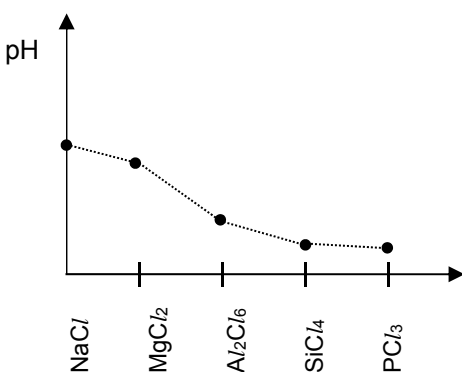
B



C



D



Section B

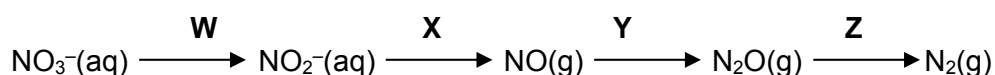
For each of the questions in this section, one or more of the three numbered statements 1 to 3 may be correct.

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

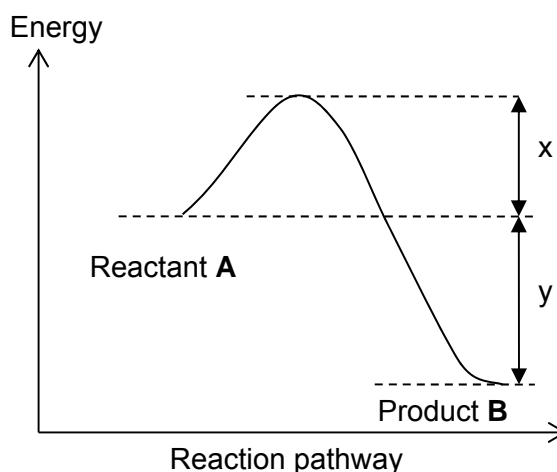
A	B	C	D
1, 2 and 3 are correct	1 and 2 are correct	2 and 3 are correct	1 only is correct

- 26** In flooded soils, like those used for rice cultivation, the oxygen content is low. In such soils, anaerobic bacteria cause the loss of nitrogen from the soil as shown in the following sequence.



Which of the following steps involve a reduction in the oxidation number of nitrogen by 1?

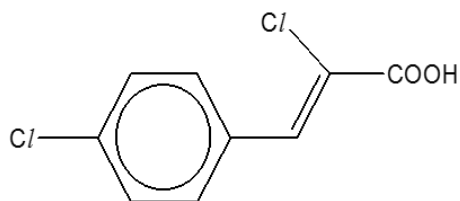
- 1 X, Y and Z
 - 2 W and Y
 - 3 W and X
- 27** The energy profile for a reversible reaction is shown below.



Which of the following statements are correct?

- 1 The reaction from **B** to **A** is endothermic.
- 2 The activation energy of the reaction **A** to **B** is x .
- 3 The activation energy of the reaction **B** to **A** is $x + y$.

- 28** Compound **A** is used as a starting material for a class of anti-bacterial drugs known as quinolones. Which of the following statements about compound **A** are correct?



compound **A**

- 1 1 mole of **A** reacts with CH_3OH to give 1 mole of H_2O .
 - 2 1 mole of **A** reacts with Na metal to give 0.5 mole of H_2 .
 - 3 1 mole of **A** reacts with CaCO_3 to give 1 mole of CO_2 .
- 29** For which types of compound are **all** of the following statements correct?
- They are unreactive towards mild oxidising agents.
 - They form esters.
 - They react with sodium.
- 1 aldehydes
 - 2 carboxylic acids
 - 3 tertiary alcohols
- 30** Which of the following trends concerning Period 3 elements from Na to Cl are true?
- 1 There is a change from metallic behaviour to non-metallic behaviour.
 - 2 Their compounds show an increase in the maximum oxidation number across the period.
 - 3 The melting points of the elements decrease across the period.

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