

INNOVA JUNIOR COLLEGE

JC 2 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

30 August 2016

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 **13** printed pages and **1** blank page.



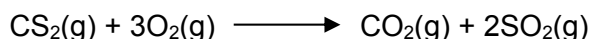
Section A

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

1 The relative atomic mass of an element is defined as

- A** $\frac{\text{average mass of one atom of carbon-12}}{\text{mass of one atom of carbon-12}}$
- B** $\frac{\text{average mass of one atom of the element}}{\text{mass of one atom of carbon-12}}$
- C** $\frac{\frac{1}{12} \times \text{average mass of one atom of carbon-12}}{\text{average mass of one atom of the element}}$
- D** $\frac{\text{average mass of one atom of the element}}{\frac{1}{12} \times \text{average mass of one atom of carbon-12}}$

2 On combustion, CS₂ is oxidised as follows.



A 20 cm³ sample of carbon disulfide vapour is ignited with 100 cm³ of oxygen. The final volume of gas after burning is treated with an excess of aqueous alkali. [All volumes were measured at the same temperature and pressure, conditions under which CS₂ is a gas.]

What percentage of this final volume dissolves in the alkali?

- A** 20% **B** 40% **C** 60% **D** 80%

3 An oxidising agent, XO₄[−], in the presence of excess alkali oxidised sulfur dioxide gas to sulfate(VI) ions, SO₄^{2−} at room temperature and pressure. XO₄[−] is reduced to X²⁺ in the process.

What changes in oxidation state occur for S and X in this reaction?

	change in oxidation state	
	S	X
A	+2	− 5
B	+4	− 7
C	+2	− 7
D	+6	− 2

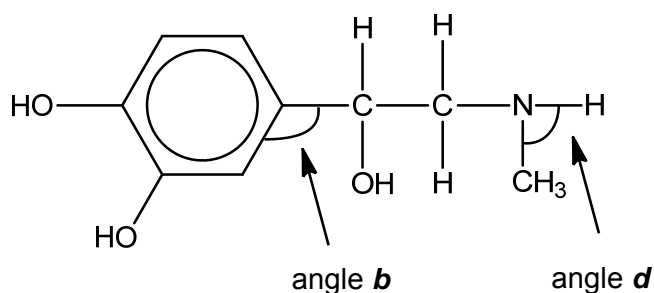
- D** D_3O^+

- D** $1s^2 2s^2 2p^6 3s^2 3p^1$

- D** NCl_3

	Compound I	Compound II
A	KCl	NaCl
B	AlF ₃	AlCl ₃
C	NH ₃	H ₂ O
D	SiCl ₄	SiO ₂

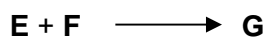
- 8 Adrenaline is a hormone which, when secreted directly into the blood stream, acts as a stimulant. It has the following structure:



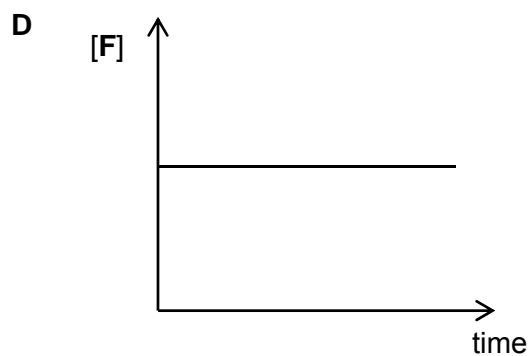
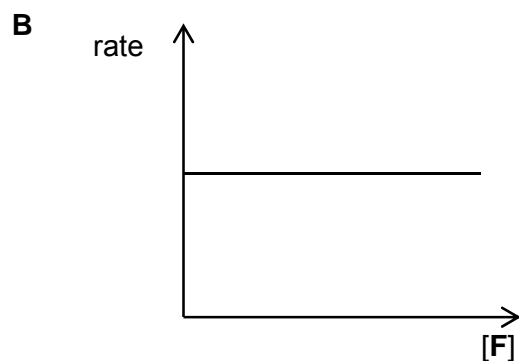
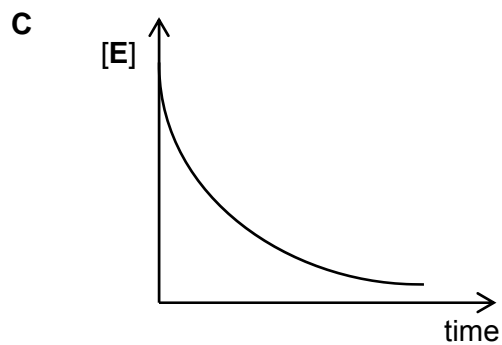
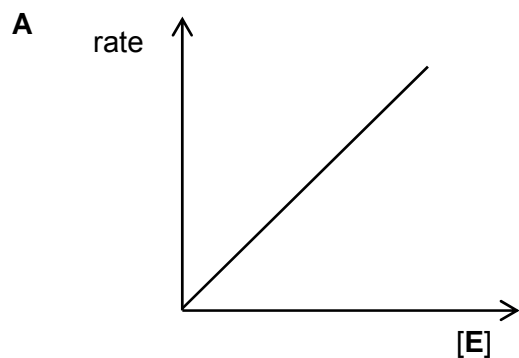
What are the values of angle *b* and angle *d* in a molecule of adrenaline?

	angle <i>b</i>	angle <i>d</i>
A	120	107
B	120	90
C	109	107
D	109	90

- 9 The following reaction is first order with respect to **E** and zero order with respect to **F**.



Which of the following graph obtained is **incorrect**?



- 10** Lead is the final product formed by a series of changes in which the slowest step is the radioactive decay of uranium-238. This radioactive decay is a **first order** reaction with half-life of 4.50×10^9 year.

What would be the age of a rock sample, originally lead-free, in which the molar proportion of uranium to lead is now 1:15?

- A** 2.25×10^9 years
B 9.00×10^9 years
C 1.35×10^{10} years
D 1.80×10^{10} years
- 11** When 0.1 mol of bismuth chloride is added to 1 dm³ of water, it reacts to form 0.02 mol of white precipitate of bismuth oxychloride and a solution of hydrochloric acid.

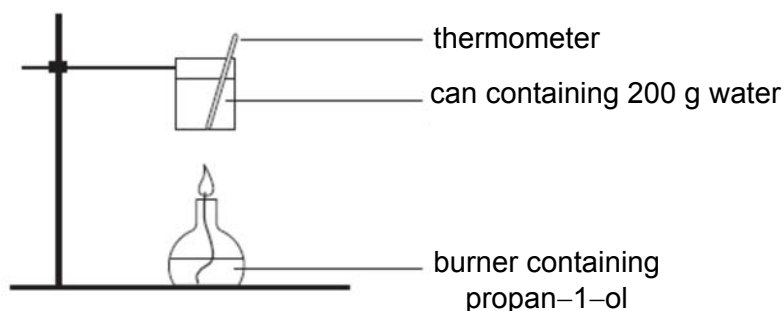
The equation for the reaction is as follows.



What is the correct expression for the equilibrium constant K_c ?

- A** $\frac{(2 \times 0.02)^2}{0.08}$
B $\frac{(0.02)(2 \times 0.02)^2}{0.08}$
C $\frac{0.08}{(2 \times 0.02)^2}$
D $\frac{0.08}{(0.02)(2 \times 0.02)^2}$

- 12 A student used the apparatus below to determine the standard enthalpy change of combustion of propan-1-ol, $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ ($M_r = 60.0$).



The following results were obtained:

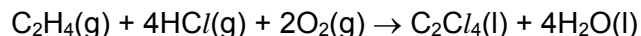
Mass of propan-1-ol burnt = 0.60 g
 Mass of water heated = 200 g
 Initial temperature of water = 21.0 °C

The specific heat capacity of water is $4.18 \text{ J g}^{-1} \text{ K}^{-1}$.

The standard enthalpy change of combustion of propan-1-ol is $-2021 \text{ kJ mol}^{-1}$.

Assuming no heat loss, what would be the maximum temperature of the water?

- A 24.2 °C B 29.1 °C C 45.2 °C D 48.4 °C
- 13 Tetrachloroethene is commonly used as degreasing solvent. The enthalpy change for the following reaction is $-878.5 \text{ kJ mol}^{-1}$.



$$\begin{aligned}\Delta H_f[\text{C}_2\text{H}_4(\text{g})] &= +52.3 \text{ kJ mol}^{-1} \\ \Delta H_f[\text{HCl}(\text{g})] &= -92.3 \text{ kJ mol}^{-1} \\ \Delta H_f[\text{H}_2\text{O}(\text{l})] &= -285.8 \text{ kJ mol}^{-1}\end{aligned}$$

Which of the following is the enthalpy change of formation of tetrachloroethene given the information above?

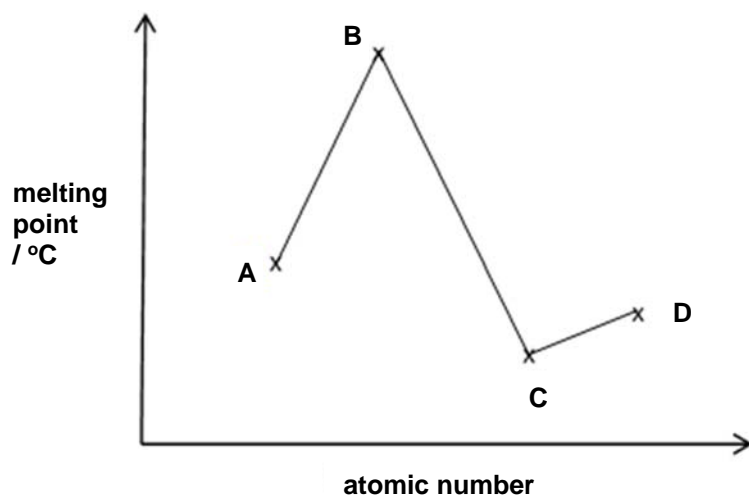
- A $-52.2 \text{ kJ mol}^{-1}$
 B $-63.3 \text{ kJ mol}^{-1}$
 C $-325.8 \text{ kJ mol}^{-1}$
 D $-632.7 \text{ kJ mol}^{-1}$

- 14 Water dissociates as follows: $\text{H}_2\text{O}(\text{l}) \rightleftharpoons \text{H}^+(\text{aq}) + \text{OH}^-(\text{aq})$. At a certain temperature above 298 K, the K_w of water is $1.0 \times 10^{-13} \text{ mol}^2 \text{ dm}^{-6}$.

Which of the following deduction can be made from these information?

- A The total concentration of ions in the equilibrium mixture is $6.32 \times 10^{-7} \text{ mol dm}^{-3}$.
 - B The water is acidic at this temperature.
 - C The K_w of water is defined as $[\text{H}^+][\text{OH}^-] / [\text{H}_2\text{O}]$.
 - D The dissociation of water is exothermic.
- 15 The graph shows the melting points of four consecutive elements in Period 3, Na to Ar, of the Periodic Table.

Which element is a good conductor of electricity?



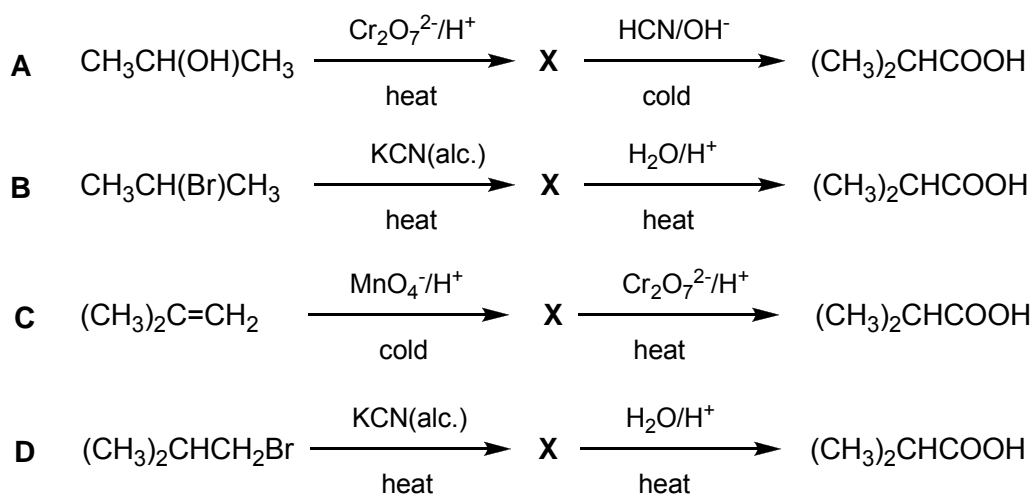
- 16 What is formed when solid sodium chloride is added to water?
- A sodium chloride molecules in solution
 - B sodium hydroxide solution and hydrochloric acid solution
 - C sodium hydroxide solution and hydrogen chloride gas
 - D sodium ions in solution and chloride ions in solution

- 17 Compound **T**, $\text{CH}_2=\text{CHCH}_2\text{COCH}_2\text{COOH}$, was treated with 2 reducing agents in separate experiments.

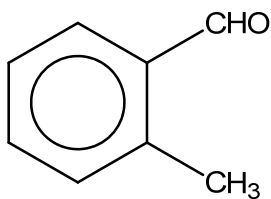
Which row correctly shows the correct product formed when compound **T** is treated with the given reducing agent?

	reducing agent	product
A	$\text{H}_2 + \text{Ni}$	$\text{CH}_3\text{CH}_2\text{CH}_2\text{COCH}_2\text{CH}_2\text{OH}$
B	$\text{H}_2 + \text{Ni}$	$\text{CH}_2=\text{CHCH}_2\text{CH}(\text{OH})\text{CH}_2\text{COOH}$
C	NaBH_4	$\text{CH}_2=\text{CHCH}_2\text{CH}(\text{OH})\text{CH}_2\text{COOH}$
D	NaBH_4	$\text{CH}_3\text{CH}_2\text{CH}_2\text{COCH}_2\text{COOH}$

- 18 Which of the syntheses will produce 2-methylpropanoic acid, $(\text{CH}_3)_2\text{CHCOOH}$?



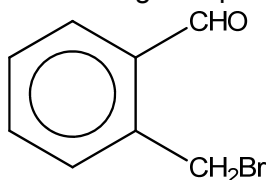
- 19 Compound **Q** has the following structure.



Compound **Q**

Which statement about compound **Q** is correct?

- A Compound **Q** produces effervescence with sodium metal.
- B Compound **Q** can be distinguished from ethanal by using Tollens' reagent.
- C On heating compound **Q** under reflux with an acidified solution of manganate(VII) ions, the empirical formula of the product formed is $C_4H_3O_2$.
- D On heating compound **Q** with Br_2 in the presence of a suitable catalyst in the dark,



is obtained as the main product.

- 20 In which class of compound, in its general formula, is the ratio of hydrogen atoms to carbon atoms the highest?

- A alcohols
- B aldehydes
- C carboxylic acids
- D halogenoalkanes

- 21 Consider the following four compounds.

- 1 CH_2FCH_2COOH
- 2 CH_3CHFCH_2COOH
- 3 CH_3CH_2COOH
- 4 CH_3CHFCH_2OH

What is the order of decreasing acidity of these compounds?

- A $1 \rightarrow 2 \rightarrow 3 \rightarrow 4$
- B $2 \rightarrow 1 \rightarrow 3 \rightarrow 4$
- C $4 \rightarrow 3 \rightarrow 1 \rightarrow 2$
- D $3 \rightarrow 4 \rightarrow 1 \rightarrow 2$

- 22 The table shows the result of separate tests done on compound J.

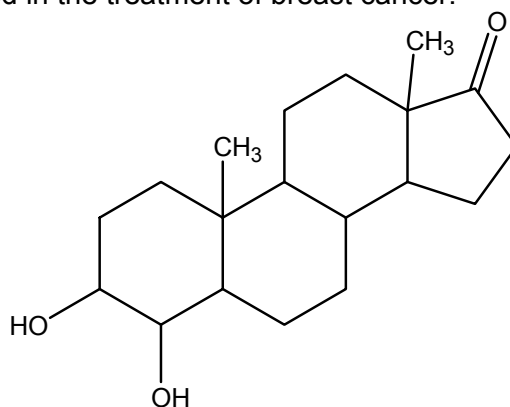
reagent	result
2,4-DNPH	positive
aq. I ₂ in NaOH	positive
Tollens' reagent	negative

From the results of the above tests, what could compound J be?

- A $\text{CH}_3\text{CH}(\text{OH})\text{COOH}$
 B $\text{CH}_3\text{COCH}_2\text{CHO}$
 C $\text{CH}_3\text{COOCH}_2\text{CH}_3$
 D $\text{CH}_3\text{COCH}(\text{OH})\text{CH}_3$
- 23 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
- 24 The steroid shown is an intermediate compound obtained during the synthesis of *Formestane* which is used in the treatment of breast cancer.



Which statement about this compound is correct?

- A It will react with Fehling's solution.
 B It will decolourise cold, dilute MnO_4^- ions.
 C It will react with concentrated sulfuric acid and aqueous bromide.
 D It will decolourise aqueous bromine.

- 25** An ester **L** was refluxed with aqueous sodium hydroxide and the resulting mixture then distilled.

The distillate gave a positive tri-iodomethane test. The residue in the distillation flask, after acidification, gave a white precipitate.

What could be **L**?

- A** $\text{CH}_3\text{CO}_2\text{C}_6\text{H}_5$
- B** $\text{CH}_3\text{OCOC}_6\text{H}_5$
- C** $\text{CH}_3\text{CH}_2\text{CO}_2\text{C}_6\text{H}_5$
- D** $\text{CH}_3\text{CH}_2\text{OCOC}_6\text{H}_5$

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 Which property of ammonia can be explained in terms of hydrogen bonding?

- 1** It is very soluble in water.
- 2** Liquid ammonia contains ion NH_4^+ and NH_2^- .
- 3** It is a proton acceptor.

27 The working range and colour change of Bromocresol green is given below.

indicator	working pH range	colour change	
		acid	alkali
bromocresol green	3.8 – 5.4	yellow	blue

Two drops of this indicator are added to each of the three aqueous solutions listed below.

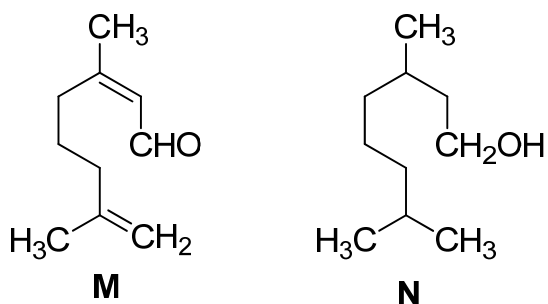
Which solution has its colour correctly stated?

	solution	colour
1	aluminium oxide added to water	blue
2	dilute HCl of concentration $3.0 \times 10^{-5} \text{ mol dm}^{-3}$	green
3	aqueous solution of MgCl_2	yellow

28 Which of the following statements about Period 3 elements, Na to Cl, are correct?

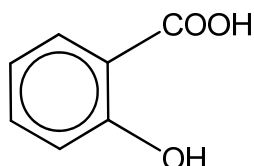
- 1** The atomic radius of the elements decreases across the period.
- 2** The oxidation number the elements show in their oxides increase across the period.
- 3** The pH of the solution when the chlorides of the elements is dissolved in water increases across the period.

- 29 The two compounds **M** and **N** shown below are important flavours in citrus fruits. These compounds are commonly used in the food and perfume industries.



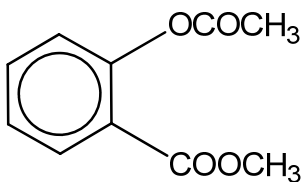
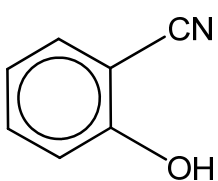
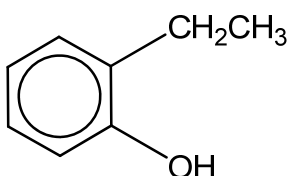
Which statements concerning **M** and **N** are correct?

- 1 **N** can be distinguished from **M** by using sodium metal.
 - 2 Reaction of **M** with hot acidified KMnO_4 gives two organic products.
 - 3 **M** can be converted to **N** using lithium aluminium hydride in dry ether.
- 30 Salicylic acid is an important compound in the medical and cosmetic industries.



Salicylic acid

Which compounds would give salicylic acid on acid hydrolysis?

- 1 
- 2 
- 3 

END OF PAPER

