

Class                      Reg Number

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Candidate's Name: \_\_\_\_\_



MERIDIAN JUNIOR COLLEGE  
**JC 2 Preliminary Examination**  
Higher 1

**Chemistry**

**8872/01**

**23 September 2015**

**Paper 1 Multiple Choice**

**50 minutes**

Additional Materials: OMR Sheet and *Data Booklet*

**READ THESE INSTRUCTIONS FIRST**

This booklet contains Section **A** of your paper.

Write your name, class and register number in the spaces provided at the top of this page.

There are **thirty** questions in this section. Answer **all** questions. For each question, there are four possible answers labelled **A, B, C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the OMR answer sheet.

**Read very carefully the instructions on the use of OMR answer sheet.**

You are advised to fill in the OMR Answer Sheet as you go along; no additional time will be given for the transfer of answers once the examination has ended.

**Use of OMR Answer Sheet**

Ensure you have written your name, class register number and class on the OMR Answer Sheet.

Use a **2B** pencil to shade your answers on the **OMR sheet**; erase any mistakes cleanly. Multiple shaded answers to a question will not be accepted.

For shading of class register number on the **OMR sheet**, please follow the given examples:

If your register number is **1**, then shade **01** in the index number column.

If your register number is **21**, then shade **21** in the index number column.

## Section A

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

- 1 Iron poisoning in pregnant woman is usually caused by excessive intake of iron supplement pills. The amount of iron which will cause poisoning depends on the weight of the pregnant woman. It was found that as little as 325 mg of  $\text{Fe}^{2+}$  can be fatal to a 70 kg pregnant woman.

How many 325 mg  $\text{FeSO}_4$  pills would it take to cause a fatal effect on a 50 kg pregnant woman?

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

- 2 One mole of sulfur dichloride dioxide,  $\text{SO}_2\text{Cl}_2$ , reacts with water to give a mixture of sulfuric acid and hydrochloric acid.

How many moles of barium hydroxide,  $\text{Ba}(\text{OH})_2$ , would be needed to exactly neutralise the resulting solution formed?

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

- 3 Which one of the following statements is **not** true with regards to the reaction below?



- A The oxidation number of Cu in  $\text{Cu}_2\text{O}$  is +1.  
 B This is a disproportionation reaction.  
**C  $\text{H}_2\text{SO}_4$  is an oxidising agent.**  
 D  $\text{Cu}_2\text{O}$  is a reducing agent.

- 4 The successive ionisation energies (IE) of two elements **X** and **Y**, are given below:

IE / $\text{kJ mol}^{-1}$	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>
<b>X</b>	786	1580	3230	4360	16000	20000	23600	29100
<b>Y</b>	1300	3380	5310	7460	8670	9330	22060	27070

What compound is most likely to be formed when **X** and **Y** are combined?

- A ionic, with formula  $\text{X}_2\text{Y}$   
 B ionic, with formula  $\text{XY}_2$   
**C covalent, with formula  $\text{XY}_2$**   
 D covalent, with formula  $\text{X}_2\text{Y}$

5 Which of the following electrostatic attraction is present in a sample of  $\text{CH}_3\text{F}$ ?

**A** van der Waals' forces

B ionic bonds

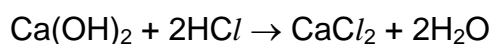
C hydrogen bonds

D dative bonds

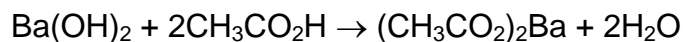
6 In which pair of molecules is the permanent dipole in molecule **I** greater than that in molecule **II**?

	<b>I</b>	<b>II</b>
A	$\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl}$	$\text{CH}_3\text{CH}_2\text{CHCl}_2$
<b>B</b>	$\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	$\text{CH}_3\text{CH}_2\text{CH}_2\text{SH}$
C	$\text{BCl}_3$	$\text{NH}_3$
D	$\text{H}_2\text{S}$	$\text{H}_2\text{O}$

7 The heat liberated from the reaction between a strong base  $\text{Ca}(\text{OH})_2$  and a strong acid  $\text{HCl}$  is  $-114 \text{ kJ mol}^{-1}$ .



What is the most likely value for the heat liberated when a strong base  $\text{Ba}(\text{OH})_2$  reacts with a weak acid  $\text{CH}_3\text{CO}_2\text{H}$  in the following reaction?



A  $-53 \text{ kJ mol}^{-1}$

B  $-57 \text{ kJ mol}^{-1}$

**C**  $-106 \text{ kJ mol}^{-1}$

D  $-114 \text{ kJ mol}^{-1}$

8 The standard enthalpy change of formation of  $\text{H}_2\text{O}(l)$  is  $-394 \text{ kJ mol}^{-1}$  and the standard enthalpy change of formation of  $\text{CO}_2(g)$  is  $-289 \text{ kJ mol}^{-1}$ .

If the standard enthalpy change of combustion of propanone is  $-1780 \text{ kJ mol}^{-1}$ , what is the standard enthalpy change of formation of propanone in  $\text{kJ mol}^{-1}$ ?

A  $-1675$

B  $-1465$

**C**  $-269$

D  $+269$

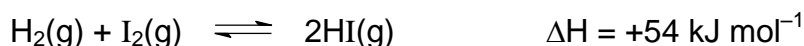
- 9 Consider the following equilibrium reaction in a closed vessel:



At 800 °C, the value of the equilibrium constant is 0.236.

Which one of the following statements is **not** true about the equilibrium?

- A The position of the equilibrium shifts to the left when temperature is decreased.
  - B The position of the equilibrium shifts to the right when pressure is decreased.
  - C The value of the equilibrium constant increases with increasing temperature.
  - D The value of the equilibrium constant decreases when less CaCO<sub>3</sub> is used.**
- 10 Two experiments were performed involving the following equilibrium.



In experiment I carried out at temperature  $T_1$  K, the equilibrium constant,  $K_c = 64$ .

In experiment II carried out at temperature  $T_2$  K, equal volume of  $\text{H}_2$  and  $\text{I}_2$  were initially added into a 1 dm<sup>3</sup> flask. The flask was found to contain 0.2 mol of  $\text{I}_2$  and 1.6 mol of HI at equilibrium.

What is the relationship between  $T_1$  and  $T_2$ ?

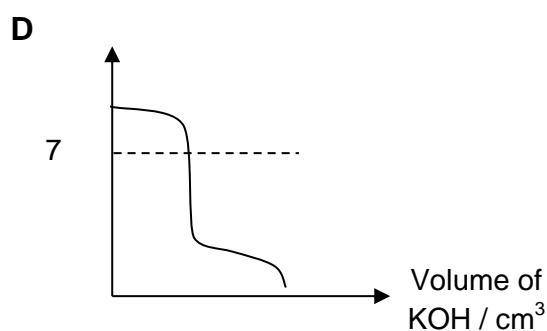
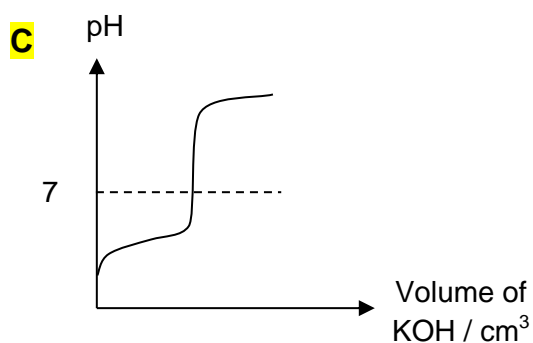
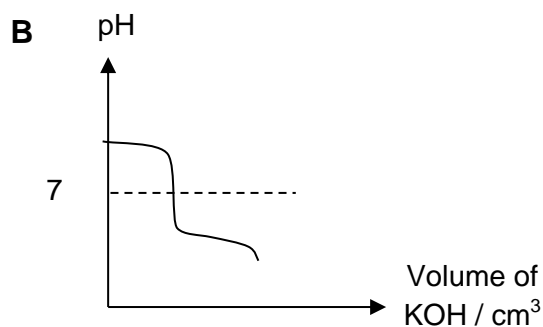
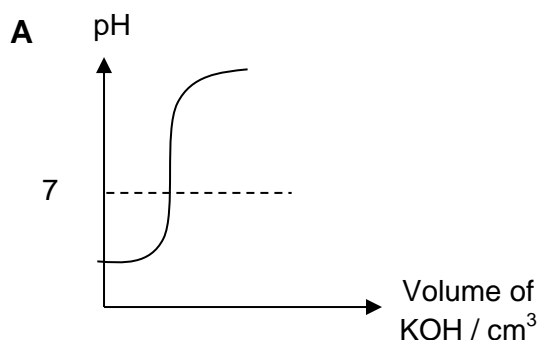
- A  $T_1 = T_2$**
  - B  $T_1 > T_2$
  - C  $T_1 < T_2$
  - D The relationship cannot be determined.
- 11 The base dissociation constant,  $K_b$ , of ethylamine,  $\text{CH}_3\text{CH}_2\text{NH}_2$ , is higher than that of ammonia,  $\text{NH}_3$ .

Which of the following statement is true?

- A The dissociation of ammonia in water is more than that of ethylamine.
- B The conjugate acid of ethylamine is weaker than that of ammonia.**
- C The concentration of  $\text{OH}^-$  is greater in a solution of ammonia.
- D The  $\text{p}K_b$  of ethylamine is higher than that of ammonia.

12 Ethanoic acid is a weak acid that has many uses.

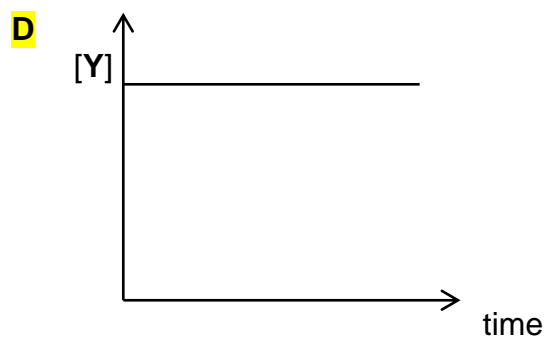
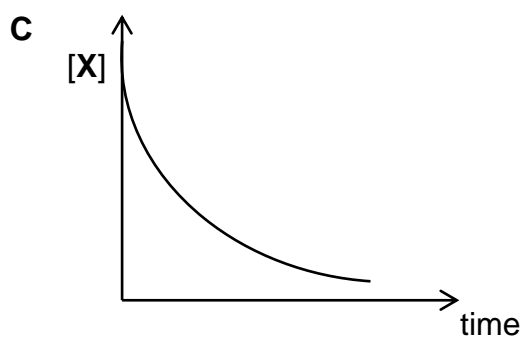
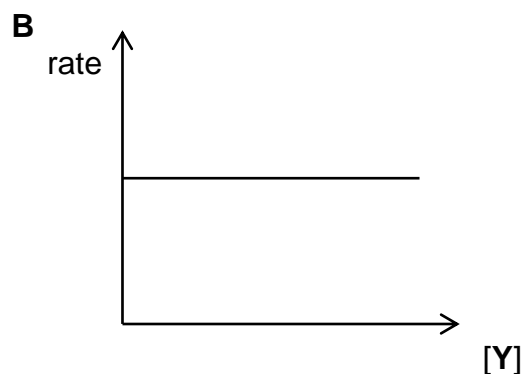
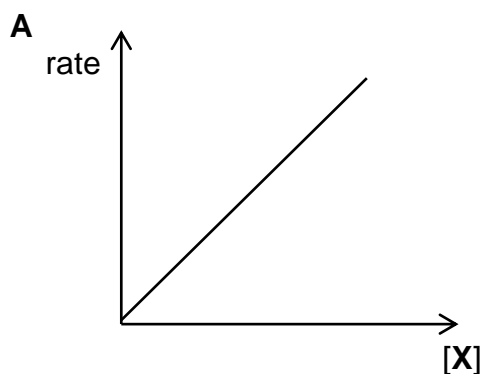
Which graph best represents the change in pH that occurs when a sample of ethanoic acid is titrated with  $\text{KOH(aq)}$ ?



13 The following reaction is first order with respect to **X** and zero order with respect to **Y**.



Which of the following graph obtained is **not** correct?



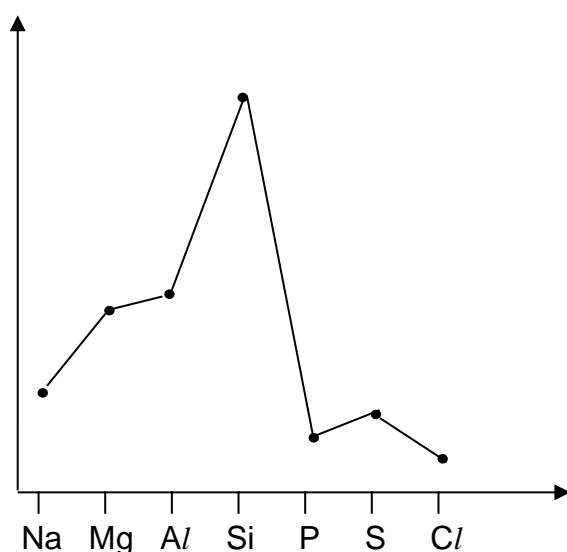
[Turn Over]

- 14 Iodine is formed from the radioactive decay of tellurium-127. This radioactive decay is first-order reaction with a half-life of 9.35 hours.

How long will it take for a pure tellurium-127 sample to reach the tellurium to iodine molar proportion of 1:7?

- A 4.675 h
- B 9.350 h
- C 18.70 h
- D 28.05 h**

- 15 The following graph shows a property of the elements sodium to chlorine.



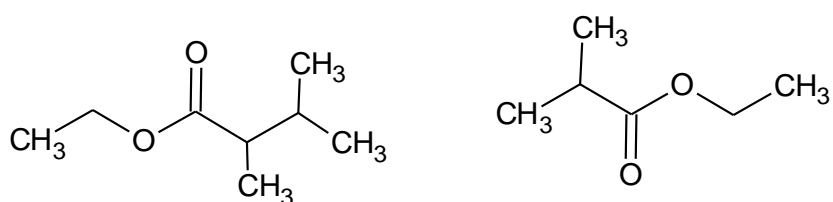
What is the property?

- A electrical conductivity
  - B first ionisation energy
  - C ionic radius
  - D melting point**
- 16 An oxide and a chloride of the elements in the third period of Periodic Table are dissolved in water separately. One of the solutions can be used to dissolve  $\text{SO}_2$  but both of the solutions can be used to dissolve  $\text{Al}_2\text{O}_3$ .

Which of the following could be the oxide and chloride used?

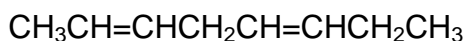
- A  $\text{Na}_2\text{O}$        $\text{PCl}_5$**
- B  $\text{MgO}$        $\text{NaCl}$
- C  $\text{P}_4\text{O}_{10}$        $\text{SiCl}_4$
- D  $\text{SiO}_2$        $\text{MgCl}_2$

- 17 The following structures belong to part of the aliphatic isoethyl ester homologous series.



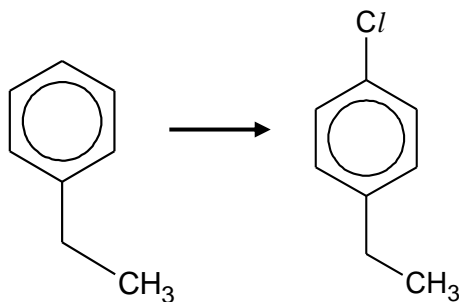
What is the general formula of this series?

- A  $C_{n+3}H_{2n+6}O_2$   
 B  $C_{n+2}H_{2n+5}O_2$   
 C  $C_{n+3}H_{2n+4}O_2$   
 D  $C_{n+2}H_{2n+3}O_2$
- 18 Compound X has the following structure:



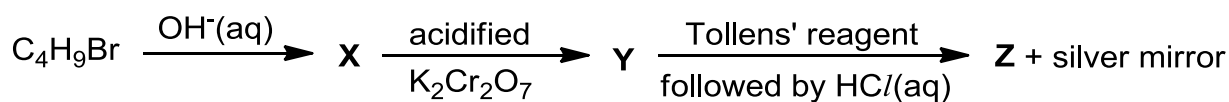
What is the total number of cis-trans isomers possible for this molecule?

- A 1                      B 2                      C 3                      D 4
- 19 Which set of conditions will bring about the transformation shown below?



- A  $Cl_2(g)$  in the presence of uv light  
 B  $Cl_2(g)$  in the presence of  $FeCl_3$   
 C concentrated  $HCl$  with heat  
 D  $SOCl_2(g)$  at rtp

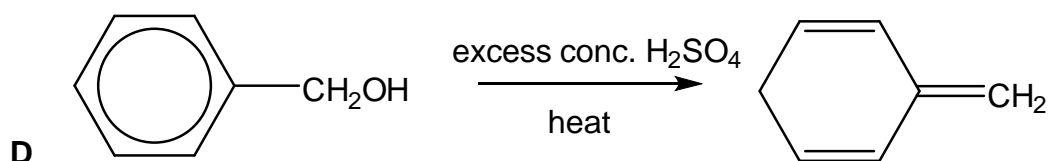
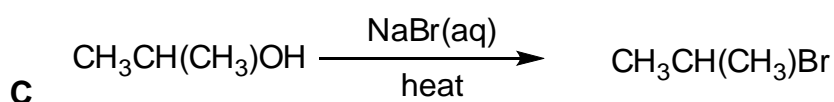
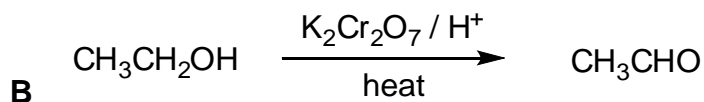
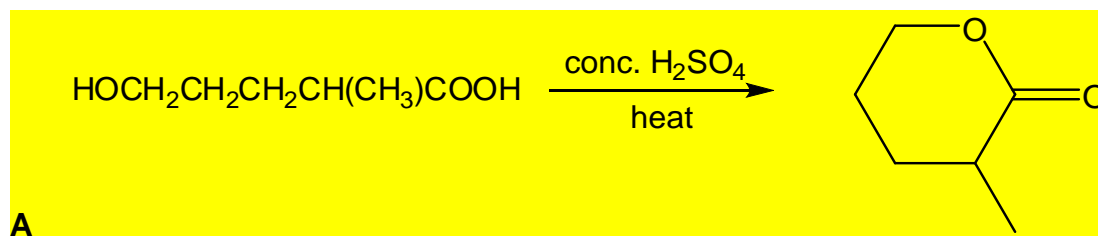
20 The compound  $C_4H_9Br$  undergoes a sequence of reactions as follows:



What could be the formulae for **X**, **Y** and **Z**?

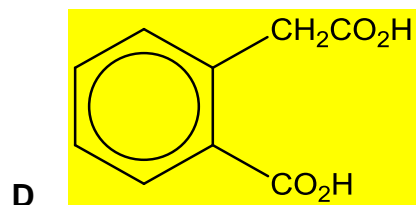
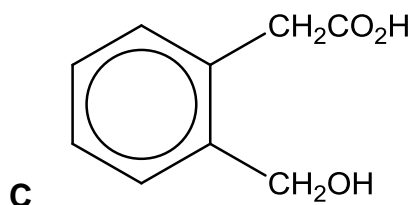
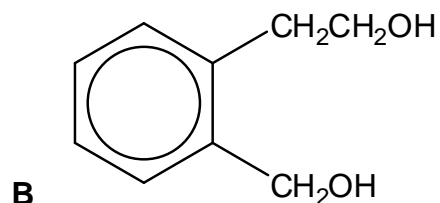
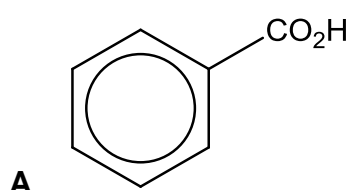
	<b>X</b>	<b>Y</b>	<b>Z</b>
<b>A</b>	$CH_3CH_2CH=CH_2$	$CH_3CH_2CO_2H$	$CH_3CH_2CHO$
<b>B</b>	$CH_3CH_2CH(OH)CH_3$	$CH_3CH_2COCH_3$	$CH_3CH_2CO_2H$
<b>C</b>	$CH_3CH(CH_3)CH_2OH$	$CH_3CH(CH_3)CHO$	$CH_3CH(CH_3)CO_2H$
<b>D</b>	$CH_3CH_2CH_2CH_2OH$	$CH_3CH_2CH_2CO_2H$	$CH_3CH_2CH_2CHO$

21 Which of the following synthesis would yield the product shown?

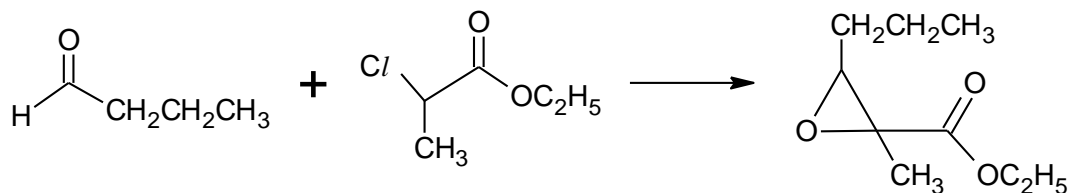




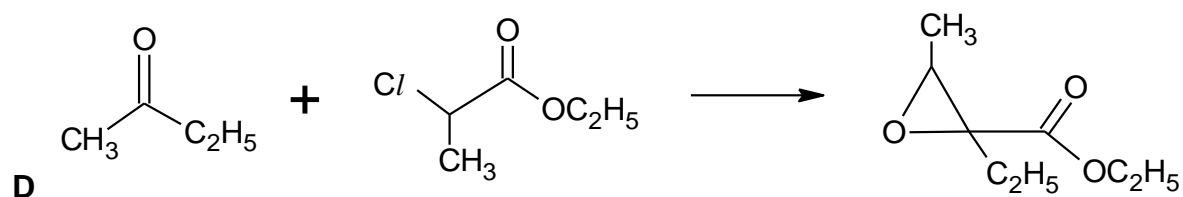
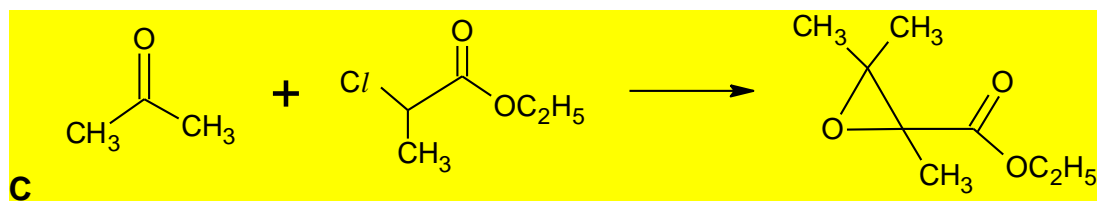
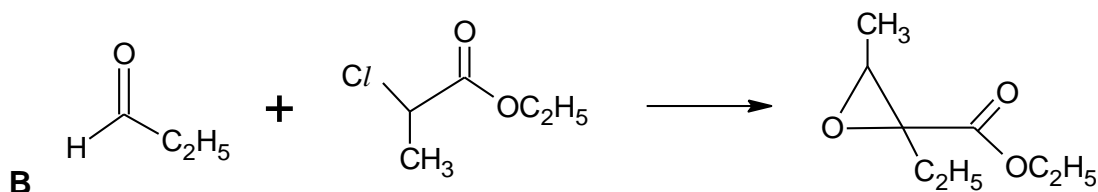
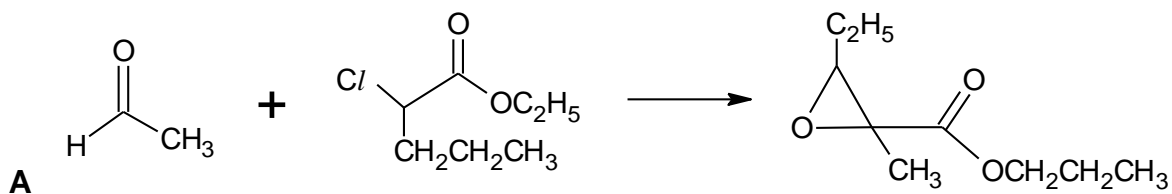
- 22 Which one of the following will liberate one mole of carbon dioxide when one mole of the compound is treated with excess sodium carbonate?



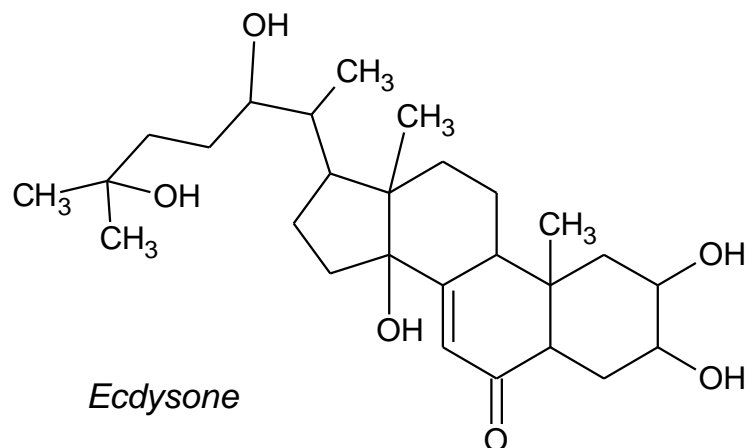
- 23 An example of *Darzens* reaction is shown below.



Based on the information above, which of the following reaction is possible?



24 *Ecdysone* is a steroidal prohormone of the major insect molting hormone.



Which of the following statements is true for *Ecdysone*?

- A *Ecdysone* gives a brick-red precipitate with Fehling's reagent.
- B Upon reaction of  $\text{LiAlH}_4$  with *Ecdysone*, there are no more double bonds in the product.
- C *Ecdysone* forms an orange precipitate with 2,4-dinitrophenylhydrazine.**
- D One mole of *Ecdysone* reacts with excess sodium to produce five moles of hydrogen gas.

25 Two compounds with  $1 \text{ mol dm}^{-3}$  concentration, 2-chloroethanol,  $\text{CH}_2\text{Cl}/\text{CH}_2\text{OH}$ , and chloroacetic acid,  $\text{CH}_2\text{Cl}/\text{CO}_2\text{H}$ , have certain properties.

Which of the following statements is true?

- A 2-chloroethanol has a lower tendency to ionise compared to chloroacetic acid.**
- B Only one of the two compounds is soluble in water due to hydrogen bonds.
- C Both 2-chloroethanol and chloroacetic acid are saturated compounds.
- D Chloroacetic acid is a stronger acid than 2-chloroethanol as it can fully dissociates in water.

## Section B

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

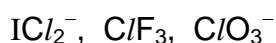
Decide whether each of the statements is or is not correct (you may find it helpful to put a tick against the statements which you consider to be correct).

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

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>1, 2 and 3</b> are correct	<b>1 and 2</b> only are correct	<b>2 and 3</b> only are correct	<b>1</b> only is correct

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

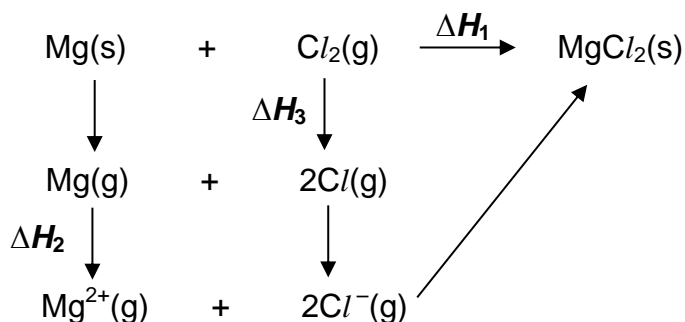
**26** The following are chlorine-containing species.



Which of the following statements are correct?

- 1**  $\text{ICl}_2^-$  is linear,  $\text{ClF}_3$  is T-shaped while  $\text{ClO}_3^-$  is trigonal pyramidal.
- 2** The bond angles decrease in the order of  $\text{ICl}_2^- > \text{ClF}_3 > \text{ClO}_3^-$ .
- 3** All chlorine atoms achieve stable octet configuration.

**27** The diagram shows the Born-Haber cycle for the formation of magnesium chloride.



Which statements are correct?

- 1**  $\Delta H_1$  is enthalpy change of formation of magnesium chloride.
- 2**  $\Delta H_2$  is twice the first ionisation energy of magnesium.
- 3**  $\Delta H_3$  is twice the bond energy of chlorine.

**28** Which of the following decreases continuously for Period 3 oxides from  $\text{MgO}$  to  $\text{P}_4\text{O}_{10}$ ?

- 1** pH of the resulting solution when dissolve in water
- 2** melting point
- 3** electrical conductivity in solid state

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

<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
<b>1,2 and 3</b> are correct	<b>1 and 2 only</b> are correct	<b>2 and 3 only</b> are correct	<b>1 only is</b> correct

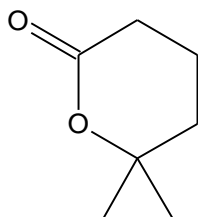
No other combination of statements is used as a correct response.

**29** Difluoromethane,  $\text{CH}_2\text{F}_2$ , is widely used as an aerosol propellant and refrigerant.

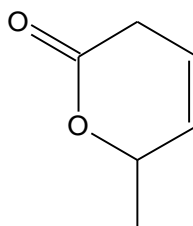
Which statements help to explain why difluoromethane is chemically inert?

- 1** It is difficult to substitute the fluorine atom of the molecule.
- 2** The carbon-fluorine bond energy is large.
- 3** Fluorine is highly electronegative.

**30** The structures of compounds **A** and **B** are as follows.



**A**



**B**

Which sets of reagents and conditions can be used to distinguish between compounds **A** and **B**?

- 1** acidified  $\text{K}_2\text{Cr}_2\text{O}_7$ , heat
- 2** aqueous sodium hydroxide with iodine, heat
- 3** aqueous bromine, r.t.p

**End of Paper 1**