First Semester

Chemistry

كلية الحرس التقنية

(Questions)

سلطنة عمان
وزارة التربية والتعليم

مركز القياس والتقويم التربوي
The Center for Educational Assessment and Measurement (CEAM)

امتحان دبلوم التعليم العام
لكلية الحرس السلطاني العماني التقنية (ثنائية اللغة)
للعام الدراسي ١٤٤٥/١٤٤٦ هـ - ٢٠٢٣ / ٢٠٢٤ م - الدور الأول - الفصل الدراسي الأول

تنبيه:
- المادة: الكيمياء.
- الأسئلة في (١٤) صفحة.
- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

تعليمات مهمة:

- يجب الحضور إلى قاعة الامتحان قبل عشر دقائق على الأقل من بدء زمن الامتحان.
- يجب إحضار أصل ما يثبت الهوية وإبرازها للعاملين بالامتحانات.
- يجب الالتزام بالزي (الدشداشة البيضاء والمصر أو الكمة للذكور) والزي المدرسي للطالبات ، ويستثنى من ذلك الدارسون من غير العمانيين بشرط الالتزام بالذوق العام، ويمنع على جميع المتقدمات ارتداء النقاب داخل المركز وقاعات الامتحان.
- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الصفة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أياً كان نوعها وأي شيء له علاقة بالامتحان.
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- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (▭) وفق النموذج الآتي:

س - عاصمة سلطنة عمان هي:

▭ القاهرة ▭ الدوحة

▬ مسقط ▭ أبوظبي

ملاحظة: يتم تظليل الشكل (▬) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

صحيح ▬ **غير صحيح** ▭ ◉ ◒ ✗ ✓

مُسَوَّدَة، لا يتم تصحيحها

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Question 1: Multiple Choice Items (14 marks)

Shade in the bubble (○) next to the **best** answer for each item.

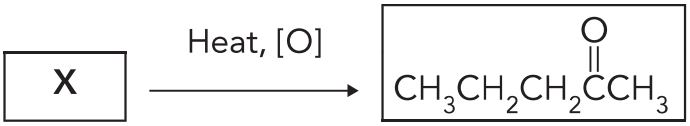
1) What is the functional group present in an organic compound when the suffix "-al" is used in its IUPAC name?

- ○ Aldehyde
- ○ Alcohol
- ○ Ketone
- ○ Carboxylic acid

2) Which of the following reagents or conditions is not required to produce ethanol by fermentation?

- ○ Yeast
- ○ Presence of Oxygen
- ○ Sugar dissolved in water
- ○ Temperature between 30-35 °C

3) From the equation below:



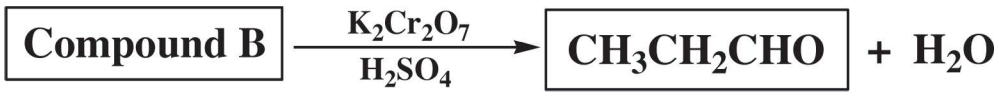
Which one of the following alcohols represents **X**?

- ○ 2-methylbutan-2-ol
- ○ 2-methylpropan-1-ol
- ○ hexan-1-ol
- ○ pentan-2-ol

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Question 1 continued

4) Study the following reaction:



What is the correct option for the reaction?

	Compound B	Functional group of organic product
☐	$CH_3CH_2CH_2OH$	Ketone
☐	$CH_3CH(OH)CH_3$	Ketone
☐	$CH_3CH_2CH_2OH$	Aldehyde
☐	$CH_3CH_2CH_2CH_2OH$	Aldehyde

5) When alcohol Z reacts with (PCl_5), a white steamy foam appears immediately. But when alcohol Z is added to acidified ($K_2Cr_2O_7$), no reaction occurs. Which of the following options describes alcohol Z?

	Classification	Alcohol (Z)
☐	Tertiary	2-methylpropan-2-ol
☐	Secondary	2-methylbutan-1-ol
☐	Tertiary	Propan-2-ol
☐	Secondary	Butan-2-ol

6) Which of the following observations indicates a positive test with Fehling's solution?

- ☐ A silver mirror.
- ☐ A red/orange precipitate.
- ☐ A yellow precipitate.
- ☐ A colour change from green to orange.

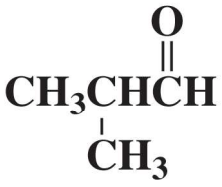
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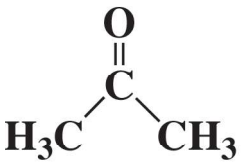
Question 1 continued

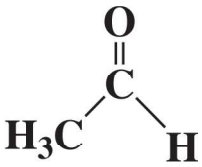
7) What type of carbonyl functional group is in the following compound?



- ☐ Alcohol
- ☐ Ketone
- ☐ Aldehyde
- ☐ Carboxylic acid

8) Which of the following reagents will give a positive test for both compounds?





- ☐ An alkaline solution of $NaOH/I_2$.
- ☐ An aqueous solution containing $[Ag(NH_3)_2]^+$.
- ☐ An acidified aqueous potassium dichromate (VI).
- ☐ An alkaline solution containing complexed Cu^{2+} ions.

9) Butanone is added to different reagents as follows:

1- $CH_3CH_2COCH_3 + Cu^{2+} \longrightarrow$

2- $CH_3CH_2COCH_3 + Ag(NH_3)_2^+ \longrightarrow$

3- $CH_3CH_2COCH_3 + NaIO \longrightarrow$

4- $CH_3CH_2COCH_3 + 2[H] \longrightarrow$

Which of the reactions above will occur?

- ☐ 3 and 4
- ☐ 2 and 3
- ☐ 1 and 2
- ☐ 1 and 4

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Question 1 continued

10) Which of the following compounds is a carboxylic acid?

- ☐ CH_3CHO
- ☐ CH_3COCH_3
- ☐ CH_3COOCH_3
- ☐ CH_3CH_2COOH

11) Which of the following compounds form ethyl propanoate in the presence of a catalyst?

- ☐ CH_3CH_2OH and CH_3CH_2CHO
- ☐ CH_3CH_2COOH and CH_3CH_2OH
- ☐ CH_3COOH and $CH_3CH_2CH_2OH$
- ☐ CH_3CH_2OH and $CH_3CH_2CH_2COOH$

12) Which of the following statements is not correct about octanoic acid:

- ☐ It reacts with $LiAlH_4$ to produce octanone.
- ☐ It reacts with NaOH to produce sodium octanoate.
- ☐ It reacts with Mg to produce magnesium octanoate.
- ☐ It reacts with Na_2CO_3 to produce sodium octanoate.

13) In an experiment, methanoic acid reacts with different compounds as shown in the equation below:

1- $2HCOOH + Mg \longrightarrow Salt\ 1 + H_2$

2- $2HCOOH + MgCO_3 \longrightarrow Salt\ 2 + CO_2 + H_2O$

What are the two salts?

	Salt 1	Salt 2
☐	$(HCOO)_2Mg$	$(HCOO)_2Mg$
☐	$(CH_3COO)_2Mg$	$(HCOO)_2Mg$
☐	$(HCOO)_2Mg$	$(CH_3COO)_2Mg$
☐	$(CH_3COO)_2Mg$	$(CH_3COO)_2Mg$

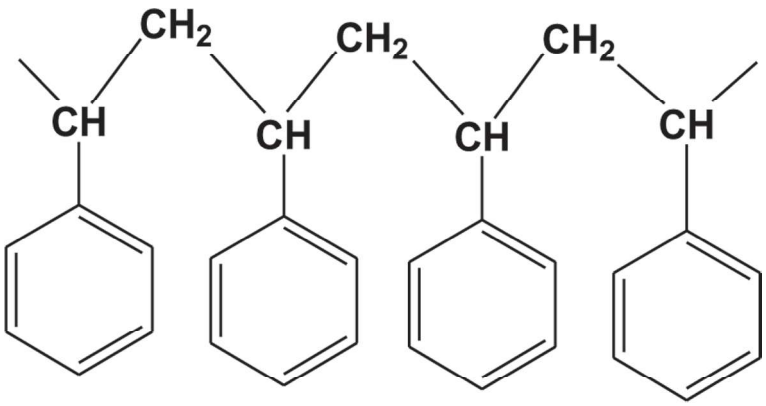
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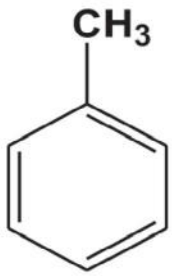
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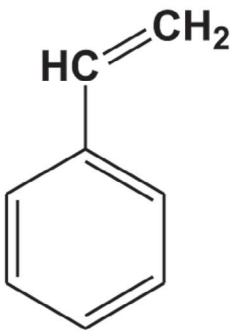
Question 1 continued

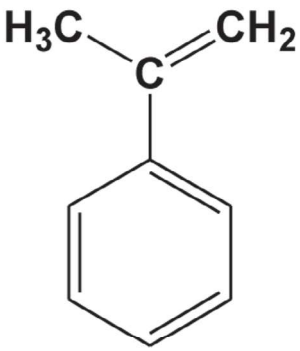
14) Part of a Poly phenylethane structure is shown below:

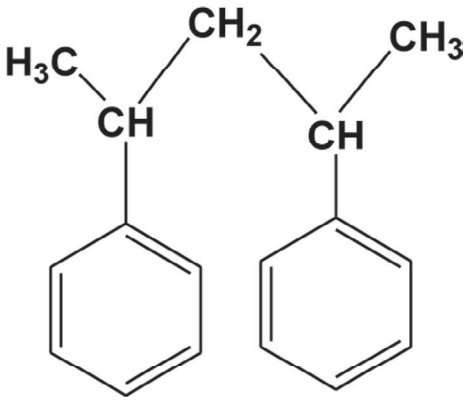


What is the monomer of this polymer?









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Question 2: Extended Reponses (56 marks)

15) The three compounds below belong to three different homologous series.

Compound	A	B	C
Molecular formula	C_3H_6	$C_3H_6O_2$	C_3H_7OH

a. Define the term "homologous series"? (1 mark)

b. Which homologous series does the A and C compound belong to? (2 marks)

A: _____

C: _____

c. Draw the displayed formula of Compound A. (1 mark)

d. What type are the following reactions? (2 marks)

Conversion of A to C

Conversion of C to B

e. Draw two possible functional group isomers for Compound B. (1 mark)

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Question 2 continued

16) Study the following chemical reactions for Compound (A) which were carried out as shown below:

$$C_4H_9I + H_3PO_3 \xleftarrow{\text{reaction 1}} \underset{\text{Compound A}}{CH_3CH_2CH_2CH_2OH} \xrightarrow{\text{reaction 2}} Y + HCl + POCl_3$$

a. Write the name of Compound A: (1 mark)

_____

b. What class is Compound A: (1 marks)

_____

c. Complete the following table. (4 marks)

Number of reaction	1	2
Structural formula of the organic product compound	$CH_3CH_2CH_2CH_2I$	_____
Type of reaction	_____	substitution
The reagent used	_____	_____

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Question 2 continued

17) **a.** Answer the following question:



(i) What type of reaction is this? (1 mark)

(ii) Draw the structural formula of product **Y.** (1 mark)

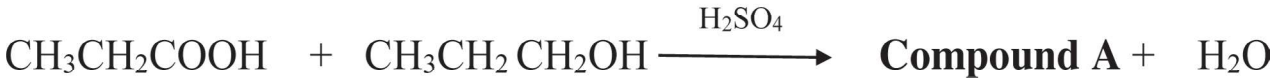
(iii) What is the name of the functional group of products ? (2 marks)

Y:

CH_3CH_2COOH:

(iv) What reagents are used in this reaction ? (1 mark)

b. The equation below illustrates the reaction of propanoic acid with propanol.



(i) Draw the structural formula for **Compound A**. (1 mark)

(ii) What is the name of the functional group of **Compound A** ? (1 mark)

c. Explain. Why propan-2-ol can't be oxidized to carboxylic acids? (1 mark)

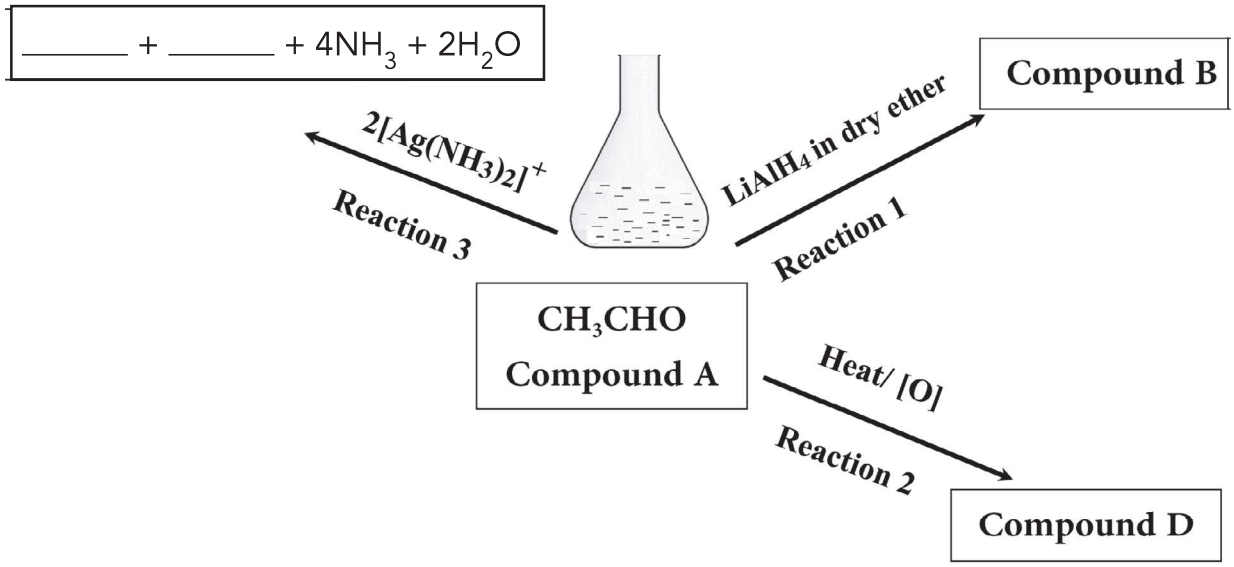
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Question 2 continued

18) Three chemical reactions for compound (A) were carried out as shown below. Study them and answer the following questions:



a. Identify the type of reactions: (2 marks)

Reaction (1): _____

Reaction (2): _____

b. Draw the structural formulae for the following organic compounds: (2 marks)

Compound (B): _____

Compound (D): _____

c. For reaction (3):

(i) Complete the reaction. (2 marks)

_____

(ii) What will form on the inside of the test tube in this reaction? (1 mark)

_____

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Question 2 continued

d. What is the difference between aldehydes and ketones in a **functional group**? (2 marks)

_____

_____

19) Three organic carbonyl compounds (X), (Y) and (Z) are isomers with the same molecular formula $C_5H_{10}O$. A student carried out different reactions to distinguish between them using Fehling's and iodoform reagents. The results are summarised in the following table.

Reaction	Fehling's reaction	Iodoform reaction
Compound (X)	Negative test	Positive test
Compound (Y)	Positive test	Negative test
Compound (Z)	Negative test	Negative test

a. Identify the **class family** of each organic compound:

(i) Compound (X): _____ (1 mark)

(ii) Compound (Y): _____ (1 mark)

(iii) Compound (Z): _____ (1 mark)

b. Draw the structural formulae for the following compounds: (2 marks)

- Compound (X):

_____

_____

- Compound (Y):

_____

_____

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Question 2 continued

20) Use the following compounds grid to answer the questions below:

A $CH_3COOCH_2CH_2CH_3$	**B** $CH_3COOCH_2CH_3$	**C** K_2CO_3
D CH_3COOK	**E** CH_3CH_2COOK	**F** $CH_3CH_2CH_2COOCH_3$

a. Write the symbol of the correct compounds for the following statements:

(i) A compound has an apple smell.(_____) (1 mark)

(ii) A compound has a pear smell.(_____) (1 mark)

(iii) It is produced when ethanoic acid reacts with ethanol.(_____) (1 mark)

(iv) A compound reacts with ethanoic acid to produce compound (**D**).(_____) (1 mark)

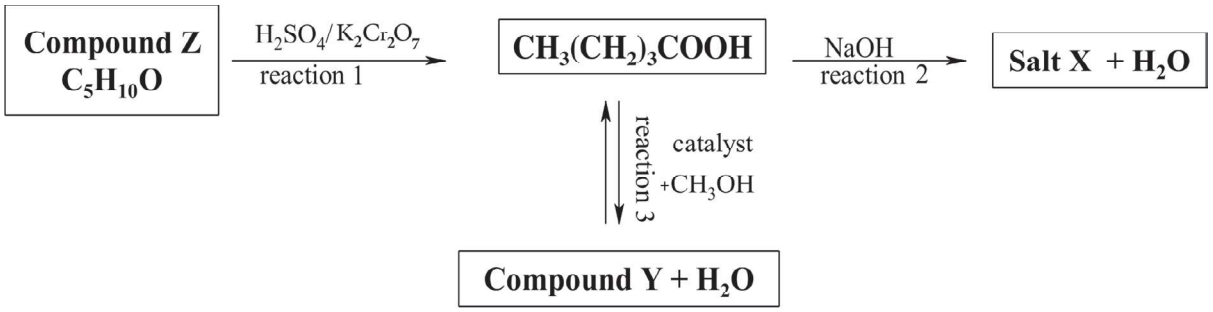
b. Complete the following balanced equation to produce compound (**E**): (1 mark)

$2CH_3CH_2COOH + $ _____ $\longrightarrow 2E + H_2$

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Question 2 continued

21) A series of three chemical reactions were carried out as follows:



a. In reaction 3, what is the catalyst that was added to produce **compound Y**? (1 mark)

_____

b. Write the structural formula for:

(i) Salt X: _____ (1 mark)

(ii) Compound Y: _____ (1 mark)

(iii) Compound Z: _____ (1 mark)

c. Explain. When **$LiAlH_4$** is added to carboxylic acid it will produce alcohol directly. (1 mark)

_____

_____

_____

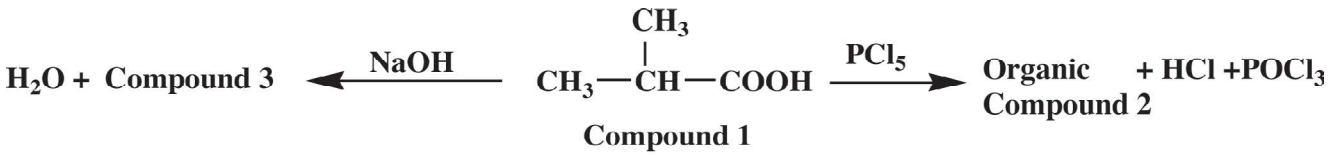
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Question 2 continued

22) Two chemical reactions were carried out as follows:



Study them and answer the following questions.

a. What is the functional group in Compound 1? (1 mark)

_____

b. Write the structural formula for: (2 marks)

Compound (2): _____

Compound (3): _____

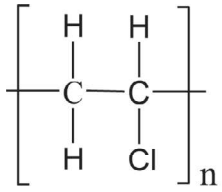
c. Write the organic product when **compound 1** is reduced with **$LiAlH_4$** (in dry ether). (1 mark)

_____

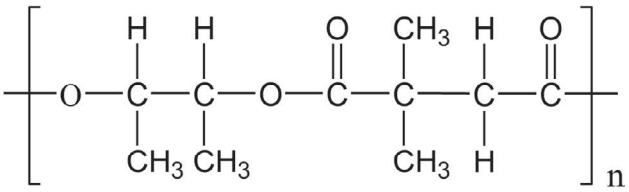
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Question 2 continued

23) The repeating units of two polymers M and S are shown in figure below:



M



S

a. What type of polymerization are these polymers? (2 marks)

- M: _____

- S: _____

b. Draw the structures for the two compounds that react together to form polymer **S**: (2 marks)

- Compound 1:

_____

_____

- Compound 2:

_____

_____

c. Explain. Why polymer **M** softens when heated? (1 mark)

_____

_____

_____

d. State two disadvantages of plastic waste landfills: (2 marks)

_____

_____

[End of the Examination]

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سلطنة عمان
وزارة التربية والتعليم

مركز القياس والتقويم التربوي
The Center for Educational Assessment and Measurement (CEAM)

امتحان دبلوم التعليم العام
لكلية الحرس السلطاني العماني التقنية (ثنائية اللغة)
للعام الدراسي ١٤٤٤ هـ - ٢٠٢٢ / ٢٠٢٣ م - الدور الأول - الفصل الدراسي الأول

تنبيه:
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- الإجابة في الورقة نفسها.

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- يجب على الممتحن التأكد من استلام دفتر امتحانه، مغلفاً بغلاف بلاستيكي شفاف وغير ممزق ، وهو مسؤول عنه حتى يسلمه لمراقبي اللجنة بعد الانتهاء من الإجابة.
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- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (▭) وفق النموذج الآتي:

س - عاصمة سلطنة عمان هي:

▭ القاهرة ▭ الدوحة

▬ مسقط ▭ أبوظبي

ملاحظة: يتم تظليل الشكل (▬) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

صحيح ▬ **غير صحيح** ▭ ◉ ◒ ✗ ✓

مُسَوَّدَة، لا يتم تصحيحها

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Question 1: Multiple Choice Items (14 marks)

Shade in the bubble (○) next to the **best** answer for each item.

1) Which of the following compounds is not a hydrocarbon?

- ○ C_6H_{12}
- ○ $C_{20}H_{18}$
- ○ H_2CO_3
- ○ C_2H_2

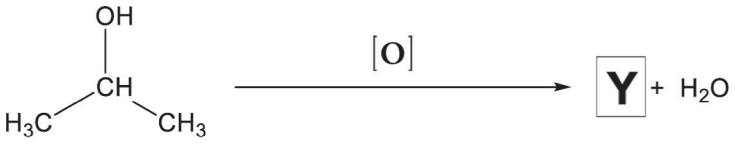
2) Which of the following is formed from the fermentation of glucose?

- ○ CO_2 and H_2O
- ○ O_2 and CO_2
- ○ Ethanol and O_2
- ○ Ethanol and CO_2

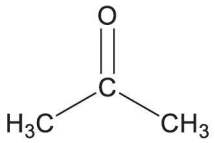
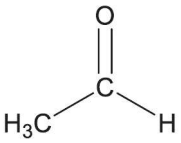
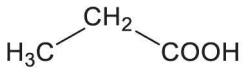
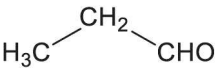
3) Which of the following is a secondary alcohol?

- ○ 3-ethylpentan-1-ol
- ○ 3-ethylpentan-2-ol
- ○ 4-ethylpentan-1-ol
- ○ 2-ethyl-pentan-2-ol

Use the reaction below to answer question 4:



4) What is the structure formula of the product **Y**?

- ○ 
- ○ 
- ○ 
- ○ 

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Question 1 continued

5) Which of the following compounds can be oxidised to form an aldehyde?

- ☐ CH_3CH_2COOH
- ☐ $CH_3CHOHCH_3$
- ☐ CH_3CH_2CHO
- ☐ $CH_3CH_2CH_2OH$

6) Which of the following statements about ketones is **not correct**?

- ☐ Reduced to primary alcohols
- ☐ Do not react with Fehling's reagent
- ☐ Oxidized by much strong oxidizing agents
- ☐ Do not react with acidic potassium dichromate

7) Which of the following compounds is a ketone?

- ☐ CH_3CH_2OH
- ☐ CH_3COCH_3
- ☐ CH_3CHO
- ☐ CH_3COOH

8) Propanal can be converted to alcohol. The correct option that describes this conversion is:

	Type of reaction	Product
☐	Reduction	$CH_3CH_2CH_2OH$
☐	Reduction	$CH_3CH(OH)CH_3$
☐	Oxidation	$CH_3CH_2CH_2OH$
☐	Oxidation	$CH_3CH(OH)CH_3$

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Question 1 continued

9) Which of the following options is correct about the propanal or propanone with Tollens' reagent?

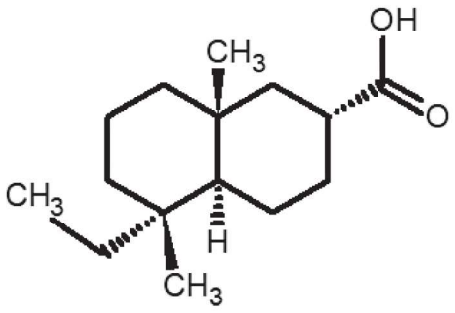
		Organic product	Observation
☐	Propanone	CH_3CH_2COOH	Silver mirror
☐	Propanone	$CH_3CH_2COCl_3$	Yellow precipitate
☐	Propanal	CH_3CH_2COOH	Silver mirror
☐	Propanal	$CH_3CH_2COCl_3$	Yellow precipitate

10) Which of the following produce an ester and water when it reacts with methanoic acid?

- ☐ A base
- ☐ An alcohol
- ☐ Phosphorus(V) chloride (PCl_5)
- ☐ Lithium aluminium hydride ($LiAlH_4$)

11) Which of the following functional groups is present in the compound shown below?

- ☐ Carboxylic acid
- ☐ Aldehyde
- ☐ Alcohol
- ☐ Ketone



12) Which of the following compounds cannot be used to produce CH_3CH_2COCl?

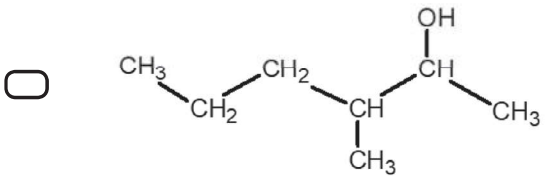
- ☐ CH_3COCH_3
- ☐ CH_3CH_2CHO
- ☐ CH_3CH_2COOH
- ☐ $CH_3CH_2CH_2OH$

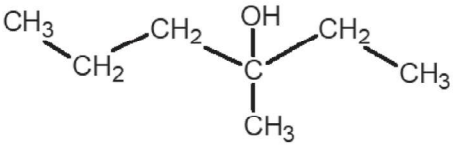
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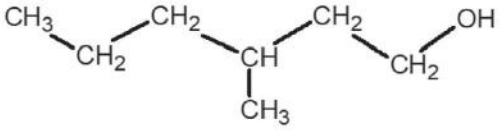
Question 1 continued

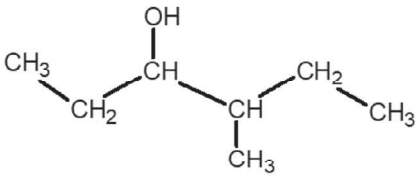
13) Compound (X) has the molecular formula $C_7H_{16}O$ and is produced by the reaction of a carboxylic acid with lithium aluminium hydride in dry ether.

Which of the following is the structural formula of compound (X)?

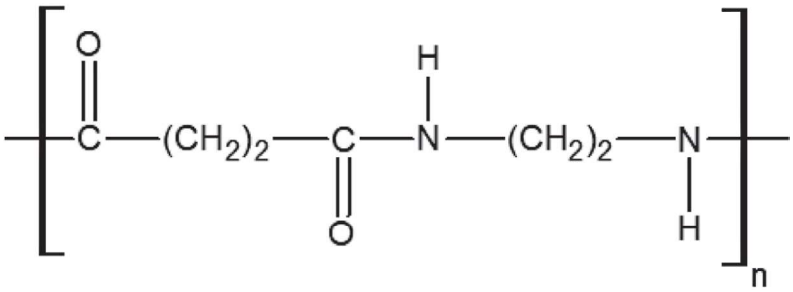








14) A polymer is shown below:



Which of the following options about this polymer is correct?

	Type of the polymerization	Type of the polymer
☐	Condensation	Polyester
☐	Addition	Polyester
☐	Condensation	Polyamide
☐	Addition	Polyamide

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Question 2: Extended Reponses (56 marks)

15) Alcohols can form isomer structures.

a. Define the term isomerism.

b. What is the reaction's name in which alcohols convert to alkanes?

c. Draw the structural formulae of 3 alcohol isomers of C_4H_9OH.

16) Ethane reacts with bromine in bright sunlight as in the following equation:

$$C_2H_6(g) + Br_2(g) \longrightarrow CH_3CH_2Br(g) + HBr(aq)$$

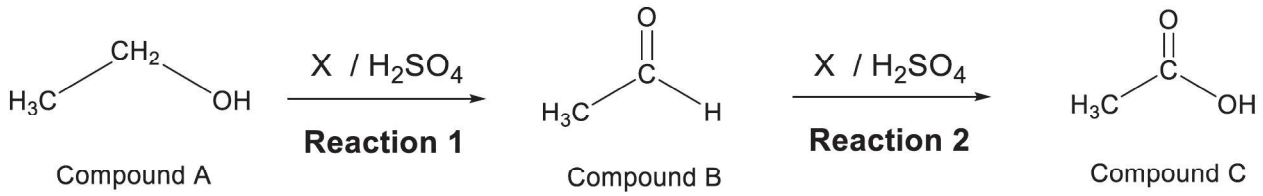
a. What type of reaction is this?

b. Write the molecular formula of compound next to ethane in the homologous series of alkanes with 3 carbon atoms.

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Question 2 continued

17) Study the reaction sequence below. Then answer the following questions:



Compound A Compound B Compound C

a. Which hydrocarbon is used to produce compound A?

_____

b. What is the type of **reaction 1**?

_____

c. What is the reagent X?

_____

d. What are the functional groups in compound B and compound C?

Compound B: _____

Compound C: _____

e. Write the chemical equation when compound A reacts with PI_3?

_____

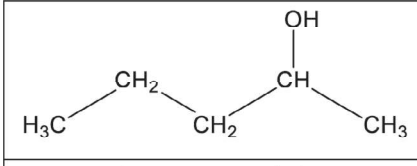
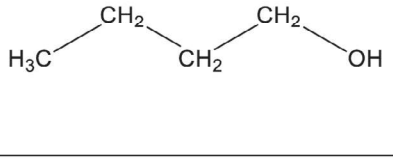
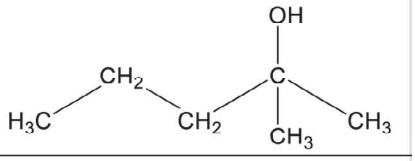
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Question 2 continued

18) The table below shows three alcohols. Study them and answer the following questions:

		
Compound A	Compound B	Compound C

a. Classify the type of each alcohols:

Compound A: _____

Compound B: _____

Compound C: _____

b. What is the organic product of the reaction of compound A with PCl_5?

_____

c. Which of these compounds cannot be oxidized?

_____

19) A student prepared ethyl propanoate by mixing Compound X and Compound Y using concentrated sulfuric acid (conc.H_2SO_4). Answer the following questions:

$$\text{Compound X + Compound Y} \xrightarrow{\text{conc.}H_2SO_4} CH_3CH_2CO_2C_2H_5 + H_2O$$

a. What are the structural formulae for compound X and compound Y?

_____

b. What role does the concentrated sulfuric acid play in the reaction?

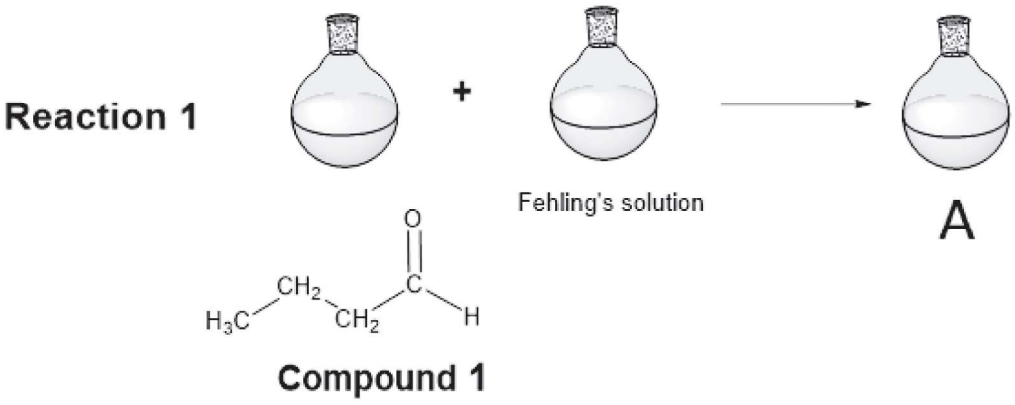
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Question 2 continued

20) A group of students made several reactions as shown in the following round bottle flasks. Study them and answer the following questions:

a. For reaction 1:



Compound 1

(i) Name compound **1**.

_____

(ii) What is the precipitate molecular structure that will be observed in **reaction 1**?

_____

(iii) Draw the structure of compound **A**.

_____

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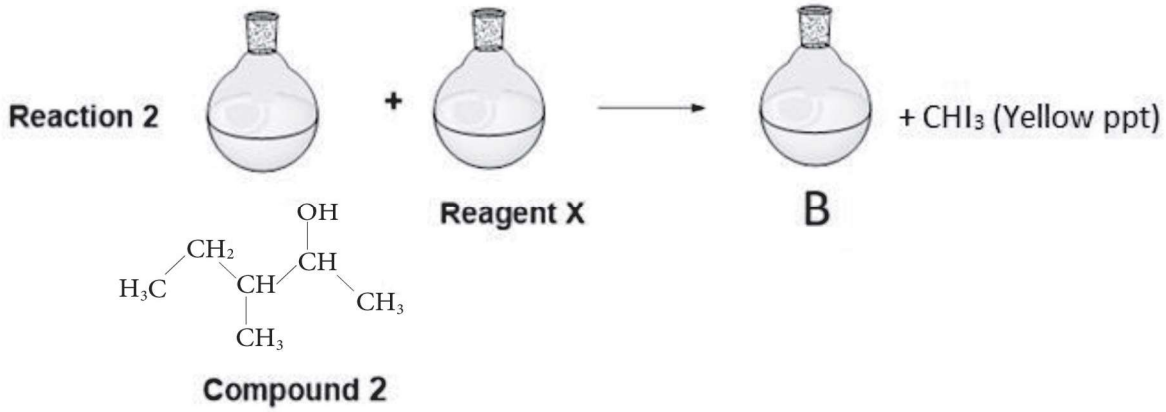
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Question 2 continued

b. For reaction 2

Compound **2** is oxidized by reagent **X**



(i) Name compound **2**.

(ii) Draw the structure of compound **B.**

(iii) What is reagent X used in **reaction 2**?

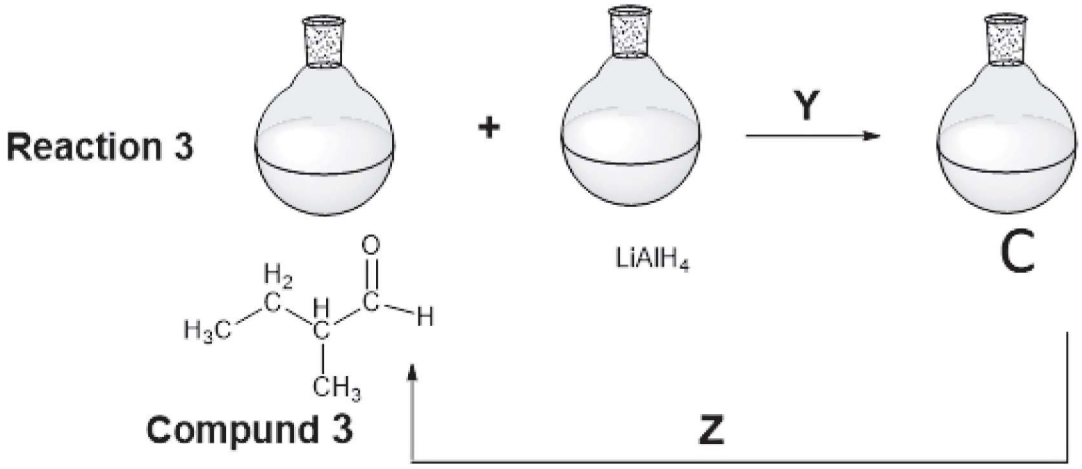
(iv) Why compound **2** can be oxidized by this reagent?

(v) How many carbon atoms does compound **B** have?

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Question 2 continued

c. For reaction 3



(i) Name compound **3**.

_____

(ii) What is the type of reaction **Y**?

_____

(iii) Draw the structure of compound **C**.

_____

(iv) Name compound **C**.

_____

(v) What is the type of reaction **Z**? _____

(vi) If compound 3 is oxidized by Cu^{2+} ions, what is the functional group of the product?

_____

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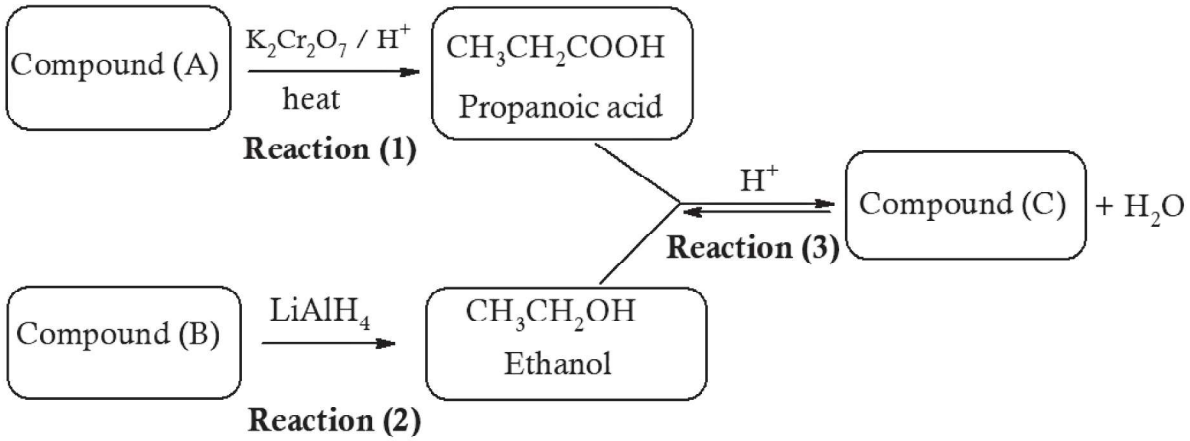
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Question 2 continued

21) The reaction sequence below shows the formation an ester.

Answer the following questions:



a. State three commercial uses of esters.

_____

_____

_____

b. Write the formula of the:

(i) Compound (A)

_____

(ii) Compound (B)

_____

(iii) Compound (C)

_____

c. What is the type of:

(i) Reaction (1): _____

(ii) Reaction (3): _____

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Question 2 continued

d. For the following chemical equation:

$$\text{Propanoic acid} + NaOH \longrightarrow \mathbf{X} + H_2O$$

(i) What is the type of the product (**X**) formed?

_____

(ii) Write the structural formula of the product (**X**).

_____

e. Write an equation for the reaction of propanoic acid with:

(i) Magnesium (Mg).

_____

(ii) Phosphorus(V) chloride (PCl_5).

_____

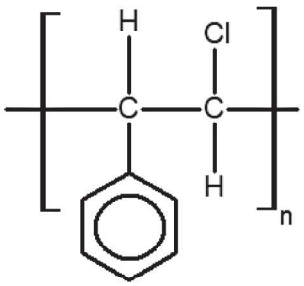
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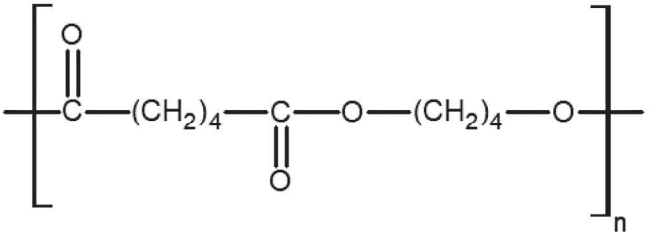
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Question 2 continued

22) The repeat unit of two polymers are shown below:



Polymer (A)



Polymer (B)

a. Give one advantage and one disadvantage of disposing of plastic by landfill.

_____

_____

b. Complete the table below:

	Polymer (A)	Polymer (B)
Type of polymerisation	_____	_____
Monomer(s)	_____	_____ _____

c. Which one polymer (A) or polymer (B) is a thermoplastic?

_____

[End of the Examination]

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مُسَوَّدَة

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امتحان دبلوم التعليم العام
لكلية الحرس السلطاني العماني التقنية (ثنائية اللغة)
للعام الدراسي ١٤٤٣ هـ - ٢٠٢١ / ٢٠٢٢ م - الدور الأول

تنبيه:
- المادة: الكيمياء.
- الأسئلة في (١٢) صفحة.
- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

تعليمات مهمة:

- يجب الحضور إلى قاعة الامتحان قبل عشر دقائق على الأقل من بدء زمن الامتحان.
- يجب إحضار أصل ما يثبت الهوية وإبرازها للعاملين بالامتحانات.
- يجب الالتزام بالزي (الدشداشة البيضاء والمصر أو الكمة للذكور) والزي المدرسي للطالبات ، ويستثنى من ذلك الدارسون من غير العمانيين بشرط الالتزام بالذوق العام، ويمنع على جميع المتقدمات ارتداء النقاب داخل المركز وقاعات الامتحان.
- يحظر على الممتحنين اصطحاب الهواتف النقالة وأجهزة النداء الآلي وآلات التصوير والحواسيب الشخصية والساعات الرقمية الذكية والآلات الحاسبة ذات الصفة التخزينية والمجلات والصحف والكتب الدراسية والدفاتر والمذكرات والحقائب اليدوية والآلات الحادة أو الأسلحة أياً كان نوعها وأي شيء له علاقة بالامتحان.
- يجب على الممتحن الامتثال لإجراءات التفتيش داخل المركز طوال أيام الامتحان.
- يجب على الممتحن التأكد من استلام دفتر امتحانه، مغلفاً بغلاف بلاستيكي شفاف وغير ممزق ، وهو مسؤول عنه حتى يسلمه لمراقبي اللجنة بعد الانتهاء من الإجابة.
- يجب الالتزام بضوابط إدارة امتحانات دبلوم التعليم العام وما في مستواه وأية مخالفة لهذه الضوابط تعرضك للتدابير والإجراءات والعقوبات المنصوص عليها بالقرار الوزاري رقم ٥٨٨ / ٢٠١٥.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان المقالية بقلم الحبر (الأزرق أو الأسود).
- يقوم المتقدم بالإجابة عن أسئلة الاختيار من متعدد بتظليل الشكل (▭) وفق النموذج الآتي:

س - عاصمة سلطنة عمان هي:

▭ القاهرة ▭ الدوحة

■ مسقط ▭ أبوظبي

ملاحظة: يتم تظليل الشكل (■) باستخدام القلم الرصاص وعند الخطأ، امسح بعناية لإجراء التغيير.

صحيح ■ **غير صحيح** ▭ ◉ ◔ ✗ ✓

مُسَوَّدَة، لا يتم تصحيحها

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Question 1: Multiple Choice Items (14 marks)

Shade in the bubble (⬭) next to the **best** answer for each item.

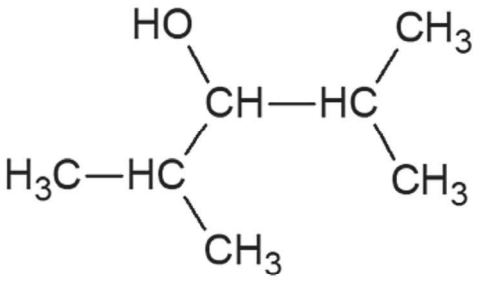
1) Which of the following can exhibit functional group isomerism?

- ⬭ Alkene with alkyne
- ⬭ Alkane with alkyl halide
- ⬭ Alcohol with ether
- ⬭ Aldehyde with ester

2) Which of the following statements about the reaction of alcohols with PCl_5 is **not correct**?

- ⬭ It happens rapidly at room temperature.
- ⬭ It can be used as a test for the (OH) group.
- ⬭ It involves the substitution of oxygen by Cl.
- ⬭ It produces chloroalkane and other compounds.

3) What is the correct classification and oxidation product of the following alcohol?



	Classification	Oxidation product
⬭	Primary	Aldehyde
⬭	Secondary	Ketone
⬭	Primary	Ketone
⬭	Secondary	Aldehyde

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Question 1 continued

4) For the following reaction:

$$3\ CH_3CH_2CH_2CH_2OH\ +\ X \xrightarrow{\text{refluxing}} 3\ Y\ +\ H_3PO_3$$

What is the correct option for (X) and (Y)?

	(X)	(Y)
☐	PI_3	$CH_3CH_2CH_2CH_2I$
☐	HI	$CH_3CH_2CH_2CH_2I$
☐	PCl_5	$CH_3CH_2CH_2CH_2Cl$
☐	HCl	$CH_3CH_2CH_2CH_2Cl$

5) Which of the following compounds can be oxidised to form a carboxylic acid?

- ☐ 3-methylhexan-1-ol
- ☐ 3-methylhexan-2-ol
- ☐ 2-methylhexan-2-ol
- ☐ 2-methylhexan-3-ol

6) Which of the following statements about both aldehydes and ketones is **not correct**?

- ☐ Aldehydes can be oxidized easily than ketones.
- ☐ both have carbonyl group.
- ☐ produce different result with Tollens reagent.
- ☐ both reduced to carboxylic acids

7) Butanal can be converted into alcohol. Which option best describes this conversion?

	Type of reaction	Suitable reagent	Product
☐	oxidation	$LiAlH_4$	$CH_3CH_2CH_2CHO$
☐	reduction	$K_2Cr_2O_7$	$CH_3CH_2CH_2CH_2OH$
☐	reduction	$LiAlH_4$	$CH_3CH_2CH_2CH_2OH$
☐	oxidation	$K_2Cr_2O_7$	$CH_3CH_2CH_2CHO$

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Question 1 continued

8) For the reaction below

$$C_5H_{11}COCH_3 \xrightarrow{H_2/Ni} Y$$

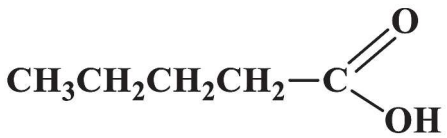
What could (Y) represent?

- ☐ $C_5H_{11}CH_2CHO$
- ☐ $C_5H_{11}CHOHCH_3$
- ☐ $C_5H_{11}CH_2COOH$
- ☐ $C_5H_{11}COHCH_2CH_3$

9) Which of the following is correct, if pentan-2-one is treated with Fehling's solution?

- ☐ $2Ag(NH_3)_2^+ + e^- \longrightarrow 2Ag + 4NH_3$
- ☐ $Cu^{2+} + 2e^- \longrightarrow Cu$
- ☐ $3NaIO \longrightarrow 2NaOH + NaI$
- ☐ No reaction occurs

10) Which of the following statements about the compound below is **not correct**?



- ☐ It can be prepared from $CH_3CH_2CH_2CH_2CHO$.
- ☐ It produces $H_{2(g)}$ when it reacts with bases.
- ☐ It produces HCl in the halogenation reaction.
- ☐ It can be reduced into $CH_3CH_2CH_2CH_2CH_2OH$ in a single step.

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Question 1 continued

11) A reaction occurs when propanoic acid is reacted with potassium hydroxide. Which row shows the correct reaction?

	Type of main product	Other product
☐	Acid	H_2O
☐	Salt	H_2
☐	Salt	H_2O
☐	Acid	H_2

12) Which mixture could be used to produce propyl methanoate?

- ☐ CH_3CH_2COOH and CH_3OH
- ☐ $CH_3CH_2CH_2OH$ and HCOOH
- ☐ $CH_3CH_2CH_2COOH$ and CH_3OH
- ☐ $CH_3CH_2CH_2CH_2OH$ and HCOOH

13) Hexanoic acid can be converted into alcohol. Which option best describes this conversion?

	The suitable reagent	Type of reaction	The product
☐	$LiAlH_4$	oxidation	$CH_3(CH_2)_6OH$
☐	$K_2Cr_2O_7$	reduction	$CH_3(CH_2)_5OH$
☐	$K_2Cr_2O_7$	oxidation	$CH_3(CH_2)_6OH$
☐	$LiAlH_4$	reduction	$CH_3(CH_2)_5OH$

14) Which of these options about burning plastic is **correct**?

- ☐ Recommended to be used for power production.
- ☐ The best option compared to recycling and landfill.
- ☐ Saves non-renewable resources.
- ☐ Releases useful natural gas.

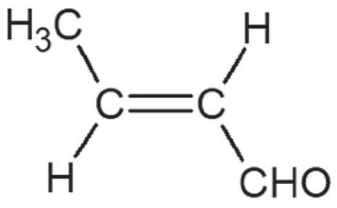
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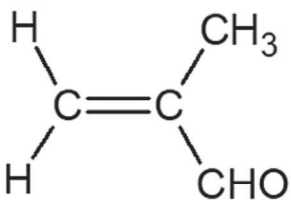
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Question 2: Extended Reponses (56 marks)

15) Study the following two isomers, then answer the following questions.



Compound (A)



Compound (B)

a. Define the term isomers?

_____

b. What type of structural isomers do these two compounds represent?

_____

c. What is the molecular formula of these compounds?

_____

d. What is the name of the carbonyl functional group in these compounds?

_____

e. Compound (A) undergoes a reaction to form CH_3-CH(OH)-CH_2-CHO:

(i) What type of reaction is this?

_____

(ii) What is the reagent used in?

_____

f. Draw a possible functional group isomer for compound (B).

_____

_____

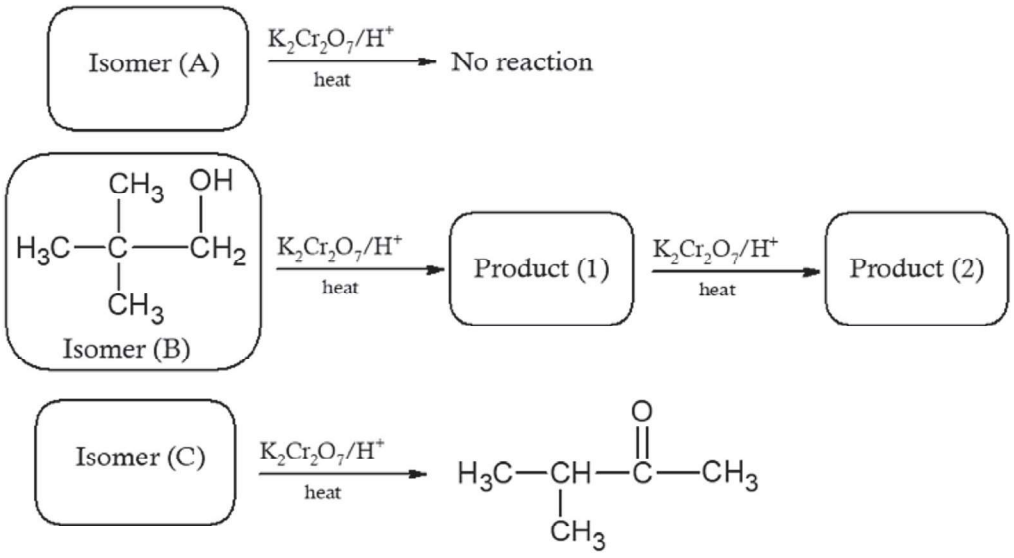
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Question 2 continued

16) Compare the industrial manufacture of ethanol and fermentation in terms of raw material and energy consumption in the table below.

	The industrial manufacture	The fermentation
Raw material	_____	_____
Energy consumption	_____	_____

17) Chemical reactions for three structural isomers of formula $C_5H_{12}O$ were carried out as shown below. Study them, then answer the following questions.



a. Draw the structural formula for:

(i) Isomer (A):

_____

(ii) Isomer (C):

_____

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Question 2 continued

b. **Name** the functional group of products (1) and (2) **and draw** its structural formula:

(i) Product (1): Name _____

structural formula: _____

_____

(ii) Product (2): Name _____

structural formula: _____

_____

c. Draw one more possible structural isomer of formula $C_5H_{12}O$, which produces a ketone when heated with acidified potassium dichromate (VI).

_____

_____

d. Isomer (B) is added to concentrated sulfuric acid and potassium bromide:

(i) What is the name of this reaction?

_____

(ii) Draw the structural formula of the organic product.

_____

_____

e. Write the equation for the reaction of isomer (B) with ethanoic acid.

_____

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Question 2 continued

18) The following table shows an experiment to distinguish between two unknown compounds. They are aldehyde and ketone and their molecular formulae are $C_6H_{12}O$.

Compound	Iodoform reaction	Heated with Tollens' reagent	Reacted with $LiAlH_4$
A	No reaction	Reaction (1)	Reaction (2)
B	Reaction (3)	No reaction	Reaction (4)

a. Identify the type of reactions:

(i) Reaction (1): _____

(ii) Reaction (2): _____

b. Write the formula of the precipitate formed in:

(i) Reaction (1): _____

(ii) Reaction (3): _____

c. Identify compounds (A) and (B) into aldehyde or ketone, and give the reasons for your answers?

(i) Compound (A) _____

Reason _____

(ii) Compound (B) _____

Reason _____

d. Draw the structural formulae of the organic compounds formed in:

(i) Reaction (1): _____

(ii) Reaction (4): _____

e. Write the full chemical equation for the reaction (3).

_____

f. Draw the structural position isomer for compound (B).

_____

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Question 2 continued

19) The chemical reagents play an important role in chemical reactions. Answer the following questions:

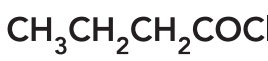
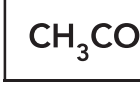
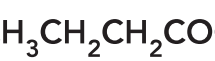
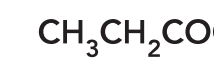
a. What reagent is used to distinguish between octan-3-one and octan-2-one?

_____

b. Which product is produced when 3,3-dimethyl pentan-1-ol reacts with a limited amount of the acidified potassium dichromate(VI) solution?

_____

20) The following grid shows the formulae of eight organic compounds. Study it and then answer the questions below.

A 	B 	C 	D 
E 	F 	G 	H 

Write the symbol of the correct compound given in the table above in the spaces provided for the following statements:

a. It is produced in an equilibrium mixture. (____)

b. It is the simplest carboxylic acid. (____)

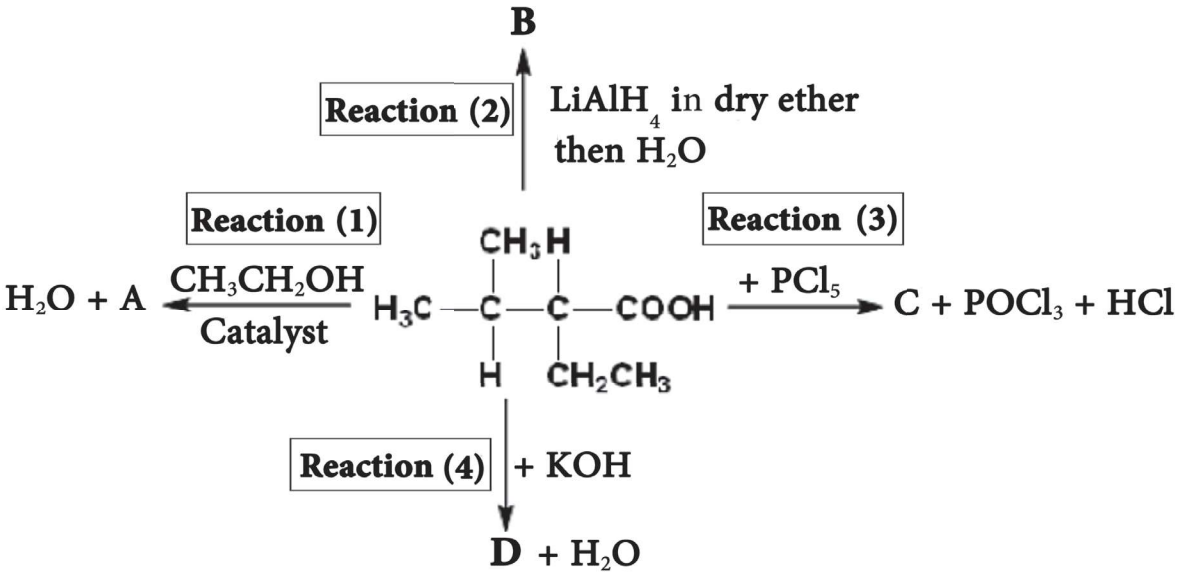
c. It is produced by the reaction of butanoic acid with PCl_5. (____)

d. It is produced by adding (NaOH) to propanoic acid. (____)

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Question 2 continued

21) A series of three chemical reactions starting with carboxylic acid was carried out as follows:



Study it and answer the following questions.

a. For reaction (1):

(i) What is the name of this reaction?

_____

(ii) Write the structural formula of compound (**A**).

_____

(iii) How can this reaction be speeded up?

_____

(iv) State two uses of compound (**A**) in industry.

_____

_____

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Question 2 continued

b. For reaction (2): What type of organic compound could compound (**B**) be?

_____

c. For reaction (3):

Draw the structural formula of compound (**C**).

_____

_____

d. For reaction (4): What type is compound (**D**)?

_____

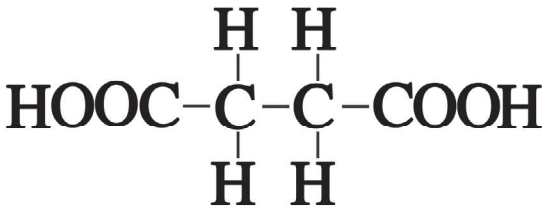
22) Compare low and high density polyethene in terms of melting points, bonding between chains and usage:

Comparison	Low Density	High Density
Melting Point		
Bonding between chains		
Usage		

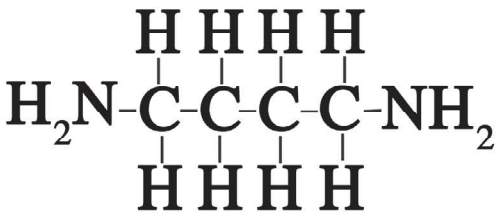
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Question 2 continued

23) Study the following two displayed structures of dicarboxylic acid and diamine, then answer the following questions.



Compound (A)



Compound (B)

a. Draw the polymer produced by the reaction of these two compounds showing two repeat units.

b. What is the common name for this polyamide?

c. What is the inorganic product in this reaction?

d. Explain why this polymer burns upon heating.

[End of Examination]

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