



- 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

Question 1: Multiple Choice Items**(28 marks)**

There are 14 multiple-choice items worth two marks each.

Shade in the bubble (☐) next to the **correct** answer for each of the following items.

- 1) Which of the following statements about ethanol is correct?
- ☐ Ethanol is a secondary alcohol.
- ☐ Ethanol burns with a clean flame.
- ☐ Dehydration of ethanol requires a strong base.
- ☐ Ethanol is produced in industry by using ethane as a raw material.
- 2) Which of the following compounds has the lowest boiling point?
- ☐ Ethane. ☐ Ethanol.
- ☐ Propane. ☐ Propan-1-ol.

Use the following information to answer question (3)

A student made the following statements about the reaction below:



- i. It is a halogenation reaction.
- ii. It is an electrophilic substitution reaction.
- iii. The product (X) in the reaction is H_2O .
- iv. The organic reactant undergoes breaking the C-O bond.

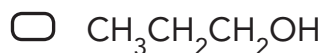
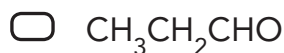
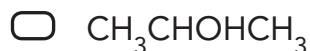
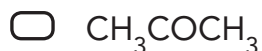
- 3) Which of the student's statements are correct?
- ☐ i and ii ☐ ii and iii
- ☐ i and iv ☐ iii and iv
- 4) Which of the following compounds reacts with ethanoic acid to produce a six carbons ester?
- ☐ Propan-2-ol. ☐ 2-methylpropan-1-ol.
- ☐ 2-methylbutan-2-ol. ☐ 2-ethylbutan-1-ol.

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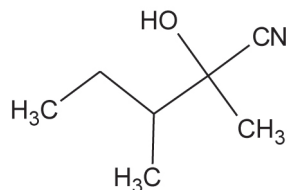
Question 1 continued

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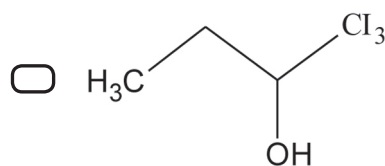
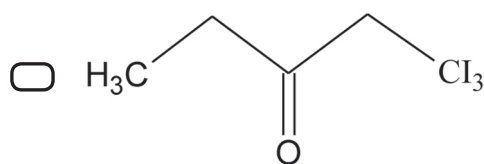
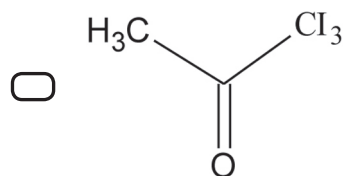
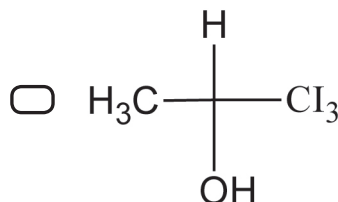
5) Which of the following compounds is not easily oxidized?



6) What is the IUPAC name of the reactant used to produce the following compound when it is reacted with HCN in the presence of NaCN?



7) Which of the following compounds can be a product of an iodoform reaction during halogenation?



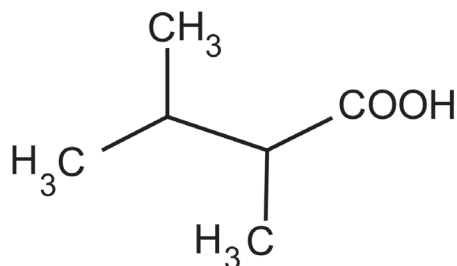
8) During saponification, which of the following materials is added to the reaction mixture to precipitate soap?



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Question 1 continued

- 9) What is the IUPAC name for the following compound?



- ☐ 3-methylbutanoic acid.
 ☐ 2-propylpropanoic acid.
 ☐ 2,3-dimethylbutanoic acid.
 ☐ 2,3,3-trimethylpropanoic acid.
- 10) Which of the following represents the reactants and the catalyst used for preparing butyl propanoate?

	reactants	catalyst
<input type="checkbox"/>	$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} + \text{CH}_3\text{CH}_2\text{COOH}$	OH^-
<input type="checkbox"/>	$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} + \text{CH}_3\text{CH}_2\text{COOH}$	H^+
<input type="checkbox"/>	$\text{CH}_3\text{CH}_2\text{CH}_2\text{OH} + \text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$	OH^-
<input type="checkbox"/>	$\text{CH}_3\text{CH}_2\text{CH}_2\text{OH} + \text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$	H^+

- 11) Which of the following compounds shows both acidic and basic properties?

- ☐ $\text{CH}_3\text{CH}_2\text{CN}$
☐ $\text{CH}_3\text{CH}_2\text{NH}_2$
☐ $\text{CH}_3\text{CH}_2\text{COCH}_3$
☐ $\text{H}_2\text{NCH}_2\text{COOH}$

- 12) Which of the following statements about benzene is incorrect?

- ☐ It is open to attack from electrophiles.
 ☐ It undergoes addition reactions under severe conditions.
 ☐ The carbons in the benzene ring form a symmetrical hexagon.
 ☐ The carbon-carbon bonds in benzene are hybrid but not equivalent.

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Question 1 continued

- 13) For the reaction below, which option gives the correct representation of reactant (X), product (Y) and type of reaction?



	Reactant (X)	Product (Y)	Type of reaction
<input type="radio"/>	Cl ₂	HCl	Nucleophilic substitution
<input type="radio"/>	2Cl ₂	3HCl	Nucleophilic substitution
<input type="radio"/>	Cl ₂	HCl	Electrophilic substitution
<input type="radio"/>	2Cl ₂	3HCl	Electrophilic substitution

- 14) Which of the following polymers is not a polyamide.

- ☐ Silk.
- ☐ Nylon.
- ☐ Kevlar.
- ☐ Terylene.

Extended Questions**(42 marks)**

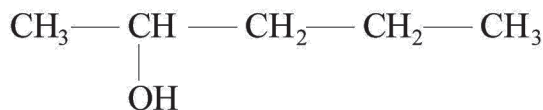
Write your answer for each of the following questions in the space provided.
Be sure to show all your work.

15) Ethylene glycol is added to car radiators during winter.

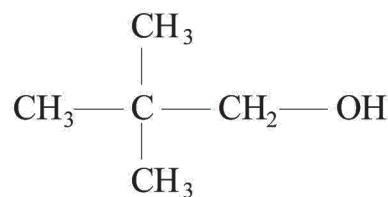
a. Draw the structural formula of ethylene glycol.

b. State **two** benefits of using ethylene glycol in car radiators.

16) The structures of two alcohols with formula $C_5H_{11}OH$ are shown below. Study them, then answer the following questions:



Alcohol (1)



Alcohol (2)

a. Name alcohol (2) according to IUPAC rules.

b. Which of the alcohols (1) or (2) will produce an aldehyde when oxidized?
Write the chemical equation for this reaction.

Selected alcohol (1 or 2): _____

Chemical equation: _____

Do not write in this space

Question 2 continued

- c. Alcohol (1) undergoes dehydration, producing two possible organic compounds. Draw the structural formulae of these two compounds.

- d. A third alcohol of formula $C_5H_{11}OH$ is not oxidized in ordinary conditions.

(i) Draw the structural formula of this alcohol

(ii) Explain why it is not oxidized in ordinary conditions.

- 17) Study the information given to 4 unbranched organic compounds in the table below, then answer the following questions. (Note: each compound has a carbonyl group)

Compound	Molecular formula	Reaction with Fehling's solution	Iodoform reaction
A	C_2H_4O	Red/orange precipitate	Yellow precipitate
B	C_3H_6O	Red/orange precipitate	No reaction
C	C_4H_8O	No reaction	Yellow precipitate
D	$C_5H_{10}O$	No reaction	No reaction

- a. Identify the family to which each compound above belongs?

Compound A : _____

Compound B: _____

Compound C: _____

Compound D: _____

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Question 2 continued

- b. Write the IUPAC name of compound (D).

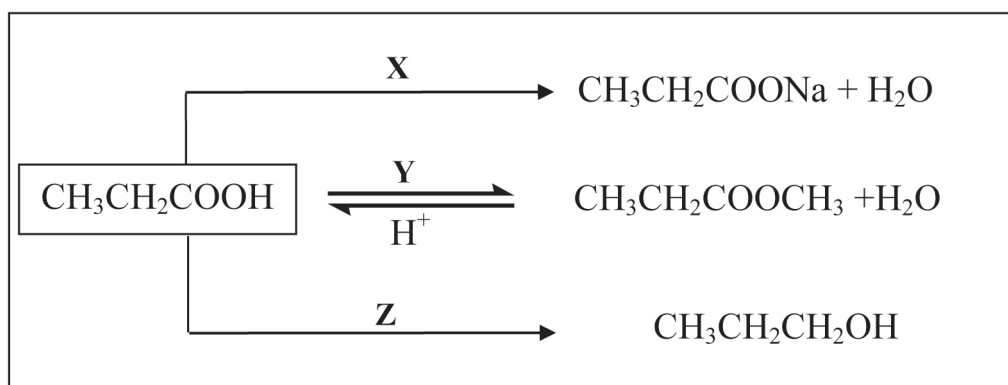
- c. Draw the structural formula of compound (B).

- d. What is the type of reaction of compound (A) with Fehling's solution?

- e. What is the molecular formula of the yellow precipitate formed in Iodoform reaction?

- f. Write the chemical equation for the reaction of compound (C) with hydrogen (H_2) using nickel as a catalyst.

- 18) A series of three chemical reactions was carried out as follows:



- a. Write the chemical formulae of the reagents represented by X, Y & Z.

X : _____

Y: _____

Z : _____

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Question 2 continued

- b. Which compound has stronger hydrogen bonds between its molecules $\text{CH}_3\text{CH}_2\text{COOH}$ or $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$? Explain your answer.

- 19) Starting with $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH}$, show the synthesis of $\text{CH}_3\text{CH}_2\text{CH}_2\text{COCl}$ by using chemical equations, suitable reagents, catalysts and conditions.

- 20) The table below shows four organic nitrogen compounds. Study the table and answer the following questions.

Compound (A)	Compound (B)	Compound (C)	Compound (D)
$\text{CH}_3\text{CH}_2\text{CHNH}_2\text{COOH}$	$(\text{CH}_3\text{CH}_2\text{CH}_2)_2\text{NH}$	$(\text{CH}_3)_3\text{N}$	$\text{C}_6\text{H}_5\text{NH}_2$

- a. To which group of organic nitrogen compounds does each of compound (A) and (D) belong?

Group of compound A: _____

Group of compound D: _____

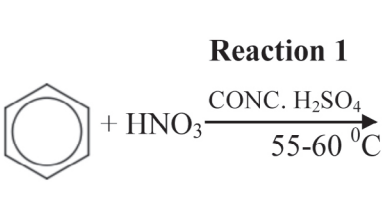
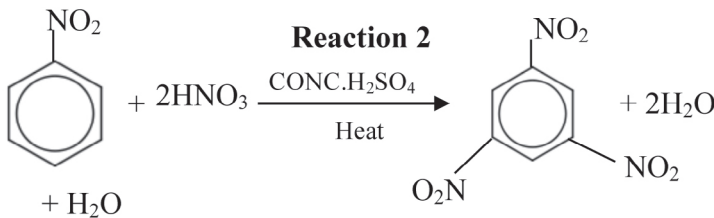
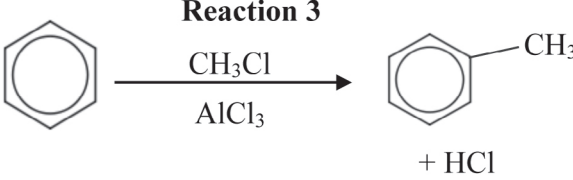
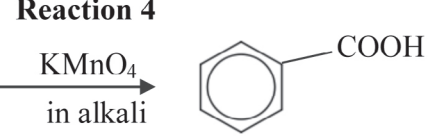

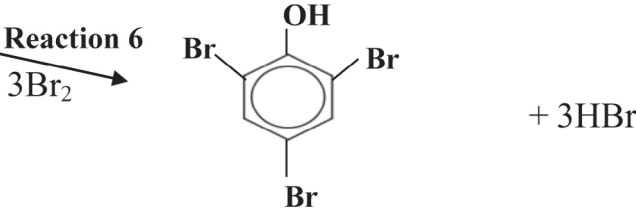
- b. Which compound (B or C) is a weaker base? Explain your answer.

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Question 2 continued

- c. Which compound from the table exhibits optical isomerism? Explain your answer.

- 21) The following table shows three different reaction series, study them then answer the questions below.

Series	Reactions
1	 
2	 
3	 

- a. Which reaction represents the following:

(i) Oxidation reaction: - _____

(ii) Alkylation reaction: - _____

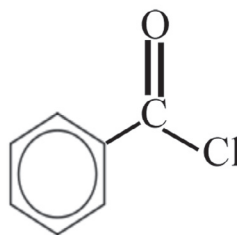
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Question 2 continued

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- b. Reaction (2) takes place at a slower rate compared to reaction (1). Explain why.

- c. If CH_3Cl in reaction (3) is replaced with the compound below, draw the structural formula of the new organic product.



- d. In Which two reactions the benzene ring is not attacked at all.

Reaction number _____

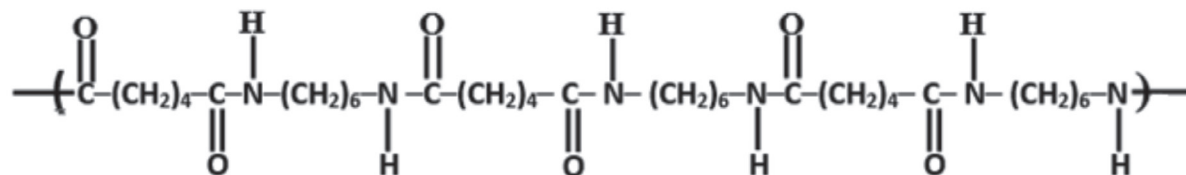
Reaction number _____

- e. If phenol is replaced with ethanol in reaction (5), no reaction will take place. Explain why.

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Question 2 continued

- 22) Consider the structural formula of the following part of polymer to answer the questions below.



- a. What is the type of polymerization by which this polymer is formed?

- b. Draw the structural formula(e) of the monomer(s) that form(s) this polymer.

- c. What is the functional group found in this polymer?

- d. A small inorganic molecule is eliminated as a product during the polymerisation reaction of this polymer.
 - (i) What is the formula of this inorganic product?

 - (ii) How many molecule(s) will be eliminated during the polymerisation reaction of this part of polymer?

[End of Examination]

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MARKING GUIDE



GENERAL EDUCATION DIPLOMA BILINGUAL PRIVATE SCHOOLS SEMESTER ONE - FIRST SESSION

CHEMISTRY
2017 / 2018

Exam Specifications:

Topics of the units	Weighting	Multiple choice (40%)		Extended response (60%)		Cognitive levels			Total
		Number of questions	Marks	Number of questions	Marks	Knowing (30%)	Applying (50%)	Reasoning (20%)	
Alcohols	25 %	4	8	3	10	5	9	4	18
Aldehydes & ketones	18 %	3	6		7	4	6	3	13
Carboxylic acids	18%	3	6		7	4	6	3	13
Nitrogen compounds	12%	1	2		6	3	4	1	8
Aromatic compounds	15 %	2	4		6	3	5	2	10
Polymers	12 %	1	2		6	2	5	1	8
Total	100%	14	28	3	42	21	35	14	70





Distribution of cognitive domains and marks.

Item	Mark	Unit	Page	Cognitive domain	Output
1	2	Alcohols	200	knowing	7
2	2	Alcohols	195	Applying	2
3	2	Alcohols	199	Applying	6.iv
4	2	Alcohols	197	Reasoning	6.iii
5	2	Aldehydes & ketones	223	knowing	5.i
6	2	Aldehydes & ketones	224	Reasoning	5.iv
7	2	Aldehydes & ketones	223	Applying	5.ii
8	2	Carboxylic acids	235	Knowing	7
9	2	Carboxylic acids	229	Applying	3
10	2	Carboxylic acids	231	Reasoning	5.iii
11	2	Nitrogen compounds	246	Applying	2
12	2	Aromatic compound	209-217	knowing	1,2
13	2	Aromatic compound	213	Applying	2iii
14	2	Polymers	254-256	knowing	1,5
15.a	1	Alcohols	201	knowing	8
15.b	2	Alcohols	201	knowing	8
16.a	1	Alcohols	195	Applying	4
16.b	2	Alcohols	196	Applying	6.i
16.c	2	Alcohols	199	Applying	6.v
16.d	2	Alcohols	196	Reasoning	3,6.i
17.a	2	Aldehydes & ketones	221	Reasoning	1,5.i,5.ii
17.b	1	Aldehydes & ketones	221	Applying	3
17.c	1	Aldehydes & ketones	221	Applying	4
17.d	1	Aldehydes & ketones	222	knowing	5.i
17.e	1	Aldehydes & ketones	223	knowing	5.ii
17.f	1	Aldehydes & ketones	223	Applying	5.iii

General Education Diploma, Semester One, First Session
Bilingual Private Schools, Chemistry, 2017/2018



Item	Mark	Unit	Page	Cognitive domain	Output
18.a	3	Carboxylic acids	230-231	applying	5.i, 5.ii,5.iii
18.b	1	Carboxylic acids	229	Knowing	2
19	3	Carboxylic acids	231	Applying	5.iv
20.a	2	Nitrogen compounds	239,246	Applying	1,2
20.b	2	Nitrogen compounds	240	Applying	3
20.c	2	Nitrogen compounds	247	Reasoning	4
21.a	2	Aromatic compound	214-217	Knowing	2iv,5
21.b	1	Aromatic compound	212,217	Knowing	2.i,4
21.c	1	Aromatic compound	212	Applying	2iv
21d	1	Aromatic compound	216,217	Reasoning	4,5
21e	1	Aromatic compound	216	Knowing	4
22a	1	Polymers	254,255	Applying	1,5
22b	2	Polymers	254,255	Applying	1,5
22c	1	Polymers	254-256	Knowing	1,5
22di	1	Polymers	254-256	Applying	1,5
22dii	1	Polymers	254-256	Reasoning	1,5

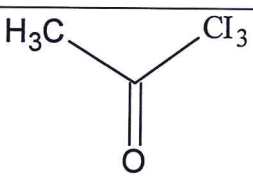


TOTAL MARKS: 70

PAGES: 5

Question One (28 Marks)

There are 14 multiple-choice items. Each correct answer worth TWO marks.

Item No.	Correct option								
1	b. ethanol burns with a clean flame.								
2	a. Ethane								
3	c. i and iv								
4	b. 2-methylpropan-1-ol								
5	a. CH ₃ COCH ₃								
6	d. 3-methylpentan-2-one.								
7	b. <div></div>								
8	a. Salt								
9	c. 2,3-dimethylbutanoic acid.								
10	b. CH ₃ CH ₂ CH ₂ CH ₂ OH + CH ₃ CH ₂ COOH H ⁺								
11	d. H ₂ NCH ₂ COOH								
12	d. The carbon-carbon bonds in benzene are hybrid but not equivalent.								
13	<table><tr><th></th><th><u>Reactant (X)</u></th><th><u>Product (Y)</u></th><th><u>Type of reaction</u></th></tr><tr><td>c.</td><td>Cl₂</td><td>HCl</td><td>Electrophilic substitution</td></tr></table>		<u>Reactant (X)</u>	<u>Product (Y)</u>	<u>Type of reaction</u>	c.	Cl ₂	HCl	Electrophilic substitution
	<u>Reactant (X)</u>	<u>Product (Y)</u>	<u>Type of reaction</u>						
c.	Cl ₂	HCl	Electrophilic substitution						
14	d. Terylene								



QUESTION TWO: Extended response (42 marks)

<u>Part</u>	<u>Section</u>	<u>The answer</u>	<u>The mark</u>
15	a.	CH ₂ OHCH ₂ OH	1 mark
	b.	<ul style="list-style-type: none"> - prevents the water from freezing, - prevents expanding and cracking the engine. - protects engines against corrosion. <i>Any two from above ,1mark for each.</i>	2 mark

<u>Part</u>	<u>Section</u>	<u>The answer</u>	<u>The mark</u>
16	a.	2,2-dimethylpropan-1-ol.	1 mark
	b.	Alcohol (2) (1 mark) <div style="text-align: center;"> $\begin{array}{c} \text{CH}_3 \\ \\ \text{H}_3\text{C}-\text{C}-\text{CH}_2-\text{OH} \\ \\ \text{CH}_3 \end{array} \xrightarrow[\text{heat}]{\text{K}_2\text{Cr}_2\text{O}_7/\text{H}^+} \begin{array}{c} \text{CH}_3 \\ \\ \text{H}_3\text{C}-\text{C}-\text{C}=\text{O} \\ \\ \text{CH}_3 \end{array}$ </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> (½ mark) (½ mark) </div> <p><i>If the student used KMnO₄ mark is given.</i></p>	2 mark
	c.	$\text{H}_2\text{C}=\text{CH}-\text{CH}_2-\text{CH}_2-\text{CH}_3$ (1 mark) $\text{H}_3\text{C}-\text{CH}=\text{CH}-\text{CH}_2-\text{CH}_3$ (1 mark)	2 mark
	d.	i. <div style="text-align: center;"> $\begin{array}{c} \text{CH}_3 \\ \\ \text{H}_3\text{C}-\text{C}-\text{CH}_2-\text{CH}_3 \\ \\ \text{OH} \end{array}$ </div> <p style="text-align: center;">(1 mark)</p> ii. Because it is a tertiary alcohol, or it does not have a hydrogen atom attached to the carbon bonded to the hydroxyl group, or It is impossible to oxidise a tertiary alcohol without breaking a C-C bond,. (1 mark)	2 mark

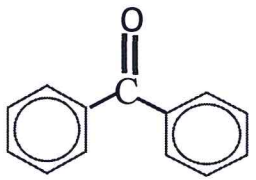


17	a.	compound A: aldehyde compound B: aldehyde compound C: ketone compound D: ketone <i>each correct compound worth (½ mark)</i>	2 mark
	b.	Pentan-3-one	1 mark
	c.	CH ₃ CH ₂ CHO	1 mark
	d.	Oxidation	1 mark
	e.	CHI ₃	1 mark
	f.	$\text{H}_3\text{C}-\text{CH}_2-\overset{\text{O}}{\parallel}{\text{C}}-\text{CH}_3 + \text{H}_2 \xrightarrow{\text{Ni catalyst}} \text{H}_3\text{C}-\text{CH}_2-\overset{\text{OH}}{\underset{ }{\text{CH}}}-\text{CH}_3$ <p><i>To get the mark all components of equation should be correct</i></p>	1 mark



<u>Part</u>	<u>Section</u>	<u>The answer</u>	<u>The mark</u>
18.	a	X : NaOH Y : CH ₃ OH Z : LiAlH ₄ Each answer worth 1 mark	(3mark)
	b	CH ₃ CH ₂ COOH (½ mark) Because its molecules pair up forming dimers (½ mark)	1 mark
19.		<p>(1) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} \xrightarrow[\text{[+O]}]{\text{K}_2\text{Cr}_2\text{O}_7/\text{H}^+} \text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ <div style="display: flex; justify-content: space-around; width: 100%;"> ½ ½ </div> </p> <p>or</p> <p>(1) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} \xrightarrow[\text{[+O]}]{\text{K}_2\text{Cr}_2\text{O}_7/\text{H}^+} \text{CH}_3\text{CH}_2\text{CH}_2\text{CHO} \xrightarrow[\text{[+O]}]{\text{K}_2\text{Cr}_2\text{O}_7/\text{H}^+} \text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$</p> <p>(2) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH} + \text{PCl}_5 \longrightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{COCl} + \text{POCl}_3 + \text{HCl}$ <div style="display: flex; justify-content: space-around; width: 100%;"> ½ ½ ½ ½ </div> </p> <p>OR</p> <p>(2) $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH} + \text{SOCl}_2 \longrightarrow \text{CH}_3\text{CH}_2\text{CH}_2\text{COCl} + \text{SO}_2 + \text{HCl}$ <div style="display: flex; justify-content: space-around; width: 100%;"> ½ ½ ½ ½ </div> </p> <p>If student used KMnO₄ instead of K₂Cr₂O₇ mark is given</p>	(3mark)
20	a.	Compound (A) : Amino acids Compound (D) : Amine Each answer 1 mark	(2 mark)
	b.	compound (C) (1 mark) Because compound (C) is a tertiary amine <u>or</u> It has three alkyl groups , so alkyl group would hinder the attack of a hydrogen atom, thus decreasing the basicity of the compound. (1 mark) <u>Or</u> Compound (B) is a secondary amine <u>or</u> It has two alkyl groups , each feedin electrons to nitrogen . This makes nitrogens lone pair more accessible in compound (B) than compound (C) .	(2 mark)
	c.	Compound (A) (1 mark) Because it has A chiral centre, or it has a carbon atom attached to four different groups. (1 mark)	(2 mark)



<u>Part</u>	<u>Section</u>	<u>The answer</u>	<u>The mark</u>
21	a.	i. Reaction 4 ii. Reaction 3 <i>-Each answer worth 1 mark.</i>	(2mark)
	b.	Because the NO ₂ group in nitrobenzene withdraws electrons from the delocalized ring, - or the availability of electrons for the electrophile in nitrobenzene is less than in benzene. -Or the source of electrons for the electrophile in nitrobenzene is less than in benzene <i>- For Any explanation from above mark is given.</i>	(1 mark)
	c.		(1 mark)
	d.	Reaction 4 Reaction 5 <i>-Each answer ½ mark.</i>	(1 mark)
	e.	Because ethanol is a very weak acid that does not react with KOH Or Because the negative charge on ethoxide ion will be concentrated on oxygen making the ion unstable. <i>Any answer from above mark is given.</i>	(1 mark)

<u>Part</u>	<u>Section</u>	<u>The answer</u>	<u>The mark</u>
22.	a.	condensation	(1mark)
	b.	HOOC(CH ₂) ₄ COOH Or ClOC(CH ₂) ₄ COCl (1 mark) H ₂ N(CH ₂) ₆ NH ₂ (1 mark)	(2mark)
	c.	Peptide or amide.	(1mark)
	d.i.	H ₂ O or HCl	(1mark)
	d.ii.	five / 5	(1mark)

This is the end of the Marking Guide