○ حاضر
○ غائب

Sultanate Of Oman
Ministry Of Education

امتحان شهادة دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)
للعام الدراسي ١٤٣٥/١٤٣٤هـ - ٢٠١٤/٢٠١٣م
الدور الأول - الفصل الدراسي الأول

- المادة: الكمياء (ثنائية اللغة).
- الأسئلة في (١٤) صفحة.
- زمن الاجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

تعليمات وضوابط التقدم للامتحان:

- الحضور إلى اللجنة قبل عشر دقائق من بدء الامتحان للأهمية.
- إبراز البطاقة الشخصية لمراقب اللجنة.
- يمنع كتابة رقم الجلوس أو الاسم أو أي بيانات أخرى تدل على شخصية الممتحن في دفتر الامتحان ، وإلا ألغي امتحانه.
- يحظر على الممتحنين أن يصطحبوا معهم بمركز الامتحان كتبا دراسية أو كراسات أو مذكرات أو هواتف محمولة أو أجهزة النداء الآلي أو أي شيء له علاقة بالامتحان كما لايجوز إدخال آلات حادة أو أسلحة من أي نوع كانت أو حقائب يدوية أو آلات حاسبة ذات صفة تخزينية.
- يجب أن يتقيد المتقدمون بالزي الرسمي(الدشداشة البيضاء والمصر أو الكمة للطلاب والدارسين والزي المدرسي للطالبات واللباس العماني للدارسات) ويمنع النقاب داخل المركز ولجان الامتحان.
- لا يسمح للمتقدم المتأخر عن موعد بداية الامتحان بالدخول إلا إذا كان التأخير بعذر قاهر يقبله رئيس المركز وفي حدود عشر دقائق فقط.
- يتم الالتزام بالإجراءات الواردة في دليل الطالب لأداء امتحان شهادة دبلوم التعليم العام.
- 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. ○ أبو ظبي.

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

صحيح ● غير صحيح ⊘ ⊗ ◒ ◉ ○

لاتكتب في هذا الجزء

لاتكتب في هذا الجزء

مُسَوَّدة، لا يتم تصحيحها

لاتكتب في هذا الجزء

لاتكتب في هذا الجزء

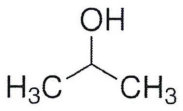
QUESTION ONE **(28 marks)**

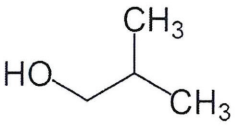
Shade in the bubble next to the best answer for each item.

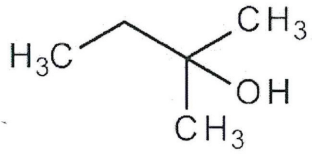
1. Which statement is true about CH_3-CH_2-OH?

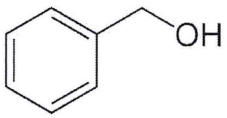
- ○ It is not miscible with water.
- ○ It gets dehydrated producing ethene.
- ○ It is produced from the oxidation of ethanal.
- ○ It reacts with sodium more vigorously than the reaction of water with sodium.

2. Which of the following alcohols is tertiary?

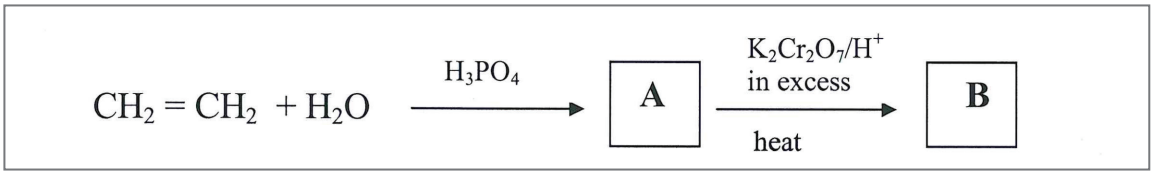
○ 

○ 

○ 

○ 

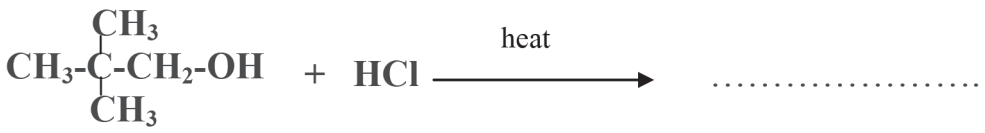
Consider the following reaction series to answer question (3)



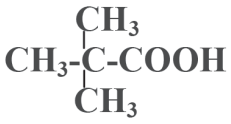
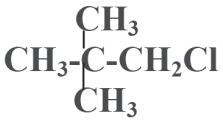
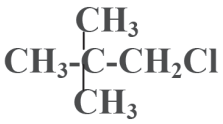
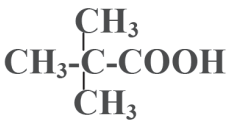
3. What is the organic product represented by (B) ?

- ○ Ethene.
- ○ Ethanal.
- ○ Ethanol.
- ○ Ethanoic acid.

Consider the following incomplete equation to answer question (4)



4. Choose the option that represents the type of this reaction and the organic product forms.

	Type of the reaction	Product
○	Oxidation	
○	Oxidation	
○	Halogenation	
○	Halogenation	

5. Which of the following statements about propanone is true?

○ It does not dissolve in water.

○ It can be oxidized by Tollen's Reagent.

○ It forms hydrogen bonds between its molecules.

○ It reacts with nucleophiles less readily than propanal.

6. According to the IUPAC rules, what is the <u>incorrect</u> ketone nomenclature?

- ○ 4- iodopentan-3-one.
- ○ 5- iodopentan-2-one.
- ○ 2- iodopentan-3-one.
- ○ 3- iodopentan-2-one.

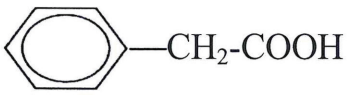
7. Which of the following compounds gives positive test with both Fehling's solution and alkaline iodine solution?

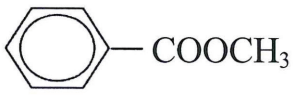
- ○ Ethanal.
- ○ Methanal.
- ○ Butanone.
- ○ Propanone.

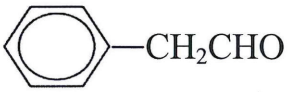
8. Which carboxylic acid provides the sting from biting ants and nettles?

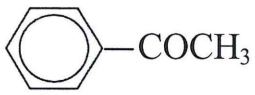
- ○ Methanoic acid.
- ○ Ethanoic acid.
- ○ 2-hydroxybutanoic acid.
- ○ 2-hydroxypropanoic acid.

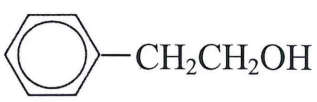
9. What is the structural formula of the organic compound produced when the following carboxylic acid reacts with $LiAlH_4$ in dry ether?



○ 

○ 

○ 

○ 

Use the following information to answer question (10)

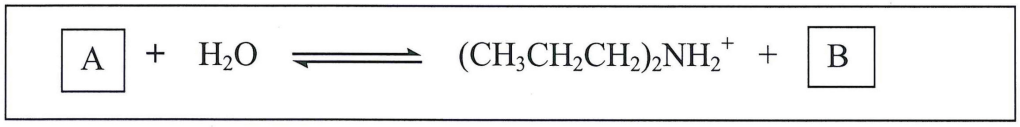
A student made the following predictions about the reaction below.

i. It is an oxidation reaction.
ii. (X) is an acid.
iii. (X) undergoes breaking the C-C bond.
iv. (X) molecules pair up forming dimers.

10. Which predictions are correct?

- ○ i and ii
- ○ ii and iv
- ○ ii and iii
- ○ iii and iv

11. For the following reaction:



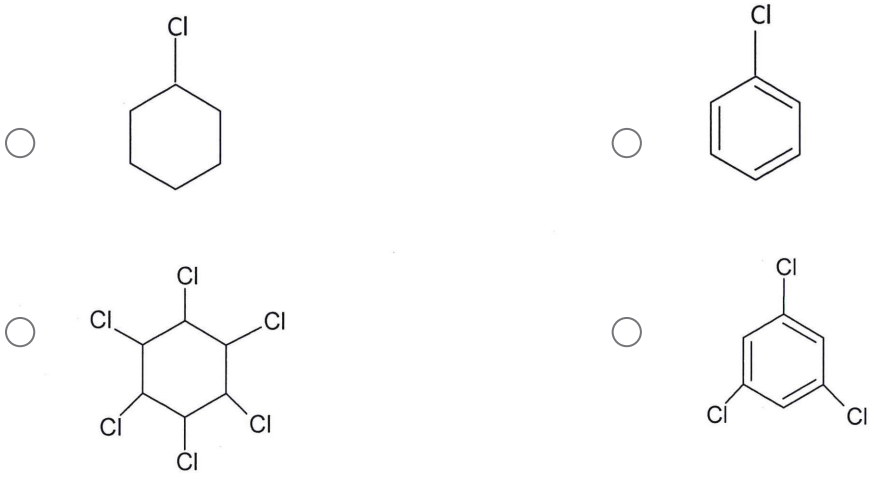
Which option gives the correct representation of reactant (A) and product (B)?

	Reactant (A)	Product (B)
○	Primary amine	OH^-
○	Secondary amine	OH^-
○	Primary amine	H^+
○	Secondary amine	H^+

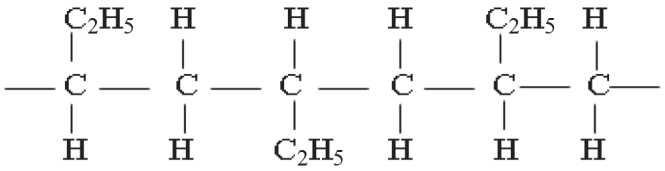
12. What is the type of the reaction below?

- ○ Addition.
- ○ Friedel-Crafts.
- ○ Electrophilic substitution .
- ○ Nucleophilic substitution .

13. What is the product from the reaction of benzene with(3 moles) of chlorine under sunlight ?



14. How many repeat units does the polymer below contain ?



- ○ 2
- ○ 3
- ○ 5
- ○ 6

QUESTION TWO **(14 marks)**

15. In the lab, a chemistry teacher divided his 12th grade students into (3) groups. He gave each group two conical flasks labelled (A) and (B) that contain two different alcohol solutions (propan-1-ol and propan-2-ol) .He asked each group to carry out an appropriate test in order to identify the alcohol in each conical flask .The tests and observations of each group are illustrated in table below.

Study it carefully then answer the following questions.

Group Test	Reagent	Observation	
		Alcohol (A)	Alcohol (B)
1	Addition of Na	Hydrogen gas released	Hydrogen gas released
2	Addition of $K_2Cr_2O_7\backslash H^+$	The colour of the solution changed	The colour of the solution changed
3	Addition of NaIO solution	Yellow precipitate	No precipitate

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A. Which group of students carried out the appropriate test to identify each alcohol?

B. Which alcohol was in conical flask (A)? Give reasons for your choice.

C. Write a balanced equation for the reaction of:

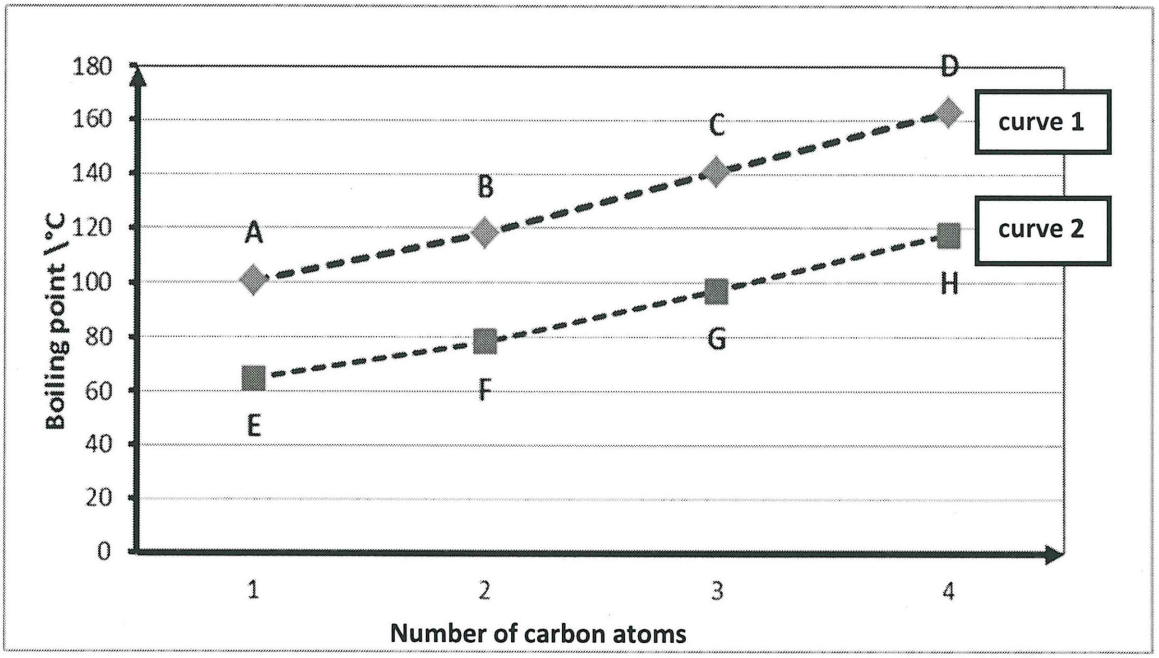
i. Alcohol Solution (B) with (Na).

ii. Alcohol Solution (A) with $K_2Cr_2O_7\backslash H^+$.

D. What is the change in colour in group(2) test?

E. What is the formula of yellow precipitate formed in group (3)test?

16. The following graph shows the boiling points for two different organic compound families (alcohols and carboxylic acids). One family is represented by curve (1) and the other by curve (2). Study it and answer the following questions.



A. Which curve represents carboxylic acids? Explain why.

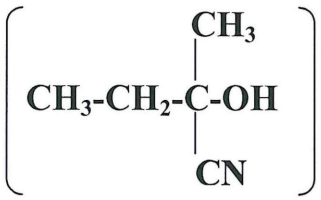
B. What type of organic product will be produced when any compound in curve (1) reacts with any compound in curve (2) in the presence of sulphuric acid and heating under reflux?

C. Write the chemical equation that represents heating compound (G) in curve (2) with concentrated sulphuric acid .

17. State two uses of ethylene glycol.

QUESTION THREE **(14 marks)**

18. Starting from butan-2-ol and by using suitable reagents , show the synthesis

of  using chemical equations .

19. Draw the structural formula for (3-bromo-2,2,4-trimethylpentanal) .

20. What is the IUPAC name of the aldehyde found in formalin solution ?

21. The grid below shows the formulae of eight organic compounds.Consider it to answer the following questions.

A $C_{17}H_{35}COONa$	**B** CH_3COOH	**C** $CH_3CH_2CH_2COOH$	**D** CH_3CH_2COOH
E $CH_3CH_2CH_2CH_2CH_2OH$	**F** CH_3CH_2OH	**G** $CH_3COOCH_2CH_2CH_3$	**H** $CH_3CH_3CH_2OH$

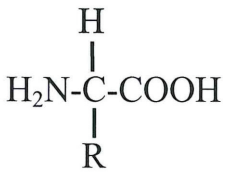
A. Which compound in the grid is formed by boiling up oil with alkaline solution?

B. Which two compounds from the grid are produced when compound (G)is hydrolyzed by a strong acid?

C. Which compound (B or C) has higher solubility in water? Explain your answer.

D. Write the chemical equation that shows the reaction of compound (C) with PCl_5.

22. The following structure shows the general formula of amino acid.



Two different amino acids represented by A and B are formed by replacing R as follows.

Amino acid	R
A	CH_3
B	H

A. What is the name of amino acid (A)?

B. Which amino acid from the table (A or B) does not exhibit optical isomerism? Explain why.

C. If the carboxylic group in amino acid (B) is replaced with (CH_3) , to which group of organic nitrogen compounds will the given compound belong ?

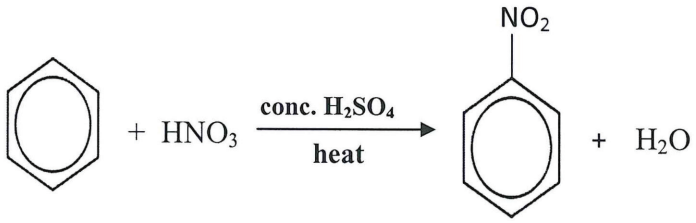
QUESTION FOUR **(14 marks)**

23. Which compound $(CH_3CH_2CH_2)_2NH$ or $CH_3CH_2CH_2NH_2$ is a weaker base? Explain Why.

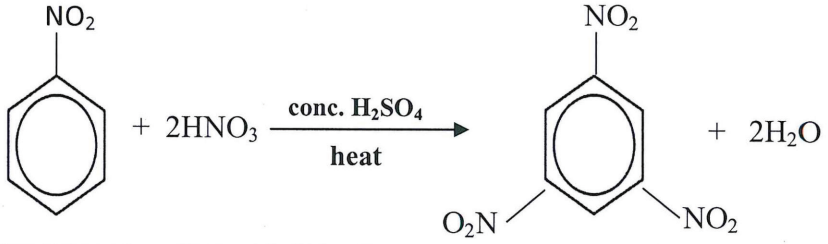
24.

Consider the following two reactions to answer the questions below

Reaction 1:



Reaction 2:



A. What is the name of reaction (1) ?

B. Shade in the (◯) to compare the rate of the two reactions

◯ Both of them have the same rate.

◯ Reaction1 is slower than reaction 2.

◯ Reaction1 is faster than reaction 2.

Give a reason for your choice.

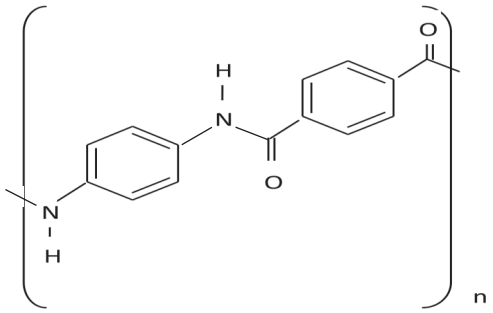
25.Use the suitable reactants and catalysts in the following table to write a balanced chemical equation of benzene that represents :

$CH_3CH_2CH_2Cl$	Cl_2
$AlCl_3$	NaOH
Ni	H_2SO_4

A. Friedel-Crafts reaction :

B. Halogenation reaction :

26. Kevlar is one of new developments in polymers. It is is very strong but flexible. These proprieties have led to Kevlar being used to make bullet-proof vests and reinforcement of other materials such as the rubber in tyres and tennis rackets. Based on the above information and the following structural formula of Kevlar, answer the given questions.



A. Draw The structural formula of the monomer(s) that form(s) Kevlar ?

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

C. What is the functional group found in this polymer?

D. Explain why the structure of this polymer is very strong?

27. Describe how photodegradable plastic breaks into smaller fragments ?

End of the Examination

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MARKING GUIDE

GENERAL EDUCATION DIPLOMA

BILINGUAL PRIVATE SCHOOLS

SEMESTER ONE - FIRST SESSION

CHEMISTRY

2013 / 2014

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.

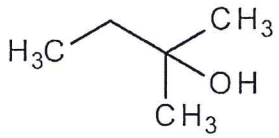
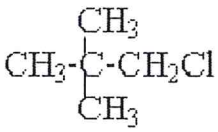
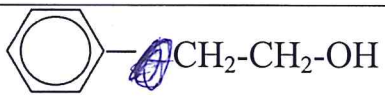
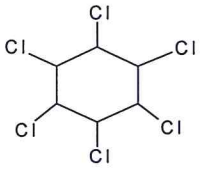
Serial. No	Question number	Item	Mark	Unit	Page	Cognitive domain	Output
1.	1	1	2	Alcohols	197	Knowing	6v
2.	1	2	2	Alcohols	196	Applying	3
3.	1	3	2	Alcohols	196	Reasoning	6i
4.	1	4	2	Alcohols	198	Applying	6iv
5.	1	5	2	Aldehydes & ketones	221-222	knowing	1 , 5i
6.	1	6	2	Aldehydes & ketones	221	Reasoning	3
7.	1	7	2	Aldehydes & ketones	222	Applying	5(i,ii)
8.	1	8	2	Carboxylic acids	229	Knowing	1
9.	1	9	2	Carboxylic acids	231	Applying	5(ii)
10.	1	10	2	Carboxylic acids	230	Reasoning	5(i)
11.	1	11	2	Nitrogen compounds	239,240	Applying	1,3
12.	1	12	2	Aromatic compounds	217	Knowing	4
13.	1	13	2	Aromatic compounds	215	Applying	3i
14.	1	14	2	Polymers	252	applying	4
15.	2	15. A	1	Aldehydes & ketones	222	Applying	5ii
16.	2	15. B	2	Alcohols	197	Reasoning	6i, 6ii
17.	2	15.Ci	2	Alcohols	221	Applying	6ii
18.	2	15.Cii	1	Alcohols	196	Applying	6i
19.	2	15.D	1	Aldehydes & ketones	221	Knowing	5i
20.	2	15. E	1	Aldehydes & ketones	221	Knowing	5ii
21.	2	16. A	2	Carboxylic acids	229	Applying	2
22.	2	16. B	1	Carboxylic acids	231	Knowing	5iii
23.	2	16. C	1	Alcohols	199	Applying	6v
24.	2	17	2	Alcohols	201	Knowing	8
25.	3	18	3	Aldehydes & ketones	224	Reasoning Applying	5

Serial. No	Question number	Item	Mark	Unit	Page	Cognitive domain	Output
26.	3	19. A	2	Alcohols	195-197	Applying	4
27.	3	19. B	1	Alcohols	195	Knowing	3
28.	3	20.A	1	Carboxylic acids	235	Knowing	7
29.	3	20.B	1	Carboxylic acids	234	applying	6
30.	3	20.C	1	Carboxylic acids	229	applying	2
31.	3	20.D	1	Carboxylic acids	231	Applying	5.iv
32.	3	21.A	1	Nitrogen compounds	247,249	Knowing	4
33.	3	21.B	2	Nitrogen compounds	246,247	Knowing	4
34.	3	21.C	1	Nitrogen compounds	247,249	Knowing	4
35.	4	22	2	Nitrogen compounds	240	Applying	3
36.	4	23.A	1	Aromatic compounds	212	Knowing	2i
37.	4	23.B	1	Aromatic compounds	217	Reasoning	4
38.	4	23.C	1	Aromatic compounds	217	Reasoning	4
39.	4	24.A	١ ½	Aromatic compounds	214	Applying	2 iv
40.	4	24.B	1½	Aromatic compounds	213	Applying	4
41.	4	25.A	2	Polymers	256	Reasoning	6
42.	4	25. B	1	Polymers	256	Applying	5
43.	4	25.C	1	Polymers	256	Applying	6
44.	4	25.D	1	Polymers	256	knowing	5
45.	4	26	1	Polymers	259	knowing	7

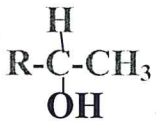
TOTAL MARKS: 70 **PAGES: 6**

Question One (28 Marks)

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

Item No.	Correct option
1	It gets dehydrated producing ethene
2	
3	Ethanoic acid
4	Halogenation 
5	It reacts with nucleophiles less readily than propanal.
6	4- iodopentan-3-one.
7	Ethanal
8	Methanoic acid.
9	
10	ii and iv
11	Secondary amine OH^-
12	nucleophilic substitution
13	
14	3

Question Two (14 Marks)

Part	Section	The answer	The mark
15.	A.	Group (3) test	(1mark)
	B.	propan-2-ol Because the iodoform reaction is used to detect the following structure  ***or*** there should be methyl group attached to the functional group to undergo the iodoform reaction and thus 2-propanol undergo the iodoform reaction.	(1 mark) (1 mark)
	C. i	$2CH_3CH_2CH_2\text{-}OH + 2\ Na \longrightarrow 2CH_3CH_2CH_2O^-Na^+ + H_2$	(2 marks) Each component ½ mark
	C. ii	$CH_3CHCH_3 \xrightarrow[\text{heat}]{K_2Cr_2O_7\backslash H^+} CH_3\text{-}C(=O)\text{-}CH_3$ OH (½) ; O (½)	(1 mark)
	D.	From orange to green.	(1 mark)
	E.	CHI_3	(1mark)
16.	A.	curve (1) . - carboxylic acid have higher boiling points than alcohols. - the hydrogen bonds in carboxylic acid are stronger than those of alcohols. - carboxylic acid molecules pair up forming dimers . ❖ *For any answer from above mark is given*	(1mark) (1mark)
	B.	Ester.	(1mark)
	C.	$CH_3CH_2CH_2OH \xrightarrow[\text{heat}]{\text{c. } H_2SO_4} CH_3CH{=}CH_2$ (½ ; ½) ***Or student can write equation for secondary alcohol with same result*** CH_3CHCH_3 OH	(1mark)

Continue Question Two (14 Marks)

Part	Section	The answer	The mark
17.		1. Antifreeze or added to radiators during winter or de-icing aeroplanes 2. Protects engines against corrosion.	(1mark) (1mark)

QUESTION Three (14 marks)

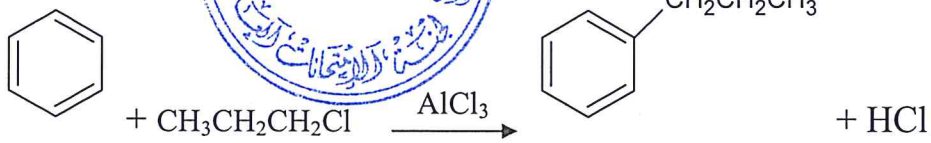
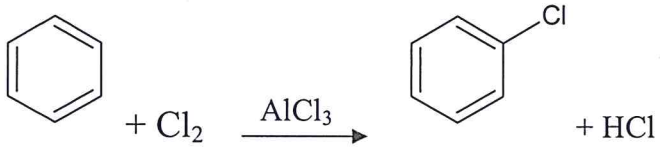
Part	Section	The answer	The mark
18.		$CH_3\text{-}\underset{\underset{OH}{|}}{CH}\text{-}CH_2CH_3 \xrightarrow[K_2Cr_2O_7\backslash H^+]{\text{oxidation or}} CH_3\text{-}\underset{\underset{O}{||}}{C}\text{-}CH_2CH_3 + H_2O$ ½ ½ 1 $CH_3\text{-}\underset{\underset{O}{||}}{C}\text{-}CH_2CH_3 + HCN \xrightarrow{NaCN} CH_3\text{-}CH_2\text{-}\underset{\underset{CN}{|}}{\overset{\overset{CH_3}{|}}{C}}\text{-}OH$ ½ ½	(2mark) (1marks)
19.	A.	$CH_3\text{-}\underset{\underset{CH_3}{|}}{\overset{\overset{Br}{|}}{CH}}\text{-}\underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}}\text{-}CHO$ - *(1 mark) is given for pentanal and(1 mark) for the branches in correct positions.*	(2 marks)
	B. 20	Methanal.	(1 mark)

Continue QUESTION Three (14 marks)

Part	*Section*	*The answer*	*The mark*
20	A	Compound (A) or $C_{17}H_{35}COONa$	(1 mark)
	B	**B** and **H** or CH_3COOH and $CH_3CH_3CH_2OH$. *To get the mark both compound should be correct.*	(1 mark)
	C	compound (B) or CH_3COOH - Because compound (B) (CH_3COOH , ethanoic acid) has more ability to form hydrogen bonds than compound (C) ($CH_3CH_2CH_2COOH$, butanoic acid). - Because compound (B) (CH_3COOH , ethanoic acid) has shorter non-polar hydrocarbon chain than compound (C) ($CH_3CH_2CH_2COOH$, butanoic acid), so it starts to have smaller effect, and the acid gets more soluble. - Because compound (C) ($CH_3CH_2CH_2COOH$, butanoic acid) has longer non-polar hydrocarbon chain than compound (B) (CH_3COOH, ethanoic acid), so it starts to have greater effect, and the acid gets less soluble.	(½ mark) (½ mark) *- For any answer mark is given.*
	D	$CH_3CH_2CH_2COOH + PCl_5 \longrightarrow CH_3CH_2CH_2COCl + POCl_3 + HCl$	(1 mark) *To get the mark, all components of the equation should be written correctly.*
21	**A**	Alanine.	(1 mark)
	B	B or amino acid B. because it does not contain a carbon bonded to four different groups or does not have a chiral centre	(1 mark) (1 mark)
	C	Amine	(1 mark)

Question Four (14 Marks)

Part	Section	The answer	The mark
22		$CH_3CH_2CH_2NH_2$ Because $CH_3CH_2NH_2$ is a primary amine. It has one alkyl group which donates electrons towards the nitrogen atom .On the other hand, $(CH_3CH_2CH_2)_2NH$ is a secondary amine. It has two alkyl group, each feeding electrons to nitrogen. This makes nitrogen's lone pair more accessible in$(CH_3CH_2CH_2)_2NH$ than in CH_3 $CH_2CH_2NH_2$ .The two ethyl groups also reduce the density of charge on the positive ion produced to a greater extent. • ***For any underlined sentence mark is given.***	(1 mark) (1 mark)
23	A.	Nitration reaction or electrophilic substitution	(1 mark)
	B.	Reaction1 is faster than reaction 2	(1 mark)
	C.	Because the $-NO_2$ in nitrobenzene withdraws electrons from the delocalized ring making the reaction slower than the reaction of benzene	(1 mark)

Part	Section	The answer	The mark
24 5	A.	 *- to get the mark all components should be right* *- If student dose not write catalyst , only (1)mark is given*	(1½ mark)
	B.	 *- to get the mark all components should be right* *- If student dose not write catalyst , (1) mark is given*	(1½ mark)
25	A.		(2marks) *- (1mark) for each monomer*
	B.	Condensation	(1mark)
	C.	Amide or peptide	(1mark)
	D.	Because it has extensive hydrogen bonding between its chains.	(1mark)
26		The carbonyl groups (C=O) in its chain breaks down due to absorption of energy from the near ultraviolet region of the electromagnetic spectrum .	(1mark)

This is the end of the Marking Guide