



حاضر

غائب

سُلْطَنَةُ عُومَانِ
وَزَارَةُ التَّوْرِيثِ وَالْبَحْثِ الْعِلْمِيِّ

امتحان شهادة دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

للعام الدراسي ١٤٣٣/١٤٣٤ هـ - ٢٠١٢ / ٢٠١٣ م

الدور الأول - الفصل الدراسي الأول

رقم الورقة	
رقم المغلف	

- زمن الإجابة: ثلاث ساعات.
- الإجابة في الورقة نفسها.

- تنبيه: المادة: الكيمياء.
- الأسئلة في (١٢) صفحة.

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 ألغى امتحانه.
- يحظر على الممتحنين أن يصطحبوا معهم بمركز الامتحان كتباً دراسية أو كراسات أو مذكرات أو هواتف محمولة أو أجهزة النداء الآلي أو أي شيء له علاقة بالامتحان كما لا يجوز إدخال آلات حادة 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 للمتقدمين 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 بدليل الطالب لأداء امتحان شهادة دبلوم التعليم العام.
- يقوم المتقدم بالإجابة عن أسئلة الامتحان بالقلم الحبر (الأزرق والأسود).
- 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، إمسح بعناية لإجراء التغيير.

صحيح غير صحيح

QUESTION ONE**(28 marks)**Shade in the bubble next to the **BEST** answer for each question.

1. The number of carbon atoms in the simplest tertiary alcohol is:

- | | |
|-------------------------|-------------------------|
| <input type="radio"/> 2 | <input type="radio"/> 3 |
| <input type="radio"/> 4 | <input type="radio"/> 5 |

2. The IUPAC name for $(\text{CH}_3)_3\text{CCH}(\text{OH})\text{CH}_2\text{CH}_2\text{CH}(\text{CH}_3)_2$ is :

- | | |
|--|--|
| <input type="radio"/> 2,2,6-trimethylheptan-3-ol | <input type="radio"/> 2,6,6-trimethylheptan-5-ol |
| <input type="radio"/> 1,1,1,6- tetramethylhexan-2-ol | <input type="radio"/> 2,6,6,6- tetramethylhexan-2-ol |

3. Which conclusion is incorrect about the reaction of propan-1-ol with sodium metal?

- Hydrogen gas is given off.
- Propan-1-ol acts as an acid.
- The organic product is sodium propanoate.
- The reaction involves breaking the O-H bond.

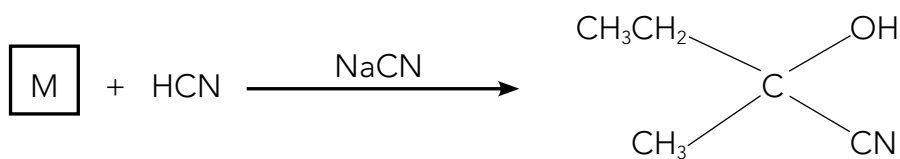
4. The compound $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$ is produced by reacting PBr_3 with :

- | | |
|---|--|
| <input type="radio"/> CH_3COCH_3 | <input type="radio"/> $\text{CH}_3\text{CH}_2\text{CHO}$ |
| <input type="radio"/> $\text{CH}_3\text{CH}_2\text{COOH}$ | <input type="radio"/> $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ |

5. What is the suitable reagent used to produce $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$ from $\text{CH}_3\text{CH}_2\text{CHO}$?

- | | |
|--|---|
| <input type="radio"/> $\text{Ag}(\text{NH}_3)_2^+$ | <input type="radio"/> $\text{H}_3\text{PO}_4/\text{H}_2\text{O}_{(\text{g})}$ |
| <input type="radio"/> KMnO_4 in alkali | <input type="radio"/> $\text{LiAlH}_4/\text{dry ether}$ |

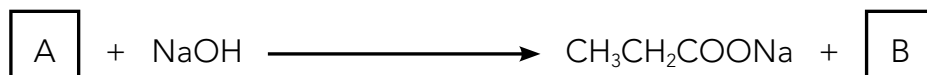
6. For the following reaction



The structural formula of reactant M is:

- $\text{CH}_3\text{COCH}_2\text{CH}_3$
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{CHO}$
 $\text{CH}_3\text{COCH}_2\text{CH}_2\text{CH}_3$
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CHO}$
7. The compound that gives yellow precipitate of iodoform when it reacts with an alkaline solution is
- pentan-1-ol
 pentan-3-ol
 pentan-2-one
 pentan-3-one
8. The carboxylic acid found in the vinegar solution is
- methanoic acid
 ethanoic acid
 propanoic acid
 butanoic acid
9. The structural formula of the organic compound produced by reacting butanoic acid with PCl_5 is:
- $\text{CH}_3\text{CH}_2\text{CH}_2\overset{\text{O}}{\parallel}{\text{C}}\text{-Cl}$
 $\text{CH}_3\text{CH}_2\text{CH}_2\overset{\text{O}}{\parallel}{\text{C}}\text{-O-Cl}$
 $\text{CH}_3\text{CH}_2\text{CH}_2\overset{\text{OH}}{\mid}{\text{CH}}\text{-Cl}$
 $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{-Cl}$

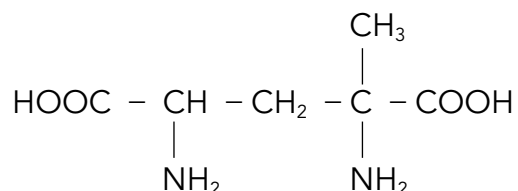
10. For the following reaction



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

	Reactant (A)	Product (B)
<input type="radio"/>	$\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	H_2
<input type="radio"/>	$\text{CH}_3\text{CH}_2\text{COOH}$	H_2
<input type="radio"/>	$\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$	H_2O
<input type="radio"/>	$\text{CH}_3\text{CH}_2\text{COOH}$	H_2O

11. The number of the chiral centre(s) in the following compound is:



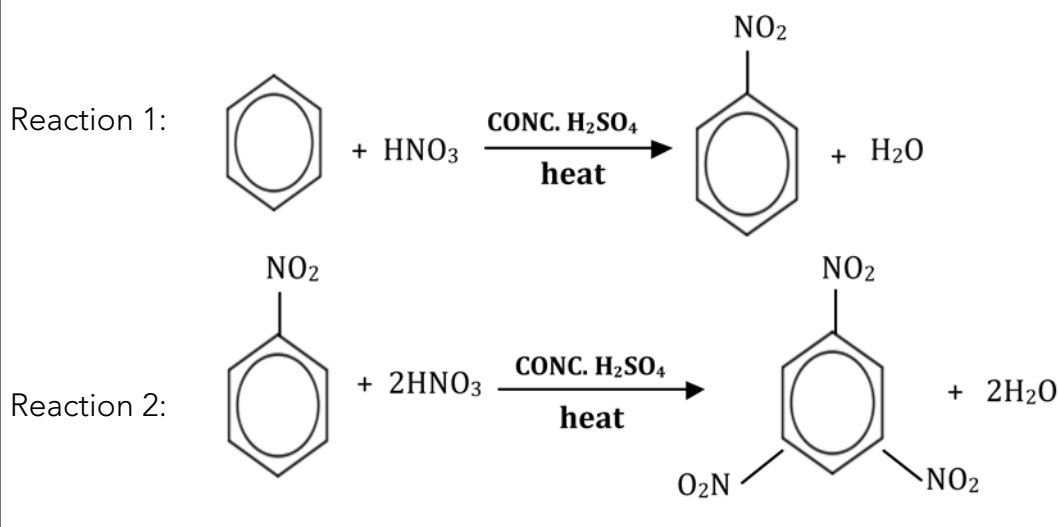
- 1 2
 3 4

12. All the following statements are correct about benzene except:

- in the side-chains reactions, the ring is not attacked.
 all the angles between the bonds in the ring are equivalent.
 it reacts with chlorine to produce chloro benzene under severe conditions.
 it undergoes electrophilic substitution reactions more readily than addition reactions.

Use the following information to answer questions 13

Consider the following two reactions:

**13. Which statement is correct about the two reactions?**

- Reaction 1 is slower than reaction 2.
- Both reactions have the same rate.
- Both reactions undergo electrophilic substitution.
- Reaction 1 undergoes electrophilic substitution whereas reaction 2 undergoes addition.

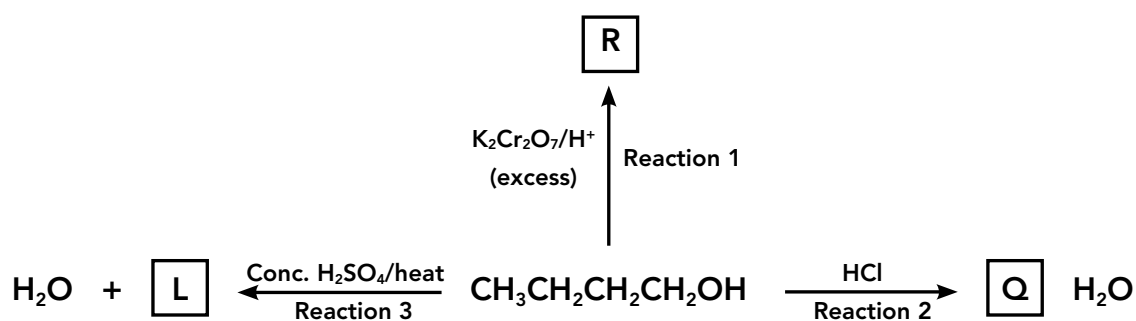
14. Which of the following properties belongs to thermosets?

- They can be remoulded.
- Their chains can be separated easily.
- They char and burn at low temperatures.
- They have covalent bonds between their chains.

QUESTION TWO**(14 marks)**

A. What is meant by fermentation of glucose?

B. A series of three chemical reactions was carried out as in the flowchart below. Study it then answer the following questions.



1. Draw the structural formulae of the organic compounds represented by (R , Q and L).

i. R: _____

ii. Q: _____

iii. L: _____

2. Identify the type of the following reactions:

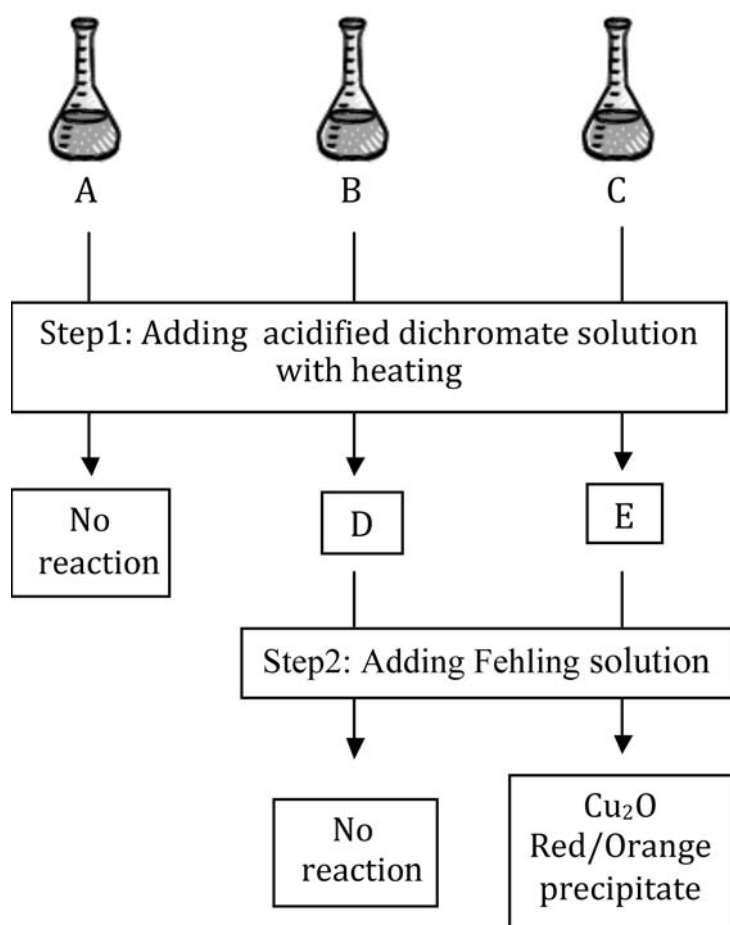
i. Reaction 1: _____

ii. Reaction 3: _____

Do not write in this space

- C. Both propanal and propanone react with HCN in presence of NaCN. Which one of them reacts more readily (propanal or propanone)? Explain your answer.

- D. A group of students investigated three unknown alcohols A, B & C that have the same molecular formula $C_4H_{10}O$. Their investigation steps and results are shown in the diagram below. Study it then answer the questions.



1. Which alcohol (A,B or C) is considered a primary alcohol?

2. What is the name of the functional group in compound (E)?

3. Draw the structural formula of :

i. Compound A: _____

ii. Compound D: _____

4. Explain why compound (A) did not react in step one.

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QUESTION THREE**(14 marks)**

A. Explain why pentanoic acid is less soluble in water than ethanoic acid.

B. The following grid shows the formulae of nine organic compounds. Study it and answer the questions below.

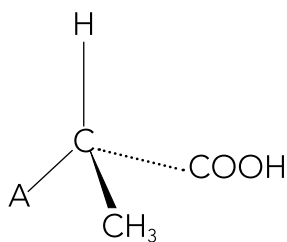
A $\text{CH}_3 - \text{CHO}$	B $\text{CH}_3 - \text{CH}_2 - \overset{\text{O}}{\parallel} \text{C} - \text{O} - \text{CH}_2\text{CH}_3$	C $\text{CH}_3 - \text{CH}_2 - \text{COOH}$
D $\text{CH}_3\text{CH}_2 - \text{OH}$	E $\text{C}_{17}\text{H}_{35}\text{COONa}$	F $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{OH}$
G $\text{CH}_3 - \overset{\text{O}}{\parallel} \text{C} - \text{O} - \text{CH}_3$	H $\text{C}_6\text{H}_5\text{COONa}$	I $\text{CH}_3 - \overset{\text{O}}{\parallel} \text{C} - \text{CH}_3$

- Write the symbol of the correct compound given in the grid above in the spaces provided for the following statements:
 - It is known as acetone. (_____)
 - It is produced by the reduction of compound (C). (_____)
 - It is formed by boiling up oil with alkali solution. (_____)
 - Two compounds react to produce compound (B). (_____) and (_____)
 - It has a carbonyl group and gives a positive test with Tollens' reagent. (_____)
- Write the chemical equations that represent the following:
 - The acid hydrolysis of compound (G).

 - The production of compound (D) from compound (A).

Do not write in this space

- C. The following structure shows an incomplete optical isomer of an organic nitrogen compound called alanine. Consider it and answer the following questions.



1. To which group of organic nitrogen compounds does alanine belong ?

2. Identify the formula of (A) to complete the structural formula of alanine.

3. Draw the other optical isomer of alanine.

4. What do we call those two optical isomers ?

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QUESTION FOUR**(14 marks)**

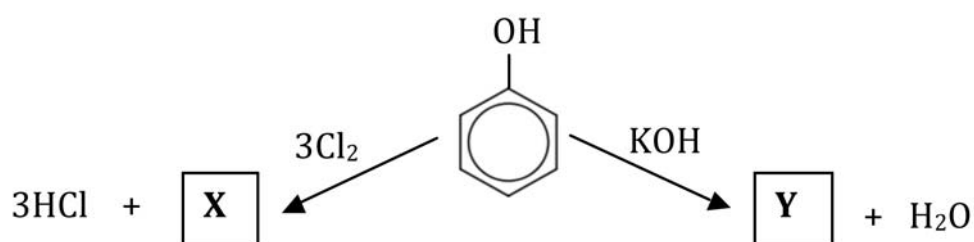
A. 1. A solution of a nitrogen compound (Z) reacts with water to give $(\text{CH}_3)_2\text{NH}_2^+$.

i. Identify the class of compound (Z) whether it is primary, secondary or tertiary.

ii. Explain why Compound (Z) acts as weak base.

2. Show the synthesis of benzoic acid starting from benzene using the chemical equations.

B. A series of two reactions of phenol was carried out as shown in the flowchart below. Consider it and answer the following questions.



1. Explain why phenol undergoes substitution reactions much more readily than benzene.

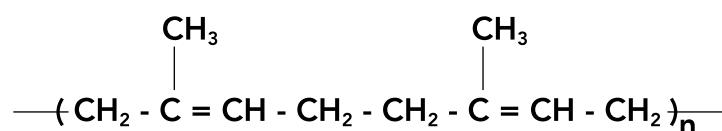
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2. Draw the structural formulae of the organic compounds (X) and (Y).

X _____

Y _____

- C. The following is the structural formula of a rubber polymer. Consider it then answer the questions below.



1. What type of polymerisation by which this polymer is formed?

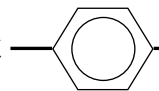
2. Explain why sulfur is added to this polymer in industry.

3. Draw the structural formula of the monomer that forms this polymer.

(Note that the above polymer has two repeat units).

Do not write in this space

- D. Study the given grid that contains six different monomers then answer the questions below.

A $\text{F}_2\text{C} = \text{CF}_2$	B $\text{ClOC}(\text{CH}_2)_4\text{COCl}$	C $\text{HO} - \text{CH}_2\text{CH}_2 - \text{OH}$
D $\text{HOOC}(\text{CH}_2)_4\text{COOH}$	E $\text{H}_2\text{N}(\text{CH}_2)_6\text{NH}_2$	F 

- Which two monomers form the polymer known as terylene?

- What is the name of the functional group in the polymer formed from the reaction of monomers B and E?

- Choose a suitable monomer from the grid to draw the structural formula of a polymer formed by addition polymerization. Draw two repeat units of this polymer.

[End of the Examination]

مُسَوِّدَة، لا يتم تصحيحها

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MARKING GUIDE



GENERAL EDUCATION DIPLOMA BILINGUAL PRIVATE SCHOOLS SEMESTER ONE - FIRST SESSION

CHEMISTRY

2012 / 2013



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		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	3	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



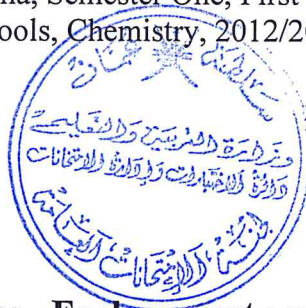
Distribution of cognitive domains and marks.

Serial. No	Question number	Item	Mark	Unit	Page	Cognitive domain	Output
1.	1	1	2	Alcohols	196	Knowing	1-3
2.	1	2	2	Alcohols	195-208	Applying	1-4
3.	1	3	2	Alcohols	196	Reasoning	1-6(ii)
4.	1	4	2	Alcohols	199	Applying	1-6(iv)
5.	1	5	2	Aldehydes & ketones	221-227	Applying	2-5(iii)
6.	1	6	2	Aldehydes & ketones	223	Reasoning	2-5(iv)
7.	1	7	2	Aldehydes & ketones	223-224	Applying	2-5(ii)
8.	1	8	2	Carboxylic acids	229	Knowing	3-1
9.	1	9	2	Carboxylic acids	231	Applying	3-5(iv)
10.	1	10	2	Carboxylic acids	229-237	Reasoning	3-5(i)
11.	1	11	2	Nitrogen compounds	247	Applying	4-4
12.	١	١٢	٢	Aromatic compounds	210,213	Knowing	5-1
13.	١	١٣	٢	Aromatic compounds	212,217	Applying	5- 2(i),4
14.	١	١٤	٢	Polymers	251	Knowing	6-3
15.	2	A	1	Alcohols	200	Knowing	1-1
16.	2	B.1-i	1	Alcohols	196	Applying	1-6(i)
17.	2	B.1-ii	1	Alcohols	197	Applying	1-6(iv)
18.	2	B.1-iii	1	Alcohols	199	Applying	1-6(v)
19.	2	B.2-i	1	Alcohols	196	Knowing	1-6(i)
20.	2	B.2-ii	1	Alcohols	199	Knowing	1-6(v)
21.	2	C	1	Aldehydes & ketones	224	Knowing	2-5(iv)
22.	٢	D.1	١	Alcohols	١٩٦	Applying	1-3
23.	٢	D.2	1	Aldehydes & ketones	٢٢٢	Knowing	2-2
24.	٢	D.3-i	1	Alcohols	195-199	Applying	1-5
25.	2	D.3-ii	١	Aldehydes & ketones	221-228	Applying	2-4
26.	2	D.4	2	Alcohols	196	Reasoning	1-6(i)

General Education Diploma, Semester One, First Session
Bilingual Private Schools, Chemistry, 2012/2013



Serial. No	Question number	Item	Mark	Unit	Page	Cognitive domain	Output
27	3	A	2	Carboxylic acids	229	Applying	3-2
28	3	B.1-i	1	Aldehydes & ketones	221	Knowing	2-2
29	3	B.1-ii	1	Carboxylic acids	231	Applying	3-5ii
30	3	B.1-iii	1	Carboxylic acids	235	Knowing	3-7
31	3	B.1-iv	1	Carboxylic acids	231	Applying	2-5iii
32	3	B.1-v	1	Aldehydes & ketones	222	Knowing	2-5i
33	3	B.2-i	1	Carboxylic acids	234	Reasoning	3-6
34	3	B.2-ii	1	Aldehydes & ketones	223	Reasoning	2-5iii
35	3	C.1	1	Nitrogen compounds	246	Knowing	4-2
36	3	C.2	2	Nitrogen compounds	246	Applying	4-2
37	3	C.3	1	Nitrogen compounds	247	Reasoning	4-4
38	3	C.4	1	Nitrogen compounds	247	Knowing	4-4
39	4	A.1-i	1	Nitrogen compounds	239	Applying	4-1
40	4	A.1-ii	1	Nitrogen compounds	244	Applying	4-1
41	4	A.2	2	Aromatic compounds	214,217	Reasoning	5-2(iii),5
42	4	B.1	1	Aromatic compounds	216	Knowing	5-4,5
43	4	B.2	3	Aromatic compounds	216	Applying	5-4.5
44	4	C.1	1	Polymers	252	Applying	6-4
45	4	C.2	1	Polymers	251	Applying	6-3
46	4	C.3	1	Polymers	252	Reasoning	6-4
47	4	D.1	1	Polymers	255	Applying	6-5
48	4	D.2	1	Polymers	255	Applying	6-5
49	4	D.3	1	Polymers	252	Applying	6-4



TOTAL MARKS: 70

PAGES: 5

Question One (28 Marks)

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

Item No.	Correct option				
1	4				
2	2,6,6-trimethylheptan-3-ol				
3	The organic product is sodium propanoate				
4	CH ₃ CH ₂ CH ₂ OH				
5	LiAlH ₄ / dry ether				
6	CH ₃ COCH ₂ CH ₃				
7	Pentan-2-one				
8	ethanoic acid				
9	$\begin{array}{c} \text{O} \\ \parallel \\ \text{CH}_3\text{CH}_2\text{CH}_2\text{C}-\text{Cl} \end{array}$				
10	<table style="width: 100%; border: none;"> <tr> <td style="text-align: center; border: none;"><u>Reactant A</u></td> <td style="text-align: center; border: none;"><u>Product B</u></td> </tr> <tr> <td style="text-align: center; border: none;">CH₃CH₂COOH</td> <td style="text-align: center; border: none;">H₂O</td> </tr> </table>	<u>Reactant A</u>	<u>Product B</u>	CH ₃ CH ₂ COOH	H ₂ O
<u>Reactant A</u>	<u>Product B</u>				
CH ₃ CH ₂ COOH	H ₂ O				
11	2				
12	It reacts with chlorine to produce chloro benzene under severe conditions				
13	Both reactions undergo electrophilic substitution				
14	They have covalent bonds between their chains				



Question Two (14 Marks)

A. The glucose is fermented with yeast to produce ethanol. (1 mark)

B. 1- i) R: $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$ (1 mark)

ii) Q: $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$ (1 mark)

iii) L: $\text{CH}_3\text{CH}_2\text{CH}=\text{CH}_2$ (1 mark)

2- i) Reaction 1: Oxidation reaction (1 mark)

ii) Reaction 3: dehydration reaction (1 mark)

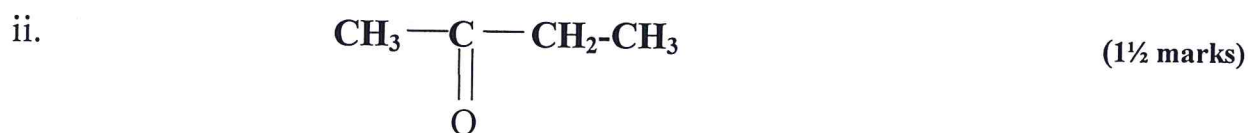
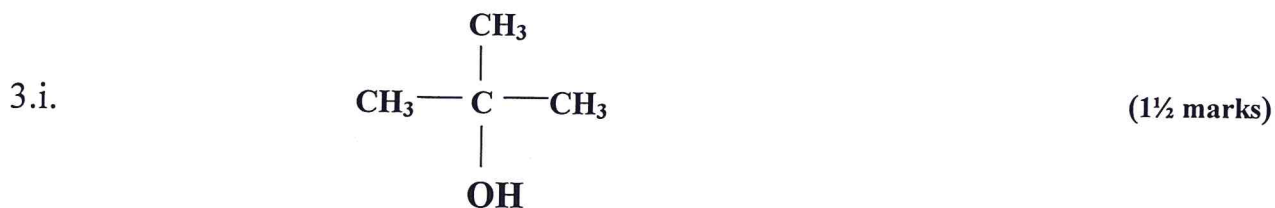
C. The propanal will reacts more readily. (1 mark)

Because, the propanal has only one alkyl group donating electrons to reduce the charge on the carbonyl carbon, while the propanone has two alkyl groups. Thus the δ^+ charge on carbonyl C atom in aldehyde is larger and therefore C-C breakage is easier. (1 mark)

• For any underlined sentence mark is given.

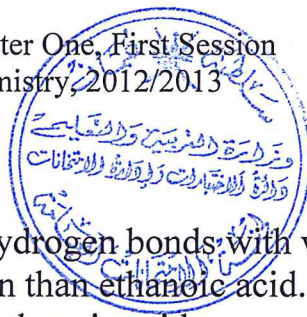
D. 1. Compound C (1 mark)

2. Aldehyde or Carbonyl (1 marks)



4. - Compund (A) is a tertiary alcohol that can not be oxidised by $\text{K}_2\text{Cr}_2\text{O}_7/\text{H}^+$
 - The carbon atom which is attached to OH does not contain a hydrogen atom
 - The C-C bond can not be broken by $\text{K}_2\text{Cr}_2\text{O}_7/\text{H}^+$. (1 mark)

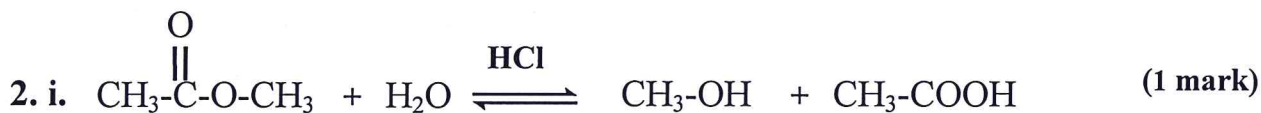
• For any answer from above mark is given.



Question Three (14 Marks)

- A. - pentanoic acid has a lower ability to form hydrogen bonds with water. (2 marks)
 - pentanoic acid has longer hydrocarbon chain than ethanoic acid.
 - pentanoic acid has bigger molar mass than ethanoic acid.
 • For any answer from above mark is given.

- B. 1-i. (I) or $\text{CH}_3\text{-}\overset{\text{O}}{\parallel}\text{C}\text{-CH}_3$
 ii. (F) or $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-OH}$
 iii. (E) or $\text{C}_{17}\text{H}_{35}\text{COONa}$
 iv. (C and D) or ($\text{CH}_3\text{-CH}_2\text{-COOH}$ and $\text{CH}_3\text{CH}_2\text{-OH}$) (6 marks)
 v. (A) or $\text{CH}_3\text{-CHO}$
 • One mark for each



- To get the mark, all components of the equation should be written correctly.
- If student writes HCl or H₂SO₄ or Acid, mark is given.

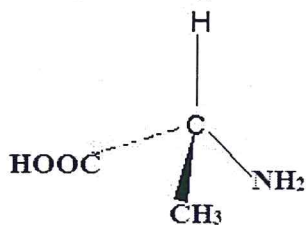


- To get the mark, all components of the equation should be written correctly.
- If student writes the reducing agents LiAlH₄ in dry ether or H₂/Ni, mark is given.

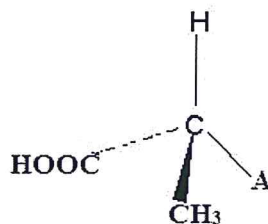
- C. 1. Amino Acids (1 mark)

2. (A): -NH₂ or NH₂ (1 mark)

3.



or



(1 mark)

- To get the mark, all components of the structure should be drawn correctly.

4. Enantiomers. (1 mark)



Question Four (14 Marks).

A. 1-i) Secondary.

(1 mark)

ii) - Compound (Z) is an amine which known as a weak base.

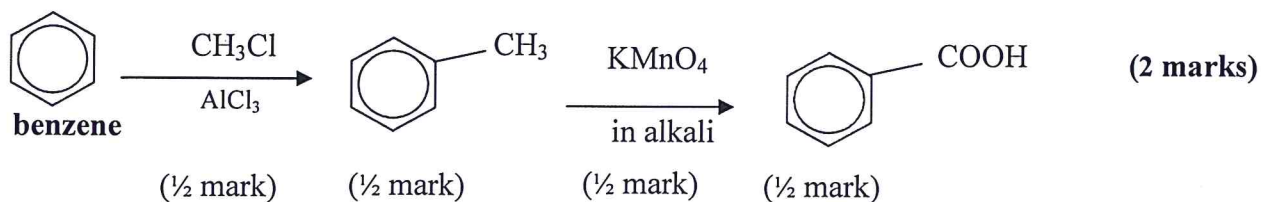
(1 mark)

- Compound (Z) accepts an H^+ ion from the water.

- The lone pair of electrons on the nitrogen atom in Compound (Z) forms a dative bond with the H^+ bond.

• For any answer from above mark is given.

2.



• Oxidation or [O] or any proper oxidizing agent, $\frac{1}{2}$ mark is given

B.1)

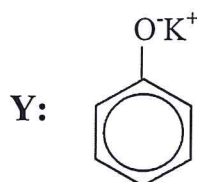
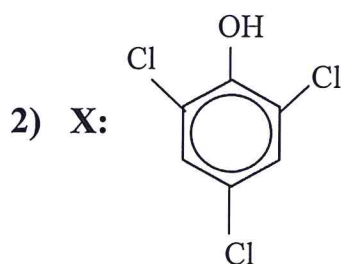
(1 mark)

- The OH in phenol is an electron donating group.

- There are two lone pairs of electrons on the oxygen atom of phenol that are drawn towards the delocalized system around the benzene ring.

- The two lone pairs of electrons on the oxygen atom are donated in the benzene ring.

• Any answer from above mark is given.



(3 marks)

• For each compound ($\frac{1}{2}$ mark).



C. 1. addition polymerisation

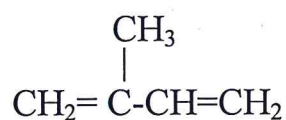
(1 mark)

2. To be more durable or to make it harder wearing or to make it stronger or to vulcanise it or to make sulfur bridges or cross links between the rubber chains.

(1 mark)

• For any answer, mark is given.

3.



(1 mark)

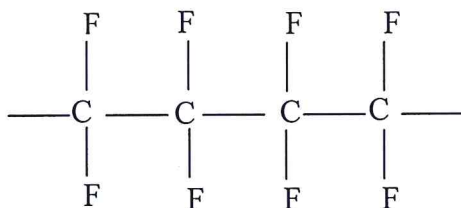
D. 1. C and F

(1 mark)

2. Amide

(1 mark)

3.



(1 mark)

This is the end of the Marking Guide