رقم الورقة	
رقم المغلف	

حاضر ○

غائب ○

سلطنة عمان
وزارة التربية والتعليم

امتحان شهادة دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

للعام الدراسي ١٤٣٣/١٤٣٤ هـ - ٢٠١٢ / ٢٠١٣ م

الدور الثاني - الفصل الدراسي الأول

تنبيه:
- المادة: الكيمياء.
- زمن الإجابة: ثلاث ساعات.
- الأسئلة في (١١) صفحة.
- الإجابة في الورقة نفسها.

تعليمات وضوابط التقدم للامتحـان

- الحضور إلى اللجنة قبل عشر دقائق من بدء الامتحان للأهمية.
- إبراز البطاقة الشخصية لمراقب اللجنـة.
- 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 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 - عاصمـة سلطنة عمـــان 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 buble next to the **BEST** answer for each question.

1. All the following statements belong to primary alcohols except:

- the smaller primary alcohols are miscible with water.
- they can be dehydrated to produce corresponding alkanes.
- their boiling points are higher than corresponding alkanes.
- they can be oxidised to produce corresponding aldehydes.

2. The structural formula of 3,3-dimethylbutan-2-ol is:

- $(CH_3)_3CCHOHCH_3$
- $(CH_3)_3CCH_2CH_2OH$
- $(CH_3)_2COHCH_2C_2H_5$
- $(CH_3)_2COHCH(CH_3)_2$

3. Which compound is not oxidised by acidified potassium dichromate solution?

- $CH_3(CH_2)_2CHO$
- $(C_2H_5)_2COHCH_3$
- $CH_3C(CH_3)_2CH_2OH$
- $(CH_3)_2CHCHOHCH_3$

4. Consider the following reaction:

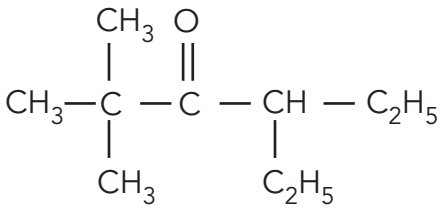
$$CH_3CH_2CH_2OH + HCl \longrightarrow CH_3CH_2CH_2Cl + H_2O$$

Which statement is incorrect about this reaction?

- It is a halogenation reaction.
- The halide ion acts as a nucleophile.
- The reaction involves breaking the C-O bond.
- It is an example of electrophilic substitution reactions.

5. The IUPAC name for the following compound is:

- ▢ 3-ethyl-5,5-dimethylhexan-4-one.
- ▢ 4-ethyl-2,2-dimethylhexan-3-one.
- ▢ 3-ethyl-5,5,5-trimethylpentan-4-one.
- ▢ 3-ethyl-1,1,1-trimethylpentan-2-one.



6. Which of the following reactions involves a sequence of halogenation, oxidation and cleavage of C-C bond?

- ▢ Ethanol with HCl.
- ▢ Propan-1-ol with PI_3.
- ▢ Butanone with NaIO.
- ▢ Ethanoic acid with PCl_5.

Use the following information to answer question (7).

A student has been asked to make predictions about the reaction below:

$$C_3H_6O \xrightarrow{NaBH_4/H_2O} C_3H_8O$$

His predictions were as follows:

i. It is a reduction reaction.

ii. Both C_3H_6O and C_3H_8O have a carbonyl group.

iii. C_3H_6O is a ketone whereas C_3H_8O is a secondary alcohol.

iv. C_3H_6O is a primary alcohol whereas C_3H_8O is an aldehyde.

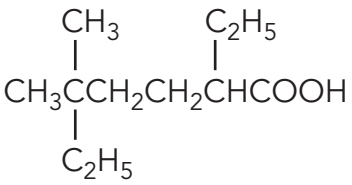
7. Which predictions he made are correct?

- ▢ i and iii
- ▢ ii and iii
- ▢ i and iv
- ▢ ii and iv

8. The soap molecules are produced by the reaction of:

- ▢ oil with hydrochloric acid.
- ▢ oil with sodium hydroxide.
- ▢ glycerol with hydrochloric acid.
- ▢ glycerol with sodium hydroxide.

9. The IUPAC name for the following compound is:



- ☐ 2,5-diethyl-5-methylhexanoic acid.
- ☐ 2-methyl-2,5-diethylhexanoic acid.
- ☐ 2,5-diethyl-2-methylheptanoic acid.
- ☐ 2-ethyl-5,5-dimethylheptanoic acid.

10. One of the following statements belongs to ethanoic acid:

- ☐ it can be oxidised by $K_2Cr_2O_7$ to ester.
- ☐ it has lower boiling point than of ethanol.
- ☐ it forms ethanoate when reacts with NaOH.
- ☐ it is less soluble than butanoic acid in water.

11. Which of the following compounds is amide?

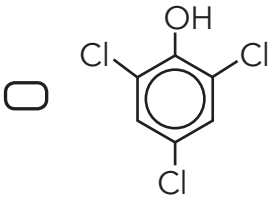
- ☐ $CH_3CH_2CH_2CN$
- ☐ $(CH_3CH_2CH_2)_3N$
- ☐ $H_2NCH_2CH_2COOH$
- ☐ $CH_3CH_2CH_2CONH_2$

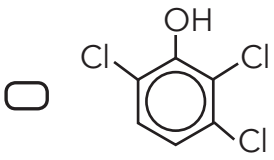
12. One of the following statements about phenol is incorrect:

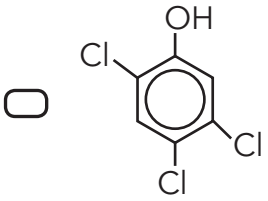
- ☐ It is more acidic than ethanol.
- ☐ It reacts with strong alkali to produce phenoxide.
- ☐ It requires a catalyst to react with bromine water.
- ☐ It undergoes substitution reactions much more readily than benzene.

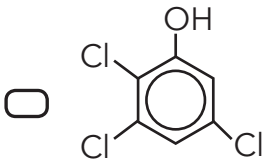
13. In the following reaction:

The structural formula of the compound represented by (X) is:









14. Which of the following properties does not belong to thermoplastics?

- They can be remoulded.
- They soften when heated.
- Their chains can be separated relatively easy.
- They have covalent bonds between their chains.

QUESTION TWO (14 marks)

15. Ethanol is considered as the fuel of the future. In industry it is manufactured on large scales either from ethene as a raw material or from glucose. Based on these information answer the following questions.

i. Write the chemical equation that indicates the production of ethanol from ethene.

_____

ii. What are the conditions of temperature and pressure required to produce ethanol from ethene?

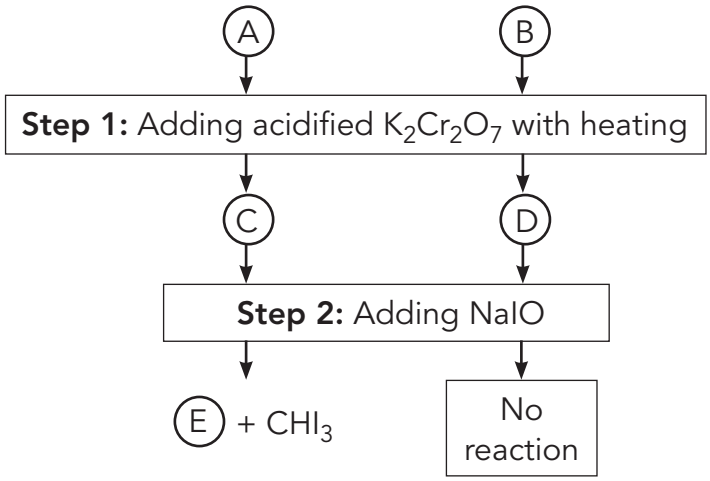
_____

_____

iii. Name the process of ethanol production from glucose.

_____

16. **Two unknown alcohols (A and B) have the same molecular formula but different structural formula. Each alcohol has 4 carbon atoms. They were identified in two steps as shown in the flowchart below. Study it then answer the questions.**



i. What is the name of the reaction in step (2)?

_____

ii. Draw the structural formulae of compounds (A, B, C and E)

Compound (A): _____

Compound (B): _____

Compound (C): _____

Compound (E): _____

iii. Identify the functional group in compound (D).

_____

17. Write the chemical equations that represent the following:

i. Reaction of propan-2-ol with PBr_5.

_____

ii. Dehydration of propan-1-ol.

_____

iii. Addition of HCN to propanone in the presence of NaCN.

_____

QUESTION THREE (14 marks)

18. Most aldehydes give positive tests with both Tollens' and Fehling's reagents.

i. What are the formulae of the precipitates formed when an aldehyde reacts with each reagent?

Tollens' reagent: _____

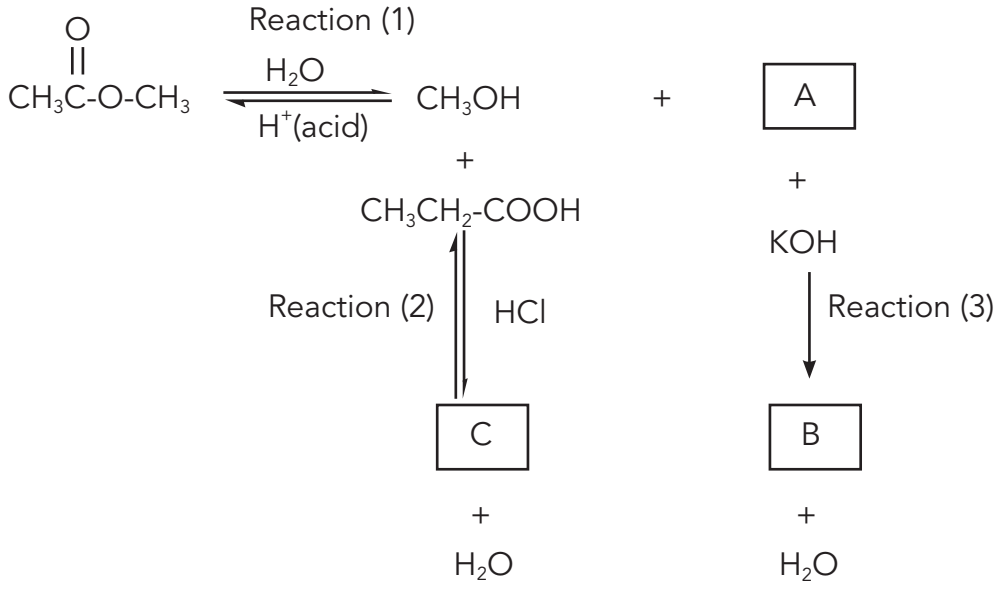
Fehling's solution: _____

ii. Pentan-1-ol has lower boiling point than butanoic acid although they have the same relative molecular mass. Explain why.

_____

_____

19. A series of three chemical reactions was carried out as shown below. Study it then answer the questions.



i. Indicate the number of the reaction from the series that represents:

Hydrolysis: _____

Esterification: _____

ii. Draw the structural formulae of the organic compounds (A) , (B) and (C).

A: _____

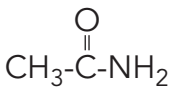
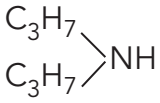
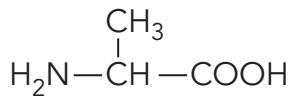
B: _____

C: _____

iii. Write the chemical equation that shows the reduction of compound (A) with $LiAlH_4$ in dry ether.

_____

20. The following grid shows the formulae of six organic compounds. Consider it and answer the below questions.

A 	**B** $CH_3\text{-}CH_2\text{-}CH_2\text{-}NH_2$	**C** $CH_3\text{-}CH_2\text{-}CH_2\text{-}C{\equiv}N$
D $HCHO$	**E** 	**F** 

i. Which compound from the grid:

A: is a secondary amine. _____

B: is a nitrile. _____

C: has a chiral centre . _____

D: its solution known as formalin. _____

ii. Write the chemical equation that shows the reaction of compound (B) with HBr .

_____

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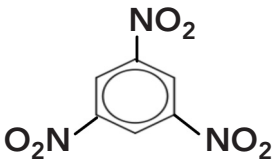
QUESTION FOUR (14 marks)

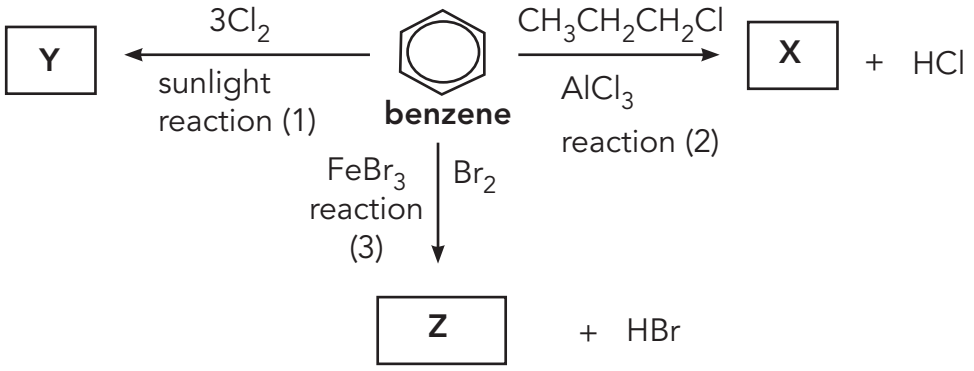
21.

i. Explain why $(CH_3)_2NH$ is more basic than CH_3NH_2.

ii. Show the synthesis of [1,3,5 trinitrobenzene] starting from benzene by using the chemical equations.



22. A series of three chemical reactions was carried out as follows



i. Which reaction from the series represents addition reaction?

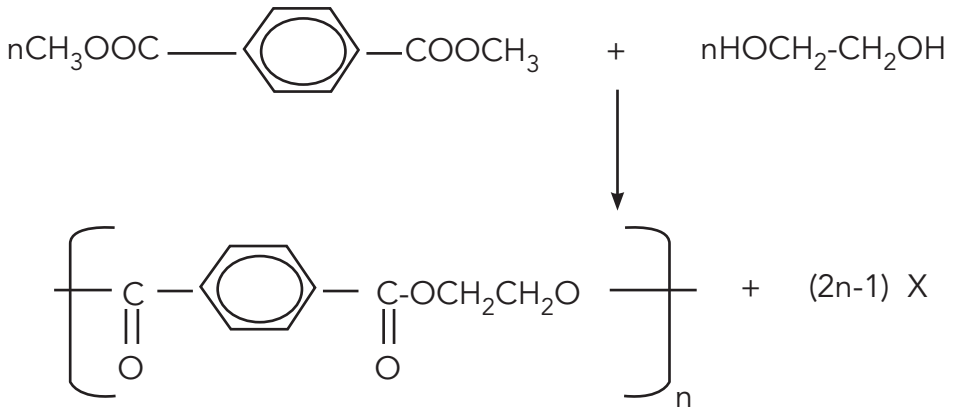
ii. Draw the structural formulae of the organic compounds (X),(Y) and (Z).

X:

Y:

Z:

23. The following shows a polymerisation reaction. Study it then answer the questions below.



i. What is the functional group found in the polymer formed in this reaction?

_____

ii. The product X is a small molecule eliminated during the polymerisation reaction. What is name or formula of X?

_____

iii. Identify the type of the polymerisation in this reaction.

_____

24. Poly(ethene) is a polymer forms from ethene ($CH_2=CH_2$) in an addition polymerisation reaction. It has two types; high density polythene and low density polythene .

i. What is the difference between the chains of high density polythene and those of low density polythene ?

ii. Draw the structural formula of poly(ethene) with three repeat units.

[End of the Examination]

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MARKING GUIDE

GENERAL EDUCATION DIPLOMA

BILINGUAL PRIVATE SCHOOLS

SEMESTER ONE - SECOND SESSION

CHEMISTRY

2012 / 2013

General Education Diploma, Semester One, Second Session
Bilingual Private Schools, 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	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

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

Distribution of cognitive domains and marks.

Serial. No	Question number	Item	Mark	Unit	Page	Cognitive domain	Output
1	1	1	2	Alcohols	199	Knowing	6v
2	1	2	2	Alcohols	196	Applying	3
3	1	3	2	Alcohols	196	Applying	6(i)
4	1	4	2	Alcohols	198	Reasoning	6iv
5	1	5	2	Aldehydes & ketones	221	Applying	3
6	1	6	2	Aldehydes & ketones	223	Applying	5(ii)
7	1	7	2	Aldehydes & ketones	223	Reasoning	5(iii)
8	1	8	2	Carboxylic acids	235	Knowing	7
9	1	9	2	Carboxylic acids	229	Applying	3
10	1	10	2	Carboxylic acids	229-233	Reasoning	1
11	1	11	2	Nitrogen compounds	244	Applying	1
12	1	12	2	Aromatic compounds	216	Knowing	4
13	1	13	2	Aromatic compounds	216	Applying	4
14	1	14	2	Polymers	251	Knowing	3
15	2	A.1	1	Alcohols	200	Knowing	7
16	2	A.2	1	Alcohols	200	Knowing	7
17	2	A.3	1	Alcohols	200,195	Knowing	1,7
18	2	B.1	1	Alcohols	196	Applying	5i
19	2	B.2	4	Alcohols,Aldehydes & ketones	196,223	Applying	6i,5ii
20	2	B.3	1	Aldehydes & ketones	221	Knowing	1
21	2	C1	2	Alcohols	198	Reasoning	6(iv)
22	2	C2	2	Alcohols	199	Reasoning	6(v)
23	2	C3	1	Aldehydes & ketones	224	Knowing	5(iv)
24	3	A.1	2	Aldehydes & ketones	223	Applying	5(i)
25	3	A.2	2	Carboxylic acids	229	Knowing	2

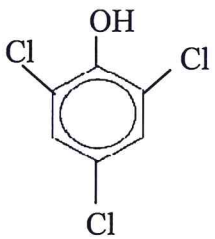
General Education Diploma, Semester One, Second Session
Bilingual Private Schools, Chemistry, 2012/2013

Serial. No	Question number	Item	Mark	Unit	Page	Cognitive domain	Output
26	3	B1.i	½	Carboxylic acids	234	Applying	6
27	3	B.1.ii	½	Carboxylic acids	231	Applying	5(iii)
28	3	B.2.A	1	Carboxylic acids	234	Applying	6
29	3	B.2.B	1	Carboxylic acids	231	Applying	5(iii)
30	3	B.2.C	1	Carboxylic acids	235	Applying	7
31	3	B.3.	1	Carboxylic acids	231	Reasoning	5(ii)
32	3	C.1.i	1	Nitrogen compounds	239	Knowing	1
33	3	C.1.ii	1	Nitrogen compounds	245	Knowing	2
34	3	C.1.iii	1	Nitrogen compounds	247	Knowing	4
35	3	C.1.iv	1	Aldehydes & ketones	221	Knowing	2
36	3	C.2	1	Nitrogen compounds	240	Reasoning	3
37	4	A.1	2	Nitrogen compounds	240	Applying	3
38	4	A.2	2	Aromatic compounds	212,217	Reasoning	2i, 4
39	4	B.1	1	Aromatic compounds	215	Knowing	3ii
40	4	B.2	3	Aromatic compounds	213-215	Applying	2ii,2iv,3ii
41	4	C.1	1	Polymers	258	Applying	6
42	4	C.2	1	Polymers	255	Reasoning	5
43	4	C.3	1	Polymers	255	Applying	5
44	4	D1	1	Polymers	250	Applying	2
45	4	D2	2	Polymers	252	Applying	2

TOTAL MARKS: 70 **PAGES: 5**

Question One (28 Marks)

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

Item number	Answer
1	they can be dehydrated to produce corresponding alkanes
2	$(CH_3)_3CCHOHCH_3$
3	$(C_2H_5)_2COHCH_3$
4	It is an example of electrophilic substitution reactions
5	4-ethyl-2,2-dimethylhexan-3-one
6	Butanone with NaIO
7	i and iii
8	oil with sodium hydroxide
9	2-ethyl-5,5-dimethylheptanoic acid
10	it forms ethanoate when reacts with NaOH
11	$CH_3CH_2CH_2CONH_2$
12	It requires a catalyst to react with bromine water
13	
14	They have covalent bonds between their chains

Question Two (14 Marks)

A. 1. $CH_2{=}CH_{2(g)} + H_2O_{(g)} \xrightarrow{H_3PO_4} CH_3CH_2OH_{(g)}$ **(1 mark)**

- **If catalyst is missing, mark is given.**
- **To get the mark, all components of the equation should be written correctly.**

2. Temperature at 350°C. **(½ mark)**
Pressure at 60 atm. **(½ mark)**

3. Fermantation **(1 mark)**

B. 1. The iodoform reaction **(1 mark)**

2. A: $CH_3\underset{\displaystyle OH}{\underset{|}{C}}HCH_2CH_3$ **(1 mark)**

B: $CH_3CH_2CH_2CH_2OH$ **(1mark)**

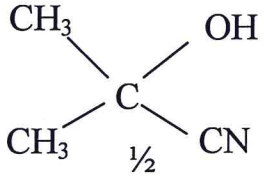
C: $CH_3CH_2\overset{\displaystyle O}{\overset{\|}{C}}CH_3$ **(1mark)**

E: $CH_3\text{-}CH_2\overset{\displaystyle O}{\overset{\|}{C}}\text{-}O^-Na^+$ **(1 mark)**

3. Aldehyde or Carbonyl. **(1mark)**

C. i. $\underset{\displaystyle OH}{\underset{|}{C}}H_3CHCH_3 + PBr_5 \longrightarrow \underset{\displaystyle Br}{\underset{|}{C}}H_3CHCH_3 + POBr_3 + HBr$ **(2 marks)**
½ ½ ½ ½

ii. $CH_3CH_2CH_2OH \xrightarrow[\text{heat}]{c.H_2SO_4} CH_3\text{-}CH{=}CH_2 + H_2O$ **(2 marks)**
½ ½ ½ ½

iii. $CH_3\overset{\displaystyle O}{\overset{\|}{C}}CH_3 + HCN \xrightarrow{NaCN}$  **(1 mark)**
½ ½

Question Three (14 Marks)

A. 1. Tollens' reagents: Ag **(1mark)**

Fehling's reagent: Cu_2O **(1mark)**

2. - Because the hydrogen bonds in the butanoic acid are stronger than those of alcohol pentan-1-ol . **(2 marks)**

- The molecules of the butanoic acid pair up forming dimers.

- **For any of the above answer, mark is given.**

B. 1.i. Reaction (1) **(½ mark)**

ii. Reaction (2) **(½ mark)**

2.

A: CH_3COOH **(1mark)**

B: $CH_3COO^-K^+$ **(1mark)**

C: $CH_3CH_2COOCH_3$ **(1mark)**

3. $CH_3COOH \xrightarrow[\text{then } H_2O]{LiAlH_4 \text{ in dry ether}} CH_3CH_2\text{-}OH$ **(1mark)**

- **If catalyst is missing, mark is given.**
- **To get the mark, all components of the equation should be written correctly.**

C. 1. i. E **(1 mark)**

ii. C **(1mark)**

iii. F **(1mark)**

iv. D **(1mark)**

2.

$$CH_3CH_2CH_2NH_2 + HBr \longrightarrow CH_3CH_2CH_2N^+H_3Br^-$$ **(1mark)**

- **To get the mark, all components of the equation should be written correctly.**

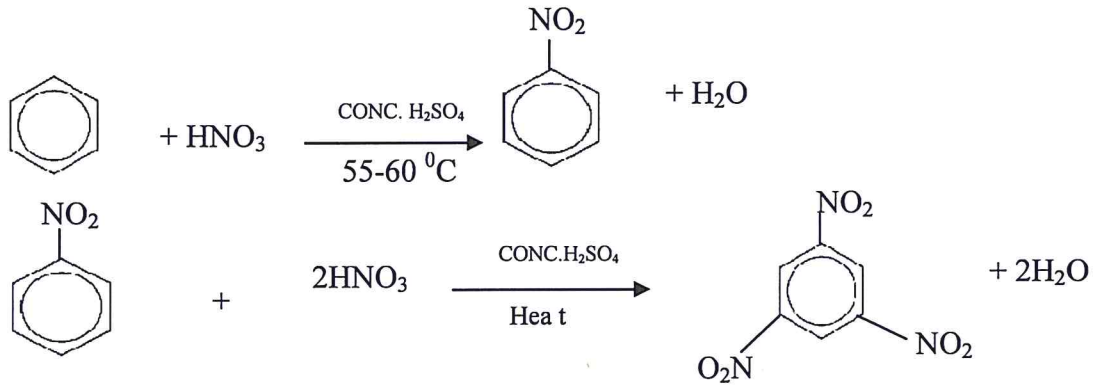
Question Four (14 Marks).

A.1. **(2 marks)**

- Because CH_3NH_2 is a primary amine as it has one alkyl group which donates electrons toward the nitrogen atom. This makes nitrogen's lone pair less accessible in CH_3NH_2 than in $(CH_3)_2NH$.
- $(CH_3)_2NH$ is a secondary amine which has two alkyl groups that feed electrons to nitrogen more than primary amine. This makes nitrogen's lone pair more accessible in $(CH_3)_2NH$ than in CH_3NH_2. The two ethyl groups also reduce the density of charge on the positive ion produced to a greater extent.

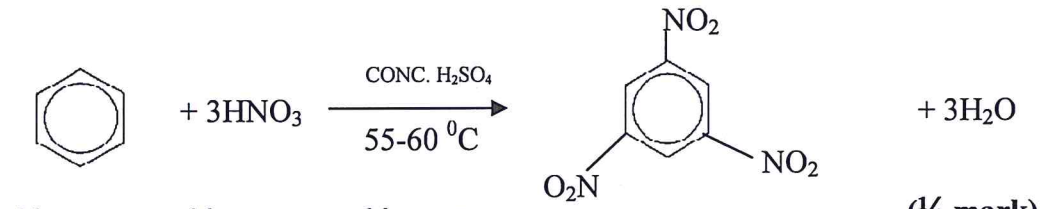
- For any of the above answer, mark is give.

2. **(2 marks)**



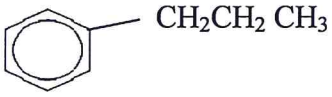
-for each complete equation (1) mark

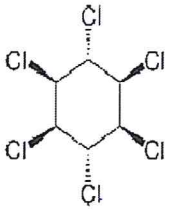
Another answer

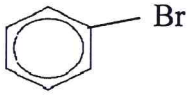


(½ mark) **(½ mark)** **(½ mark)** **(½ mark)**

B.1. reaction (1) **(1 mark)**

2. **X:**  **(1 mark)**

Y:  **(1 mark)**

Z:  **(1 mark)**

C.1. Ester **(1 mark)**

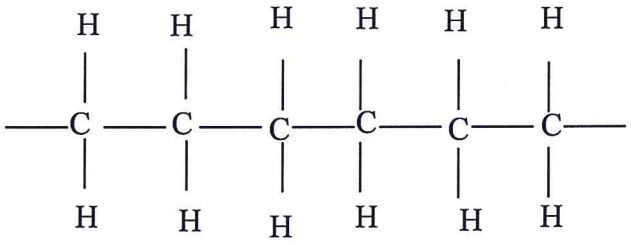
2. CH_3OH or Methanol **(1 mark)**

3. Condensation polymerisation **(1 mark)**

D.1.

- The chains of (LDPE) are branched or not straight whereas the chains of (HDPE) are straight or not branched or lined up.
- The chains of (LDPE) can't pack in regular pattern whereas the chains of (HDPE) can pack closely together or line up together. **(1 mark)**

- **For any answer from above mark is given.**

2.  **(2 marks)**

This is the end of the Marking Guide