ختم المركز

حاضر ▢

غائب ▢

سلطنة عمان
وزارة التربية والتعليم

امتحان دبلوم التعليم العام للمدارس الخاصة (ثنائية اللغة)

للعام الدراسي ١٤٣٦/١٤٣٥ هـ - ٢٠١٤ / ٢٠١٥ م

الدور الأول - الفصل الدراسي الأول

تنبيه
- المادة: الكيمياء.
- الأسئلة في (١٣) صفحة.
- زمن الإجابة: ثلاث ساعات.
- 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 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 - عاصمـة سلطنة عمـــان هي:

▢ القاهرة ▢ الدوحة

■ مسقط ▢ أبوظبي

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

صحيح ■ **غير صحيح** ▭ ◉ ◒ ☒ ☑

مُسَوَّدَة، لا يتم تصحيحها

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Question 1 (28 marks)

There are 14 multiple-choice items worth two marks each.
Shade in the **correct** answer for each of the following items .

1) What is the organic product formed by fermentation of glucose?

- ○ CH_3CH_2OH
- ○ $HCOOCH_3$
- ○ CH_3COCH_3
- ○ CH_3CHO

2) What is the IUPAC name for the organic compound
$(CH_3)_3CCH_2CH(OH)CH(CH_3)C_2H_5$

- ○ 5-ethyl-2,2-dimethylhexan-4-ol
- ○ 2-ethyl-5,5-dimethylhexan-3-ol
- ○ 3,6,6- trimethylheptan-4-ol
- ○ 2,2,5- trimethylheptan-4-ol

3) Which alcohol matches it's classification?

	Alcohol	Classification
○	$(CH_3)_2CHCH_2OH$	secondary
○	$(CH_3)_2C(OH)CH_2CH_3$	secondary
○	$(CH_3)_3C(OH)$	tertiary
○	$(CH_3)CH(OH)CH_3$	primary

4) For the following reaction:
$CH_3CH(CH_3)CH_2OH + HI \longrightarrow CH_3CH(CH_3)CH_2I + H_2O$

Which statement is **incorect** about this reaction?

- ○ It is a halogenation reaction.
- ○ The (I^-) ion acts as electrophile.
- ○ The reaction undergoes breaking the C-O bond.
- ○ PI_3 can be used instead of (HI) to get the same organic product.

Question 1 continued

5) Which of the following reactions takes place less readily?

- ☐ The oxidation of aldehydes.
- ☐ The reduction of aldehydes.
- ☐ The oxidation of ketones.
- ☐ The reduction of ketones.

6) For the following reaction:

$$CH_3CHOHCH_3 \xrightarrow{I_2 / NaOH} \boxed{X} + CHI_3$$

Which of the following compounds represents product (X)?

- ☐ $CH_3COO^-Na^+$
- ☐ $CH_3CH_2O^-Na^+$
- ☐ $CH_3CH_2COO^-Na^+$
- ☐ $CH_3CH(O^-Na^+)CH_3$

7) Alkaline potassium manganate(VII) and Fehling's solutions are two reagents used to test propanone, what is the option that gives the correct test results?

	alkaline potassium manganate(VII) test	Fehling's test
☐	Positive	Negative
☐	Positive	Positive
☐	Negative	Positive
☐	Negative	Negative

8) According to IUPAC rules, which of the following nomenclatures of carboxylic acids is correct?

- ☐ 3-propanoic acid
- ☐ 2-ethylpentanoic acid
- ☐ 2- propylbutanoic acid
- ☐ 5-ethylhexanoic acid

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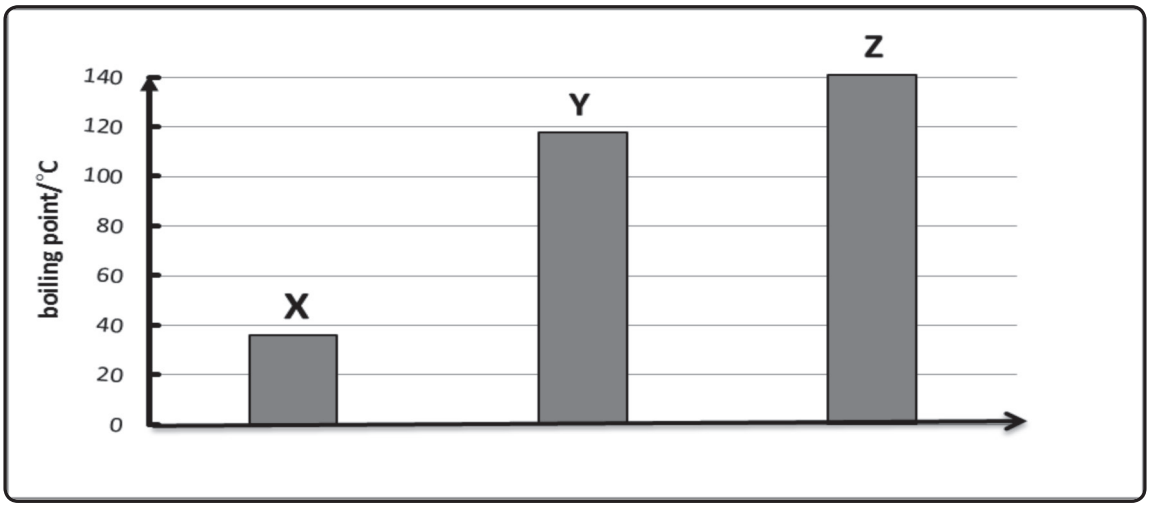
Question 1 continued

Use the following information to answer questions 9and 10 .

The bar chart below shows the boiling points for (3) different organic compounds that have almost the same molecular mass and represented by (X, Y & Z) .



9) Which of the following options represents the three organic compounds?

	X	Y	Z
☐	Alcohol	Alkane	Carboxylic acid
☐	Alkane	Carboxylic acid	Alcohol
☐	Carboxylic acid	Alcohol	Alkane
☐	Alkane	Alcohol	Carboxylic acid

10) Which compound(s) form(s) hydrogen bonds between its molecules?

☐ X only. ☐ Y & Z only.

☐ Z only. ☐ All of them.

11) What is the correct order for three amine compounds according to the availability of nitrogen's lone pair to bond with H^+?

☐ Diethylamine > Ethylamine > Phenylamine.

☐ Phenylamine > Diethylamine > Ethylamine.

☐ Ethylamine > Diethylamine > Phenylamine.

☐ Ethylamine > Phenylamine > Diethylamine

Question 1 continued

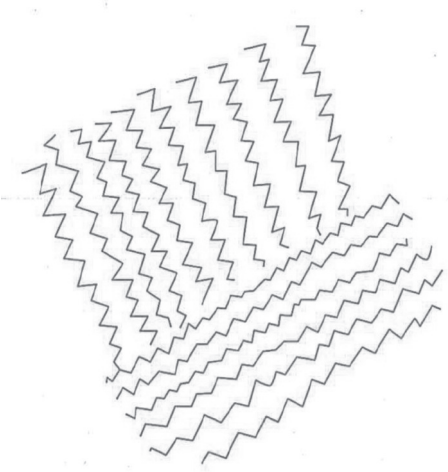
12) What are the best conditions to produce cyclohexane from benzene?

	Reagent	Temperature	Catalyst
☐	$2H_2$	300 °C	Fe
☐	$3H_2$	300 °C	Ni
☐	$2H_2$	Sunlight	Ni
☐	$3H_2$	Sunlight	Fe

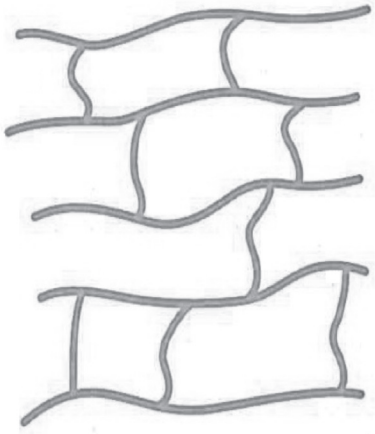
13) Which of the following statements is correct about benzene?

- ☐ It is miscible with water.
- ☐ It forms hydrogen bonds between its molecules.
- ☐ The carbons in its ring form a symmetrical hexagon.
- ☐ The electrons in the π (pi) bond are not delocalized.

14) What type of interaction is formed between the chains in each of the following two polymers?



polymer (1)

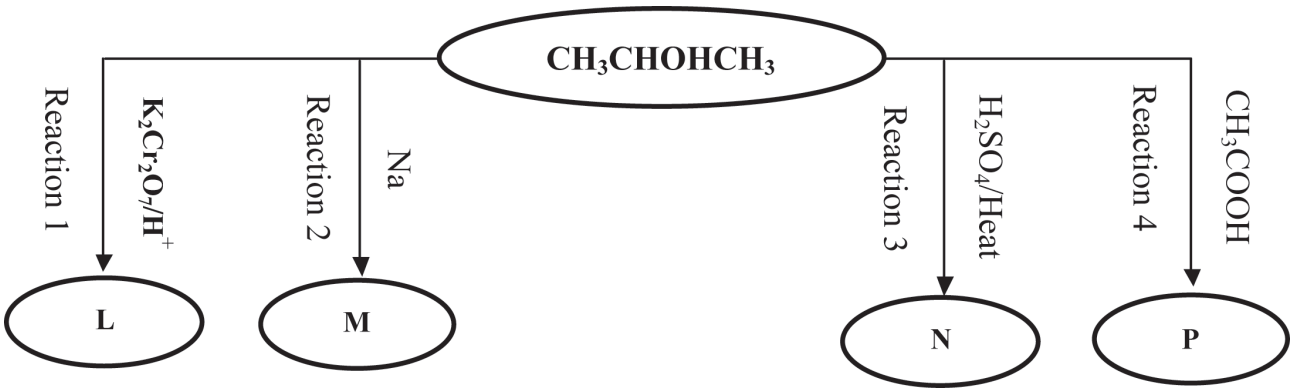


polymer (2)

- ☐ Covalent bonds in both of them.
- ☐ Vander Waals forces in both of them.
- ☐ Covalent bonds in polymer (1) whereas Vander Waals forces in polymer (2).
- ☐ Vander Waals forces in polymer (1) whereas Covalent bonds in polymer (2).

Question 2 (14 marks)

15) A series of four chemical reactions was carried out as follows:



a. Draw the structural formulae for the organic compounds represented by L, M & N.

L : _____

M : _____

N : _____

b. Identify the type of the following reactions:

Reaction (1): _____

Reaction (3): _____

c. What is the catalyst used in reaction (4)?

_____

d. Which reaction(s) undergo(es) breaking the O-H bond?

_____

e. What will happen to the color of orange dichromate in reaction (1) if ($CH_3CHOHCH_3$) is replaced with 2-methylpropan-2-ol? Explain your answer?

_____

_____

Question 2 continued

16) **Aldehydes and ketones are widely used in industry and laboratories.**

a. Name the ketone found in the nail varnish remover.

b. Write the structural formula of the aldehyde found in formalin solution.

c. Explain the following:

(i) Smaller aldehydes and ketones are soluble in water.

(ii) CH_3COCH_3 reacts less readily than CH_3CH_2CHO with HCN in the presence of NaCN .

Question 3 (14 marks)

17) Write balanced chemical equations for the reactions of:

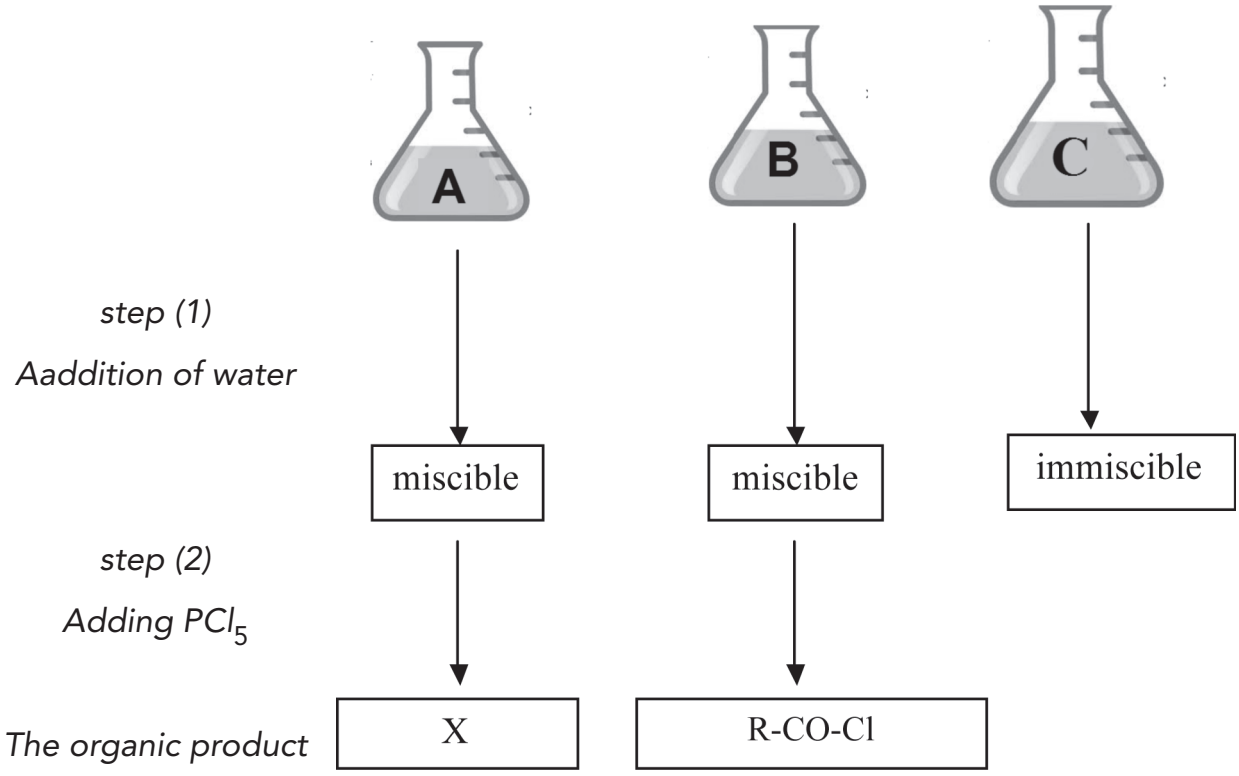
a. propanal with Tollens' reagent.

b. pentan-2-one with H_2 in the presence of Ni as a catalyst.

Question 3 continued

18) The following diagram illustrates an experiment carried out by 12th grade students to identify three organic compounds in three conical flasks labelled (A, B, C). The three compounds are (propanoic acid, ethanol and pentane).

Study it then answer the following questions.



a. Which compounds are in flasks (B & C)?

(B) : _____

(C) : _____

b. Write the structural formula of compound (X).

_____

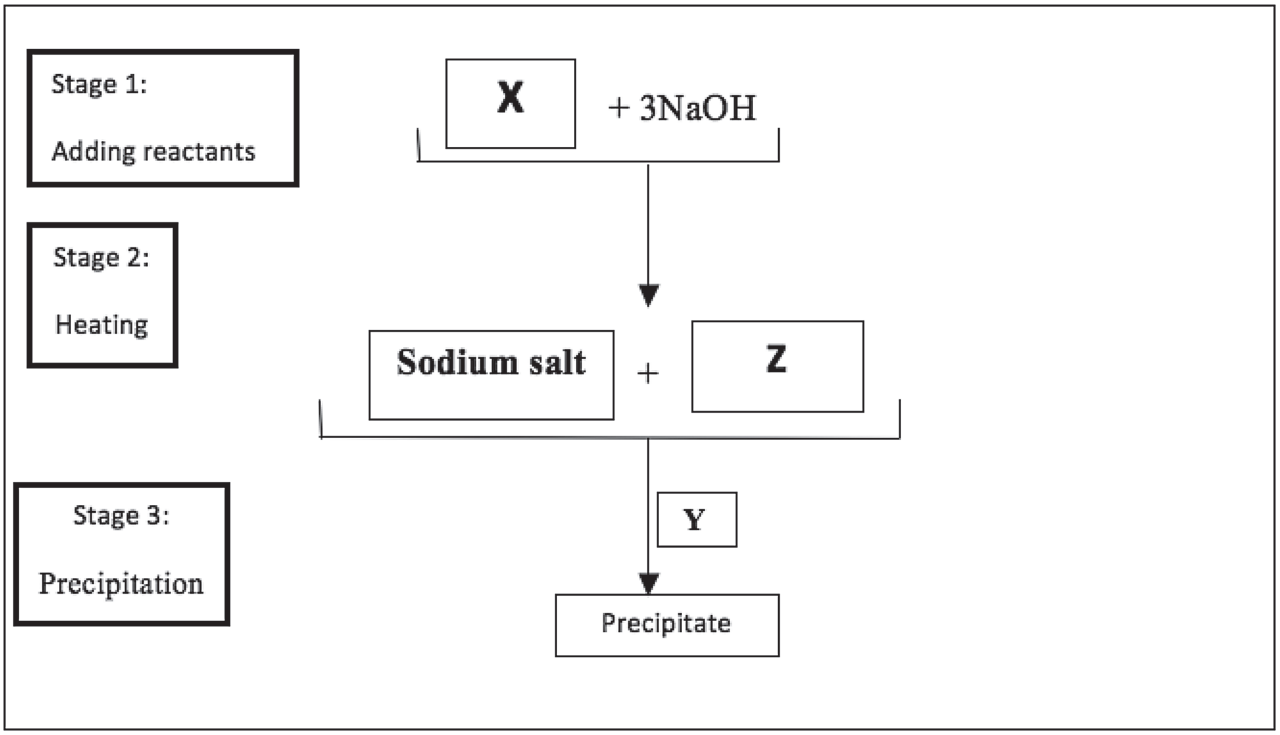
c. Two inorganic products are common between the two reactions in step (2), write the chemical formulae of these two products.

_____

_____

Question 3 continued

19) The scheme below shows the stages for making soap. Study it then answer the following questions.



a. To which family does the organic compound (X) belong?

b. Draw the structural formula of compound (Z)

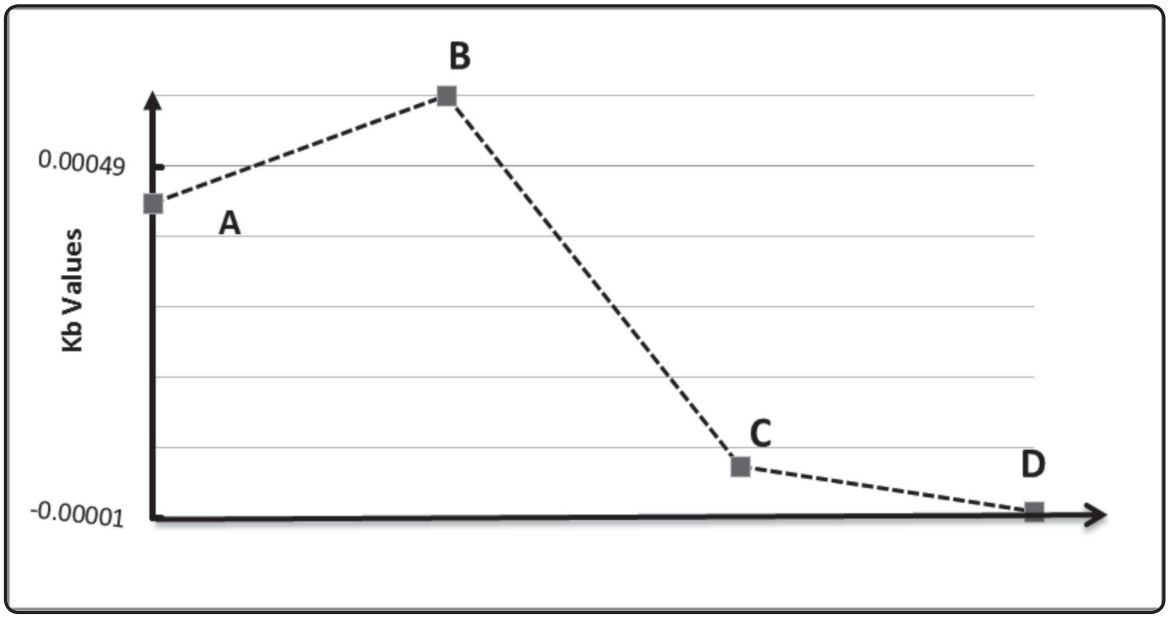
c. Which solution represented by (Y) is added in stage (3) to form the precipitate?

Question 3 continued

20) The following graph shows the dissociation constant (K_b) for four different amines labelled (A, B, C & D) . The structural formulae for these amines are

(C_6H_5-NH_2 , CH_3NH_2 , $(CH_3)_2NH$, $(CH_3)_3N$)

Study it then answer the following questions.



a. Which amine corresponds to (B & D) in the graph?

(B) : _____

(D) : _____

b. From the above, what is the molecular formula of the amine that has the lowest solubility in water? Explain why.

_____

_____

c. Write a chemical equation that shows the reaction of amine (B) with hydrochloric acid.

_____

_____

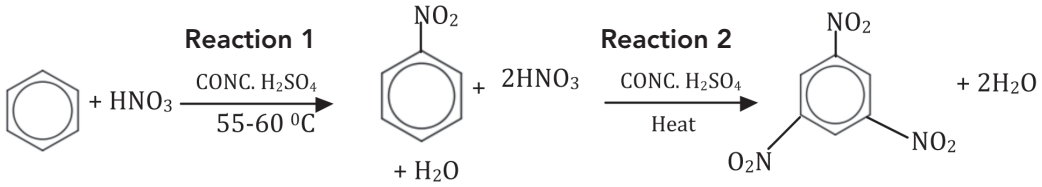
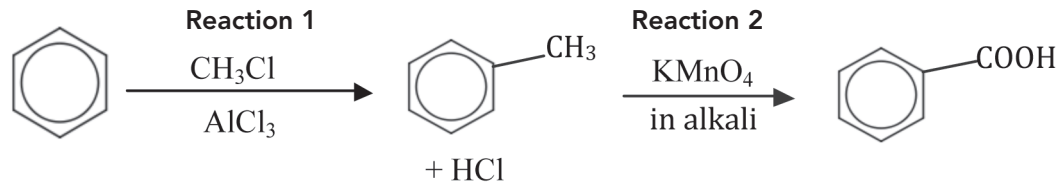
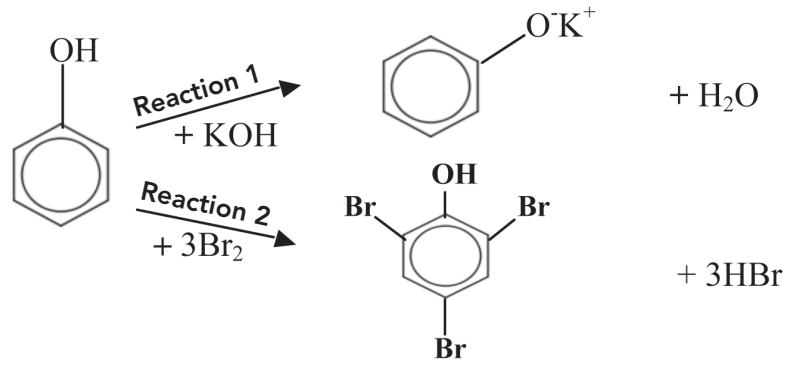
Question 4 (14 marks)

21) Amino acids are the building blocks of proteins which are present in our skin, blood, hair, nerves and tendons. A common natural amino acid is (2-aminobutanoic acid) .

a. Draw the molecular structure of (2- aminobutanoic acid).

b. Does this amino acid exhibit optical isomerism? Explain why.

22) The following table shows three different reaction serieses, study them then answer the questions below.

Series	Reactions
1	
2	
3	

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Question 4 continued

a. Complete the following table :

Type of reaction	Number of reaction	Number of series
Acid-base		
Oxidation		
Friedel-crafts		

b. Which reaction takes place more readily; reaction (1) of series (1) or reaction (2) of series (3).Explain why?

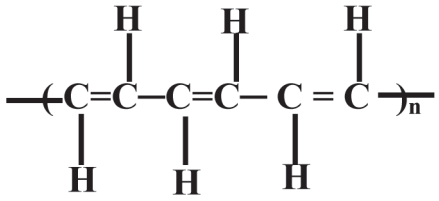
c. Write the formula of the electrophile of reaction (1) in series (1) and the electrophile of reaction (1) in series (2).

Reaction (1) in series (1): _____

Reaction (1) in series (2): _____

Question 4 continued

23) Most polymers are electrical insulators. However, a group of polymers have been developed to conduct electricity such as poly(ethyne), Which are used for making space craft. Based on the following structural formula of poly(ethyne) answer the questions below.



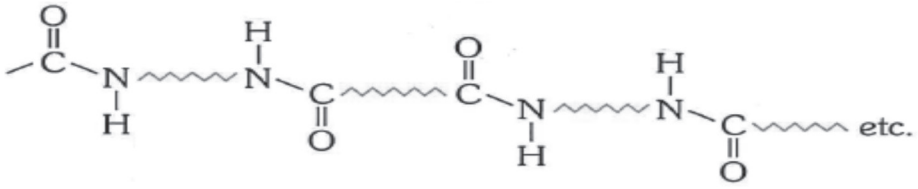
a. Draw the structural formula of the monomer(s) that form(s) poly(ethyne).

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

c. Give two reasons why conducting polymers can replace metals in making space craft.

Question 4 continued

24) The diagram below shows one chain of a polyamide. Study it then answer the following questions.



a. What are the intermolecular forces that are holding the chains of the polyamide to each other?

b. Draw the structure of two cross-linked chains of this polyamide.

c. When the chains of the polyamide are cold drawn, they form a strong and rigid fibre. Explain why.

[End of Examination]

مُسَوَّدَة

MARKING GUIDE

GENERAL EDUCATION DIPLOMA
BILINGUAL PRIVATE SCHOOLS
SEMESTER ONE - FIRST SESSION

CHEMISTRY
2014 / 2015

General Education Diploma, Semester One, First Session
Bilingual Private Schools, Chemistry, 2014/2015

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, First Session
Bilingual Private Schools, Chemistry, 2014/2015

Distribution of cognitive domains and marks.

Serial. No	Question number	Item	Mark	Unit	Page	Cognitive domain	Output
1.	1	1	2	Alcohols	195	Knowing	1,2,7
2.	1	2	2	Alcohols	196	Applying	4
3.	1	3	2	Alcohols	196,198	Applying	3
4.	1	4	2	Alcohols	198,199	Reasoning	6iv
5.	1	5	2	Aldehydes & ketones	222	Applying	1 , 2
6.	1	6	2	Aldehydes & ketones	223	Reasoning	5ii
7.	1	7	2	Aldehydes & ketones	222	Applying	5i
8.	1	8	2	Carboxylic acids	229-231	Applying	3,4
9.	1	9	2	Carboxylic acids	229	Reasoning	2
10.	1	10	2	Carboxylic acids	229	Knowing	2
11.	1	11	2	Nitrogen compounds	239-246	Applying	1,3
12.	1	12	2	Aromatic compounds	215	Applying	3
13.	1	١٣	٢	Aromatic compounds	٢ 21	Knowing	١
14.	1	١٤	٢	Polymers	250,251	Knowing	2,3
15.	2	15 A	3	Alcohols	196,197,199	Applying	6i,6ii,6v
16.	2	15B	2	Alcohols	196,197	Applying	6i, 6v
17.	2	15C	1	Alcohols	197	Applying	6iii
18.	2	15D	2	Alcohols	197	Applying	6ii,6iii
19.	2	15E	2	Alcohols	196	Reasoning	3
20.	2	16A	1	Aldehydes & ketones	221	Knowing	2,3
21.	2	16B	1	Aldehydes & ketones	221	Knowing	3,4
22.	2	16Ci	1	Aldehydes & ketones	221	Knowing	1,2
23.	2	16Cii	1	Aldehydes & ketones	224	Knowing	5iv
24.	3	17A	2	Aldehydes & ketones	222	Applying	5i
25.	3	17B	1	Aldehydes & ketones	223	Reasoning	5iii

General Education Diploma, Semester One, First Session
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Serial. No	Question number	Item	Mark	Unit	Page	Cognitive domain	Output
26.	3	18A	١	Carboxylic acids	229	Reasoning	2,3
27.	3	18B	1	Carboxylic acids	١٩٥,٢٢٩	Applying	5iv
28.	3	8C	١	Carboxylic acids	231	Applying	٢
29.	3	19A	1	Carboxylic acids	235	Applying	7,5i
30.	3	19B	1	Carboxylic acids	235	Knowing	7,5i
31.	3	19C	1	Carboxylic acids	235	Applying	7
32.	3	20A	2	Nitrogen compounds	239-241	Reasoning	٣
33.	3	20B	٢	Nitrogen compounds	239-241	Knowing	1,3
34.	3	20C	١	Nitrogen compounds	239-241	Applying	1,3
35.	4	21A	١	Nitrogen compounds	٢٤٦-٢٤٧	Applying	1,4
36.	4	21B	١	Nitrogen compounds	٢٤٦-٢٤٧	Applying	1,4
37.	4	22A	3	Aromatic compounds	214,216 ,217	Applying	2iv,4,5
38.	4	22B	2	Aromatic compounds	212,216	Reasoning	4,2i
39.	4	22C	1	Aromatic compounds	211-217	Knowing	2
40.	4	23A	1	Polymers	252,258	Applying	4,6
41.	4	23B	1	Polymers	252	Applying	1,4
42.	4	23C	1	Polymers	258	Applying	6
43.	4	24A	1	Polymers	٢٥١,٢٥٤, ٢٥٥	Applying	3,5
44.	4	24B	1	Polymers	251,254, 255	Applying	3,5
45.	4	24C	1	Polymers	255	Applying	٣,٥

TOTAL MARKS: 70 **PAGES: 5**

Question One (28 Marks)

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

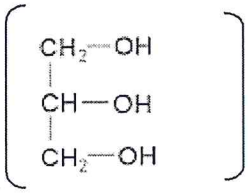
Item No.	Correct option
1	CH_3CH_2OH
2	2,2,5- trimethylheptan-4-ol
3	$(CH_3)_3C(OH)$ tertiary
4	The (I^-) ion acts as electrophile.
5	The oxidation of ketones.
6	$CH_3COO^-Na^+$
7	Negative Negative
8	2-ethylepentanoic acid.
9	Alkane Alcohol Carboxylic acid
10	Y & Z only.
11	Diethylamine > Ethylamine > Phenylamine .
12	$3H_2$ 300 Ni
13	The carbons in its ring form a symmetrical hexagon.
14	Vander Waals forces in ~~diagram~~ Polymer (1) whereas Covalent bonds in ~~diagram~~ Polymer (2).

Question Two (14 Marks) **Question Two (14 Marks)**

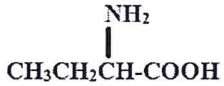
Part	*Section*	*The answer*	*The mark*
15.	**A**	L: CH_3COCH_3 M: $CH_3CHO^-Na^+CH_3$ N: $CH_3CH{=}CH_2$ **Each compound worths 1 mark*	(3 marks)
	B	Reaction (1): oxidation Reaction (3): dehydration **Each answer worths 1 mark*	(2 marks)
	C	Strong acid or H^+ or H_2SO_4 or acid	(1 mark)
	D	Reaction (2) and reaction(4) *Each worths 1 mark*	(2 marks)
	E	The color of the solution doesn't change or remains orange (1mark) because the compound 2-metylpropan-2-ol is tertiary alcohol. ***or*** it is impossible to break C-C bonds. ***Or*** the carbon atom which is attached to OH does not contain hydrogen atom (1 mark)	(2 marks)
16	**A**	Propanone or Acetone	(1 mark)
	B	HCHO	(1 mark)
	Ci	Because they form hydrogen bonds with water molecules.	(1 mark)
	Cii	Because CH_3COCH_3 (ketone) has two alkyl donating electrons groups whereas CH_3CH_2CHO (aldehyde) has only one alkyl donating electrons group. ***Or*** : the $\delta+$ charge in the electron deficient carbon atom in aldehydes is larger than in ketones. ***Or:*** aldehydes tend to donate less electrons than ketones. ***for Any underlined answer mark is given.***	(1 mark)

Question Three (14 marks)

Part	Section	The answer	The mark
17.	A.	$\underline{CH_3CH_2CHO} + 2Ag(NH_3)_2^+ + 3OH^- \rightarrow \underline{CH_3CH_2COO^-} + \underline{2Ag} + 4NH_3 + 2H_2O$ (½ mark) (½ mark) (½ mark) (½ mark)	(2marks)
	B.	$\underline{CH_3CH_2CH_2COCH_3} + H_2 \xrightarrow{Ni} \underline{CH_3CH_2CH_2CHOHCH_3}$ (½ mark) (½ mark)	(1mark)

Part	Section	The answer	The mark
18.	A.	(B) : propanoic acid (C): pentane	(½ mark) (½ mark)
	B.	CH_3CH_2Cl	(1 mark)
	C.	$POCl_3$ HCl	(½ mark) (½ mark)
19	A.	Glycerides **or** Esters **or** oil **or** fats.	(1 mark)
	B.		(1 mark)
	C	concentrated NaCl **or** concentrated salt solution.	(1 mark)
20	A.	(B) : $(CH_3)_2NH$ ***or*** dimethylamine (D) : C_6H_5-NH_2 ***or***  ***or*** phenylamine	(1 mark) (1 mark)
	B.	$(CH_3)_3N$ Three alkyl groups reduce the solubility of tertiary amines.	(1 mark) (1 mark)
	C.	$(CH_3)_2NH + HCl \longrightarrow (CH_3)_2N^+H_2\ Cl^-$ *To get the mark all components of the equation should be correct.*	(1 mark)

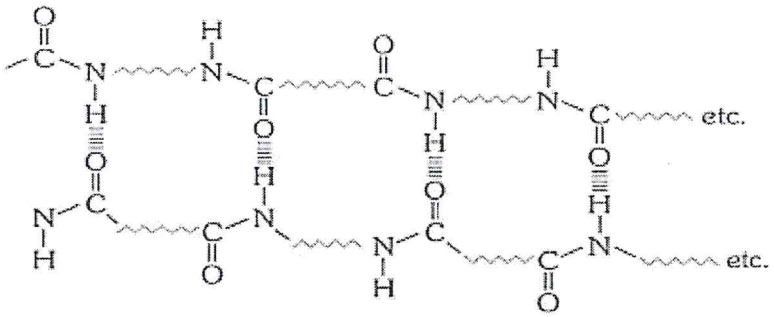
Question Four (14 Marks)

Part	Section	The answer	The mark
21	A.		(1 mark)
	B.	Yes. Because it contains a carbon atom bonded to four different groups. ***Or*** Because it contains a chiral Centre	(½ mark) (½ mark)

Part	Section	The answer	The mark
22	A.	**Type of reaction** / **Number of reaction** / **Number of series** Acid base: 1 / 3 Oxidation: 2 / 2 Friedel-crafts: 1 / 2 ***- Each answer worths ½ mark.***	(3marks)
	B.	reaction(2) of series (3) takes place more readily than reaction(1) of series (1 (1 mark) because the oxygen in phenol has two lone pairs of electrons that are not involved in bonding. These are drawn toward the delocalized system around the benzene ring. **Or** because the –OH in phenol is an electron-donating group. So phenol can lose an H^+ because O-H bond is slightly weakened as electrons are drawn away from that end of the molecule. (1mark) ***Any underlined answer mark is given.***	(2mark)
	C	reaction (1) in series(1) : NO_2^+ reaction(1) in series (2) : $\overset{+}{C}H_3$ ***-Each answer ½ mark.***	(1mark)

Continue Question Four (14 Marks)

Part	*Section*	*The answer*	*The mark*
23	A.	H—C ≡ C—H	(1 mark)
	B.	Addition	(1 mark)
	C.	1- They do not corrode or rust. 2- They are much less dense or have low density. ***Each reason worths ½ mark.***	(1 mark)

Part	*Section*	*The answer*	*The mark*
24	A.	hydrogen bonds.	(1mark)
	B.		(1mark)
	C.	This will align the chains in the same direction and this maximizes the hydrogen bonding and increase the strength of the fibre formed. * ***For each underlined sentence (½ mark).***	(1mark)

This is the end of the Marking Guide