UNIVERSITI SAINS MALAYSIA

First Semester Examination
2015/2016 Academic Session

December 2015 / January 2016

EKC 107 – Organic Chemistry
[Kimia Organik]

Duration : 3 hours
[Masa : 3 jam]

Please check that this examination paper consists of NINE pages of printed material before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi SEMBILAN muka surat yang bercetak sebelum anda memulakan peperiksaan ini.]

Instruction: Answer **ALL** (4) questions.

*[**Arahan:** Jawab **SEMUA** (4) soalan.]*

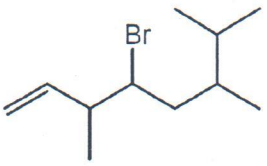
In the event of any discrepancies, the English version shall be used.

[Sekiranya terdapat sebarang percanggahan pada soalan peperiksaan, versi Bahasa Inggeris hendaklah diguna pakai.]

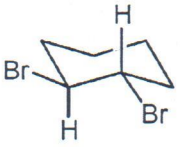
...2/-

Answer ALL questions.

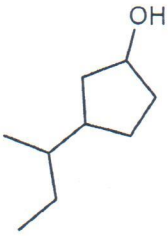
1. [a] Give IUPAC name for each compound:

[i] 

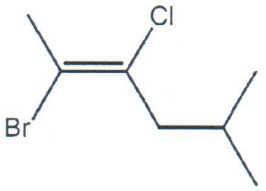
[1 mark]

[ii] 

[1 mark]

[iii] 

[1 mark]

[iv] 

[1 mark]

[v] isobutyl alcohol

[1 mark]

[b] Carbocations are frequent intermediates in acidic reactions of alkenes, alcohols, etc. What reaction can carbocations undergo?

[4 marks]

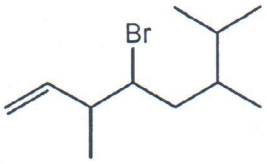
[c] Provide a mechanistic explanation for the formation of the observed products in the following reaction. Use curved arrows to show the movement of electron.

[11 marks]

Jawab <u>SEMUA</u> soalan.

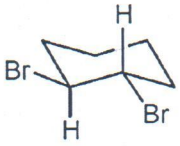
1. [a] *Berikan nama IUPAC bagi setiap kompaun:*

[i]



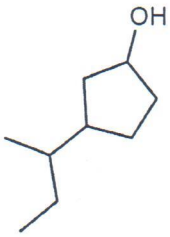
[1 markah]

[ii]



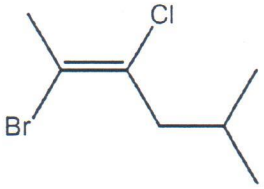
[1 markah]

[iii]



[1 markah]

[iv]



[1 markah]

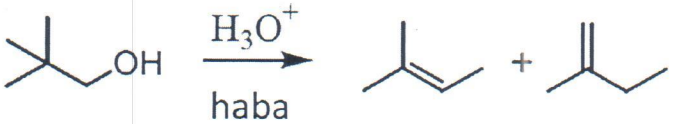
[v] isobutil alkohol

[1 markah]

[b] Karbokation adalah perantaraan yang kerap dalam tindak balas berasid alkena, alkohol, dan lain-lain. Apakah tindak balas yang boleh dilalui oleh karbokation?

[4 markah]

[c] Berikan penjelasan mekanistik untuk pembentukan produk yang diperhatikan dalam tindak balas berikut. Gunakan anak-anak panah melengkung untuk menunjukkan pergerakan elektron.



[11 markah]

[d] Explain the following observation:

When 2-methylbutane reacts with Cl_2, the monochlorinated products consist of four constitutional isomers in significant yields. However, when the same alkane is allowed to react with Br_2, there is only one major monobromination product.

[5 marks]

2. [a] Write the name and structure of the compound which will react with hydrogen chloride to form the following major organic product:

[i] 2-chloro-2-methylbutane

[2 marks]

[ii] 1-chloro-1-ethylcyclohexane

[2 marks]

[b] Explain about the production of polyethylene. Include the schematic diagram of the manufacturing process starting from the feedstock to the final product.

[10 marks]

[c] Some margarine is made by hydrogenating carbon-carbon double bonds in animal or vegetable fats and oils. Describe the mechanism of catalytic hydrogenation.

[11 marks]

3. [a] Draw structures corresponding to the following names;

[i] 3-phenyl-2-propenal

[ii] Butanedial

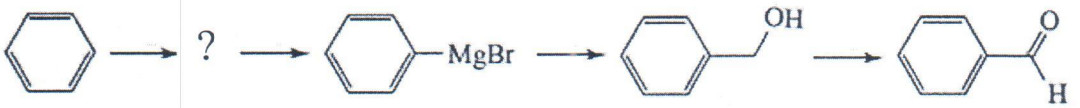
[2 marks]

[b] Show how you would synthesize propanal from propanoic acid.

[3 marks]

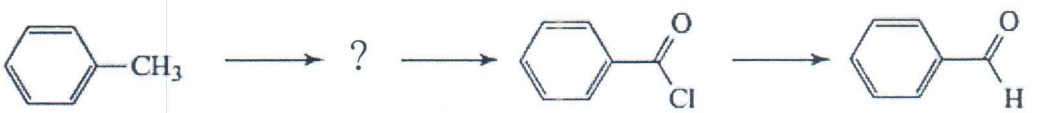
[c] Provide the reagents and indicated the intermediates (?) in each of the following synthesis

[i]



[4 marks]

[ii]



[4 marks]

...5/-

[d] *Terangkan pemerhatian berikut:*

Apabila 2-metilbutana bertindak balas dengan Cl_2*, produk-produk monoklorin terdiri daripada empat isomer berjuzuk terhasil dengan ketara. Walau bagaimanapun, apabila alkana yang sama dibenarkan untuk bertindak balas dengan* Br_2*, hanya ada satu produk utama monobrominan.*

[5 markah]

2. [a] *Tuliskan nama dan struktur kompaun yang akan bertindak balas dengan hidrogen klorida untuk membentuk produk organik utama yang berikut:*

[i] *2-kloro-2-metilbutana*

[2 markah]

[ii] *1-kloro-1-etilsikloheksana*

[2 markah]

[b] *Jelaskan mengenai pengeluaran polietilena. Masukkan gambar rajah skema proses pembuatan bermula dari bahan mentah sehingga produk akhir.*

[10 markah]

[c] *Sesetengah marjerin dibuat oleh penghidrogenan ikatan ganda dua karbon-karbon dalam lemak-lemak dan minyak-minyak haiwan atau sayur. Jelaskan mekanisma penghidrogenan bermangkin.*

[11 markah]

3. [a] *Lukiskan struktur yang sepadan dengan nama-nama berikut.*

[i] *3- fenil -2- propenal*

[ii] *Butanadial*

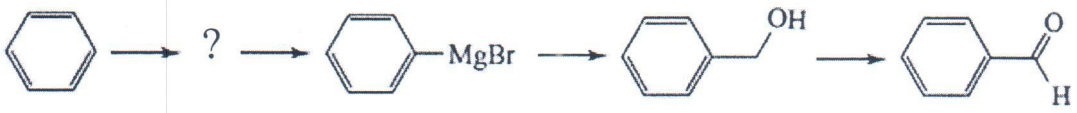
[2 markah]

[b] *Tunjukkan bagaimana anda akan mensintesis propanal daripada asid propanoik.*

[3 markah]

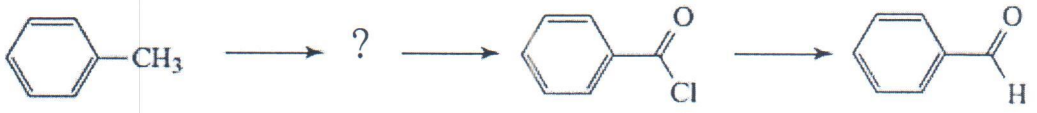
[c] *Nyatakan reagen dan bahan perantaraan (?) dalam setiap sintesis berikut*

[i]



[4 markah]

[ii]



[4 markah]

...6/-

[d] Write the detailed mechanism for the formation of an acetal from benzaldehyde and methanol in the presence of acid catalyst.

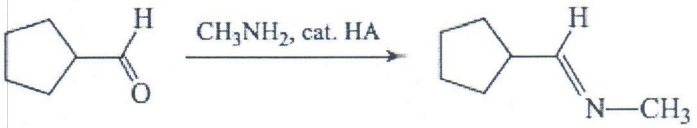
[4 marks]

[e] How would you use a Grignard reaction on an aldehyde or ketone to synthesize 2-pentanol?

[3 marks]

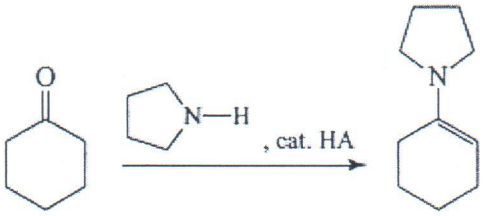
[f] Write out the detail mechanism for each of the following reactions.

[i]



[3 marks]

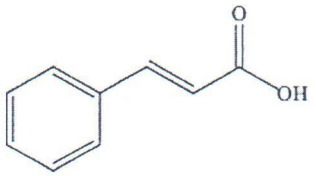
[ii]



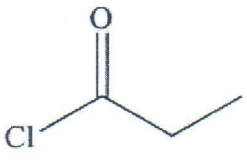
[2 marks]

4. [a] Give an IUPAC name for each of the following compounds.

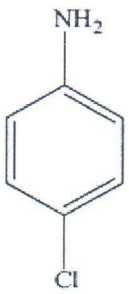
[i]



[ii]



[iii]



[3 marks]

...7/-

[d] *Tulis mekanisma terperinci untuk pembentukan asetal dari benzaldehid dan metanol dengan asid sebagai pemangkin.*

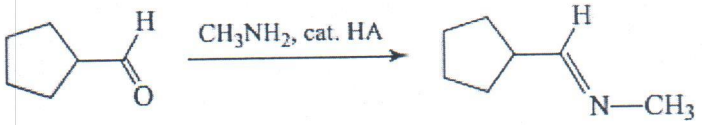
[4 markah]

[e] *Bagaimana anda menggunakan tindak balas Grignard pada aldehid atau keton untuk mensintesis 2- pentanol?*

[3 markah]

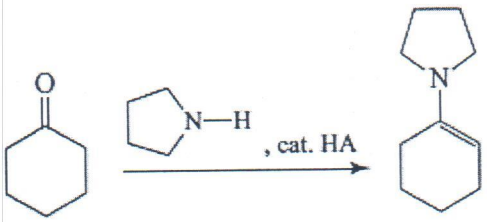
[f] *Tuliskan mekanisma terperinci bagi setiap tindak balas berikut*

[i]



[3 markah]

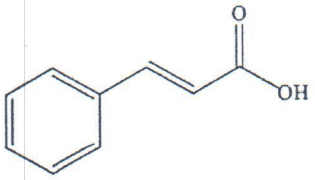
[ii]



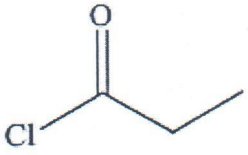
[2 markah]

4. *[a]* *Berikan nama IUPAC bagi setiap sebatian berikut*

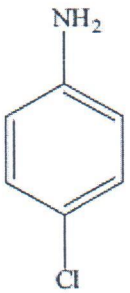
[i]



[ii]



[iii]



[3 markah]

...8/-

[b] Starting from benzene, outline a synthesis route of the following compounds.

[i] Isopropylbenzene

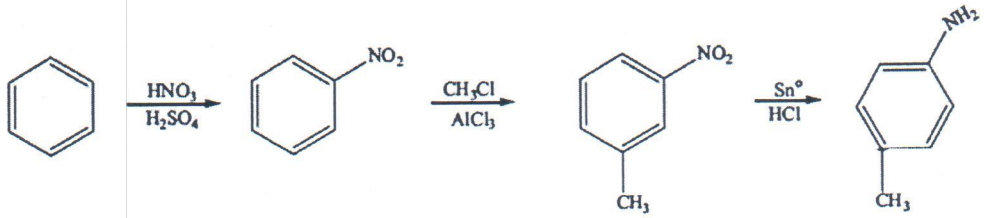
[ii] Tert-butylbenzene

[4 marks]

[c] What factor accounts for the much greater acidity of amides as compared to amines?

[3 marks]

[d] The following synthesis will fail. Explain what is wrong.



[3 marks]

[e] What is the organic product would you expect to obtain when malonic anhydride (oxetane-2,4-dione) react with the followings.

[i] NH_3 (excess)

[ii] H_2O

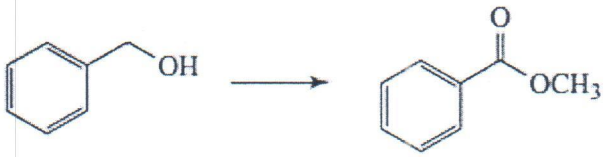
[iii] CH_3CH_2OH

[iv] $C_6H_6 + AlCl_3$

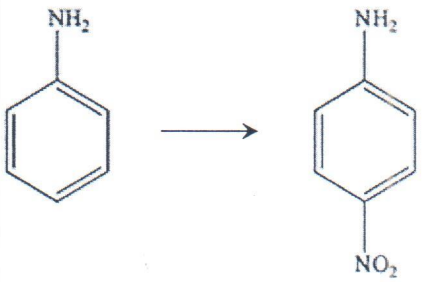
[4 marks]

[f] Indicate the reagent required to accomplish the following transformation and provide a detailed mechanism for the reactions.

[i]



[ii]



[8 marks]

...9/-

[b] *Bermula daripada benzena, berikan sintesis sebatian berikut.*

[i] *Isopropilbenzena*

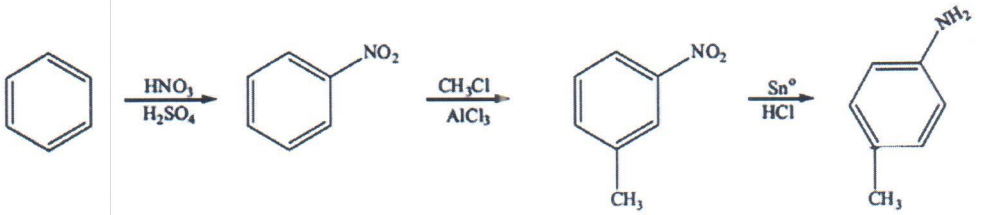
[ii] *Tert-butilbenzena*

[4 markah]

[c] *Apakah faktor yang menyebabkan keasidan lebih kuat untuk amida berbanding dengan amina?*

[3 markah]

[d] *Sintesis berikut akan gagal. Terangkan apakah kesilapannya.*



[3 markah]

[e] *Apakah produk organik utama yang anda perolehi apabila asetik malonik anhidrid (oxetana-2,4-diona) bertindak balas dengan berikut.*

[i] NH_3 *(berlebihan)*

[ii] H_2O

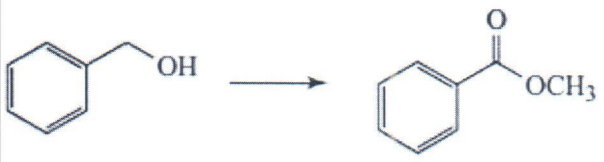
[iii] CH_3CH_2OH

[iv] $C_6H_6 + AlCl_3$

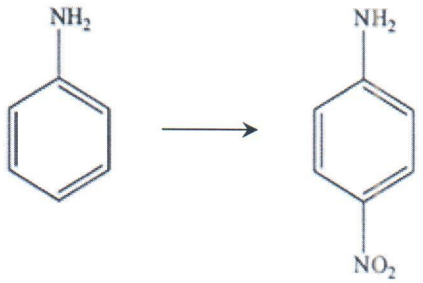
[4 markah]

[f] *Nyatakan reagen yang diperlukan untuk memperolehi transformasi yang berikut dan nyatakan mekanisma terperinci bagi tindak balas berikut.*

[i]



[ii]



[8 markah]

- oooOooo -