
UNIVERSITI SAINS MALAYSIA

First Semester Examination
2012/2013 Academic Session

January 2013

EKC 107 – Organic Chemistry
[Kimia Organik]

Duration : 3 hours
[Masa : 3 jam]

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

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

Instruction: Answer **ALL** questions.

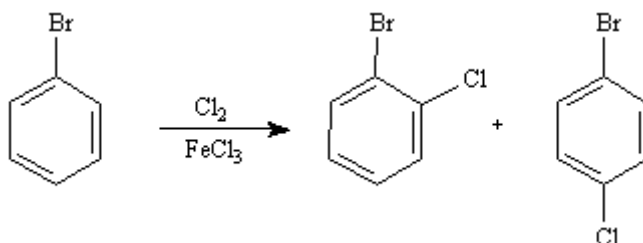
Arahan: Jawab **SEMUA** soalan.]

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.]

Answer ALL questions.
Jawab SEMUA soalan.

1. [a] Consider the reaction below to answer the following question(s).
Pertimbangkan tindak balas di bawah untuk menjawab soalan berikut.



- [i] Write the complete stepwise mechanism for the formation of the *ortho* product. Show all intermediate structures and show all electron flow with arrows.

Tuliskan mekanisma berlangkah yang lengkap untuk pembentukan produk orto. Tunjukkan semua struktur perantaraan dan tunjukkan semua aliran elektron dengan anak panah.

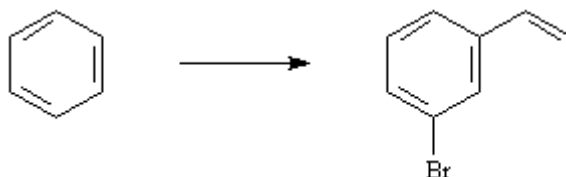
- [ii] Draw resonance structures for the intermediate carbocation that explain the directing effect of the $-\text{Br}$.

Lukiskan struktur resonan untuk perantaraan pengkarbonan yang menerangkan kesan terus bagi $-\text{Br}$.

[6 marks/markah]

- [b] Propose syntheses to carry out each of the following conversions. Assume *ortho* and *para* isomers can be separated.

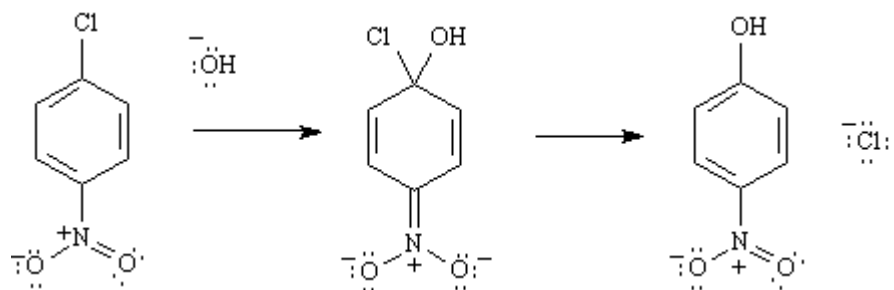
Cadangkan sintesis untuk menjalankan penukaran di bawah. Anggapkan isomer orto dan para boleh dipisahkan.



[5 marks/markah]

- [c] On the structural intermediates below, show all electron flow with arrows for the nucleophilic aromatic substitution reaction of *p*-nitrochlorobenzene with KOH.

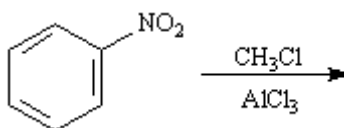
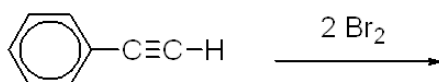
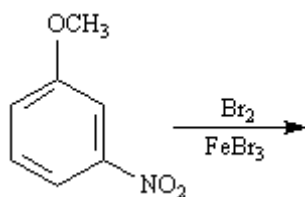
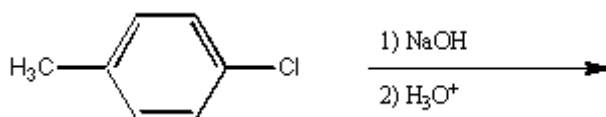
Bagi struktur perantara di bawah, tunjukkan semua aliran elektron dengan anak panah untuk tindak balas penukaran neuklofilik aromatik bagi p-nitrochlorobenzena dengan KOH.

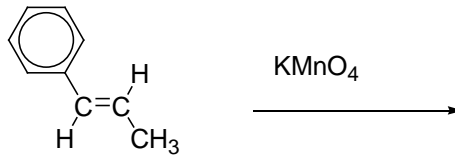


[4 marks/markah]

- [d] Give the major organic product(s) of each of the following reactions. If none is predicted, write "N.R."

Berikan hasil major organik bagi setiap tindak balas berikut. Jika tiada ramalan, tuliskan "N.R."





[10 marks/markah]

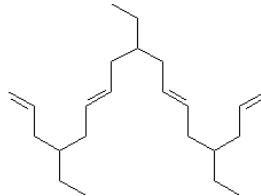
2. [a] Draw the structure of the product produced by the acyclic diene metathesis (ADMET) of 1,6-heptadiene.

Lukiskan struktur hasil yang dikeluarkan oleh metatesis asiklik dien (ADMET) untuk 1, 6-heptadin.

[2 marks/markah]

- [b] Draw the structure of the monomer used to produce the following polymer segment using the ROMP method.

Lukiskan struktur monomer yang digunakan untuk menghasilkan segmen polimer berikut dengan menggunakan kaedah ROMP.



[2 marks/markah]

- [c] Which type of polymer has a high glass transition temperature (T_g)?

Polimer jenis manakah mempunyai suhu peralihan kaca yang tinggi (T_g)?

[2 marks/markah]

- [d] Which type of polymer is characterized by irregular chain length, low T_g , and only a small degree of cross-linking?

Polimer jenis manakah yang mempunyai ciri panjang rantai tak tentu, rendah T_g dan hanya bersuhu kecil pautan-silang?

[2 marks/markah]

- [e] Explain the process of disproportionation of toluene?

Terangkan proses takberkadaran bagi toluena?

[5 marks/markah]

- [f] Explain how soap works in water and water -insoluble fat stains?

Terangkan bagaimana sabun bekerja di dalam air dan air-lumuran lemak tak terlarut?

[4 marks/markah]

- [g] Explain the main steps for the preparation of ibuprofen by using the green process?

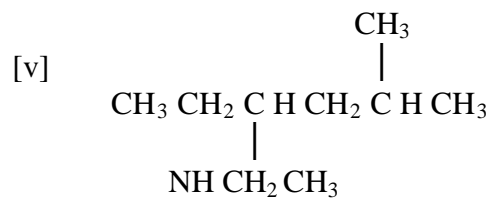
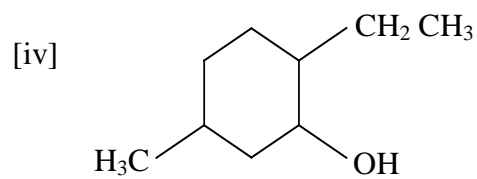
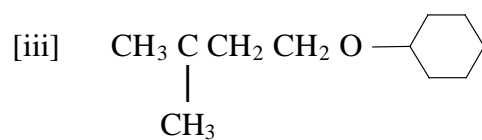
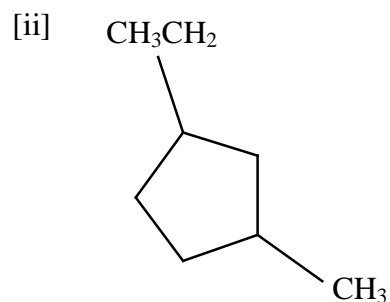
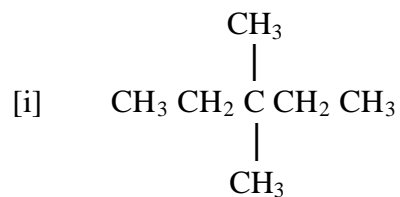
Terangkan langkah utama untuk penyediaan ibuprofen dengan menggunakan proses hijau?

[8 marks/markah]

...5/-

3. [a] Give the systematic IUPAC names for each of the following:

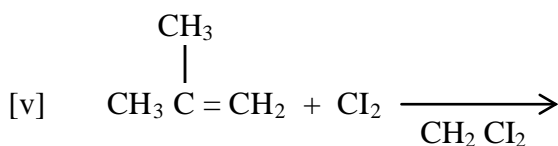
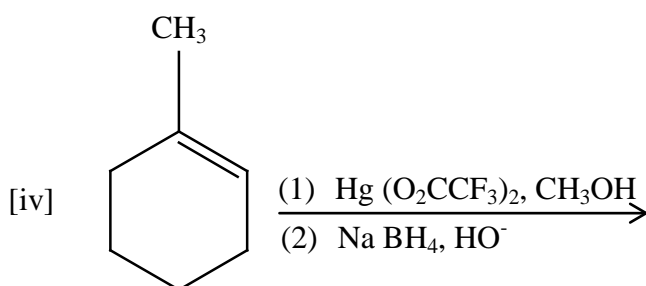
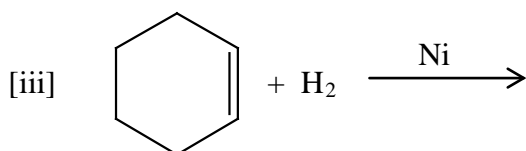
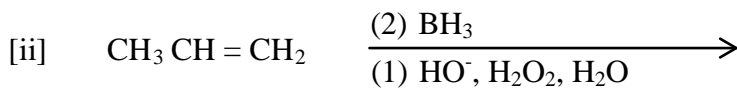
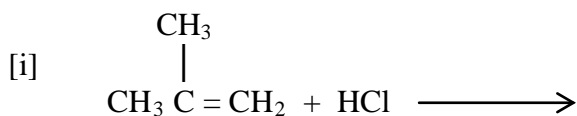
Berikan nama sistematik IUPAC bagi setiap yang berikut:



[5 marks/markah]

[b] Name the products of the following reactions:

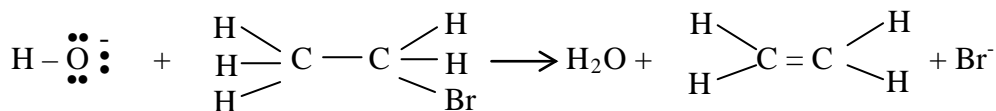
Namakan produk bagi tindak balas-tindak balas berikut:



[5 marks/markah]

[c] Draw curved arrows to show the flow of electrons responsible for the conversion of the reactants into the products.

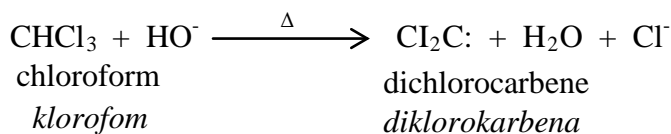
Lukiskan lengkungan anak panah untuk menunjukkan aliran elektron yang bertanggungjawab bagi penukaran bahan tindak balas kepada produk.



[5 marks/markah]

- [d] Dichlorocarbene can be generated by heating chloroform with HO^- . Propose a mechanism for the reaction.

Diklorokarbena boleh dihasilkan dengan memanaskan kloroform bersama HO^- . Cadangkan mekanisma bagi tindak balas.



[5 marks/markah]

- [e] Explain Markovnikov's rule, and give ONE example for it.

Jelaskan aturan Markovnikov's, dan berikan SATU contoh baginya.

[5 marks/markah]

4. [a] Fill in the blanks with "oxidized" or "reduced".

Isikan tempat kosong dengan "oksidasi" atau "reduksi".

[i] secondary alcohols are _____ to ketones.
alkohol sekunder _____ ke ketona.

[ii] acyl halides are _____ to aldehydes.
asil halida _____ ke aldehyd.

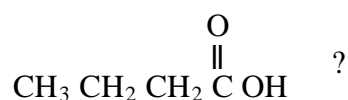
[iii] aldehydes are _____ to primary alcohols.
aldehyd _____ ke alkohol primer.

[iv] alkenes are _____ to aldehydes and/or ketons.
alkena _____ ke aldehyd dan/atau ketona.

[v] alkenes are _____ to alkanes.
alkena _____ ke alkana.

[5 marks/markah]

- [b] How could each of the following compounds be converted to
Bagaimanakah setiap daripada sebatian-sebatian berikut ditukarkan ke



[i] $\text{CH}_3 \text{CH}_2 \text{CH}_2 \overset{\text{O}}{\parallel} \text{C} \text{H}$

[ii] $\text{CH}_3 \text{CH}_2 \text{CH}_2 \text{CH}_2 \text{OH}$

[iii] $\text{CH}_3 \text{CH}_2 \text{CH}_2 \text{CH}_2 \text{Br}$

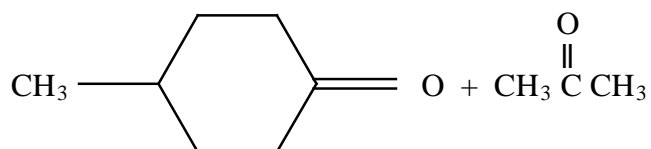
...8/-



[8 marks/markah]

- [c] Terpineol ($\text{C}_{10}\text{H}_{18}\text{O}$) is an optically active compound with one chirality center. It is used as an antiseptic. Reaction of terpineol with H_2/Pt forms an optically inactive compound ($\text{C}_{10}\text{H}_{20}\text{O}$). Heating the reduced compound in acid followed by ozonolysis under reducing conditions produces the following compounds.

Terpineol ($\text{C}_{10}\text{H}_{18}\text{O}$) ialah sebatian optik yang aktif dengan satu pusat kiral. Ianya digunakan sebagai antiseptik. Tindak balas terpineol dengan H_2/Pt membentuk sebatian optik yang tidak aktif ($\text{C}_{10}\text{H}_{20}\text{O}$). Pemanasan sebatian tereduksi di dalam asid diikuti dengan ozonolisis di bawah keadaan penurunan menghasilkan sebatian-sebatian berikut.



What is the structure of terpineol?
Apakah struktur bagi terpineol?

[5 marks/markah]

- [d] Describe a simple process flow diagram for the manufacturing of margarine.
Berikan gambarajah aliran yang mudah bagi proses untuk menghasilkan marjerin.

[7 marks/markah]