



UNIVERSITI SAINS MALAYSIA

Final Examination
2016/2017 Academic Session

May/June 2017

JIK 224 – Organic Chemistry I
[Kimia Organik I]

Duration : 3 hours
[Masa : 3 jam]

Please ensure that this examination paper contains **SEVEN** printed pages before you begin the examination.

Answer **FIVE** questions. Answer the questions in English. You may also answer the questions in Bahasa Malaysia, but not a mix of both languages.

All answers must be written in the answer booklet provided.

Each question is worth 20 marks and the mark for each sub question is given at the end of that question.

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

*Sila pastikan bahawa kertas peperiksaan ini mengandungi **TUJUH** muka surat yang bercetak sebelum anda memulakan peperiksaan ini.*

*Jawab **LIMA** soalan. Jawab soalan-soalan dalam Bahasa Inggeris. Anda juga dibenarkan menjawab soalan dalam Bahasa Malaysia, tetapi campuran antara kedua-dua bahasa ini tidak dibenarkan.*

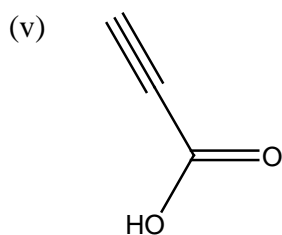
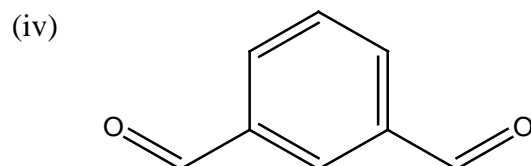
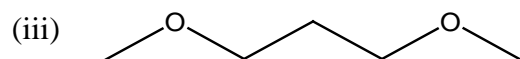
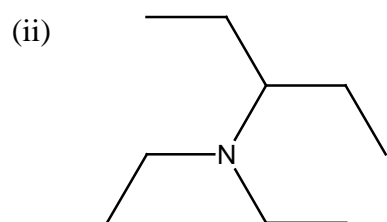
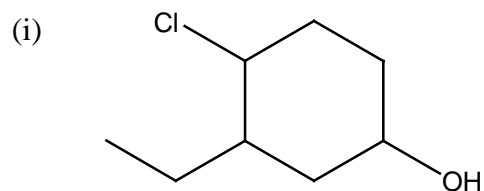
Setiap jawapan mesti dijawab di dalam buku jawapan yang disediakan.

Setiap soalan bernilai 20 markah dan markah subsoalan diperlihatkan di penghujung subsoalan itu.

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

1. (a) Give the IUPAC name for each of the following compounds.

Berikan nama IUPAC bagi setiap sebatian berikut.



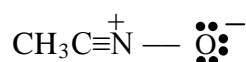
(10 marks/markah)

- (b) Compound **A** has the molecular formula of C_7H_{14} . **A** exists as two geometric isomers that are optically inactive, nonresolvable and are diastereomers of each other. Catalytic hydrogenation of **A** yield **B**. Compound **B** is optically inactive, but can be resolved into separate enantiomers. Give all the structural formula for compounds **A** and **B** (including their isomers). Write the reaction equation for the transformation **A** to **B**.

Sebatian A mempunyai formula molekul C_7H_{14} . A boleh wujud sebagai dua isomer geometri yang tidak beraktif optik, tidak teresolusikan dan merupakan diastereomer antara satu sama lain. Penghidrogenan mangkin sebatian A menghasilkan B. Sebatian B adalah beraktif optik, tetapi boleh diresolusikan kepada enantiomer berbeza. Berikan ke semua formula struktur bagi sebatian A dan B (berserta isomer-isomernya). Tuliskan persamaan tindak balas bagi perubahan A ke B.

(10 marks/markah)

2. (a) Draw another two resonance structures for the species below.
Lukis dua lagi struktur resonans bagi spesies di bawah.



(4 marks/markah)

- (b) For each of the molecule pairs below, which molecule has a higher boiling point? Explain your answer.
- isopentyl alcohol or isopentylamine
 - pentyl chloride or isopentyl chloride

Bagi setiap pasangan molekul di bawah, molekul yang manakah mempunyai takat didih lebih tinggi? Jelaskan jawapan anda.

- isopentil alkohol atau isopentilamina*
- pentil klorida atau isopentil klorida*

(8 marks/markah)

(c) For each of the compound below, draw the two chair conformations. In each case, determine which conformation is more stable.

- (i) *cis*-1-chloro-2-methylcyclohexane
 (ii) *trans*-1-chloro-2-methylcyclohexane

Bagi setiap sebatian di bawah, lukiskan kedua-dua konformasi kerusi. Tentukan konformasi yang mana lebih stabil untuk setiap sebatian.

- (i) *cis*-1-kloro-2-metilsikloheksana
 (ii) *trans*-1-kloro-2-metilsikloheksana

(8 marks/markah)

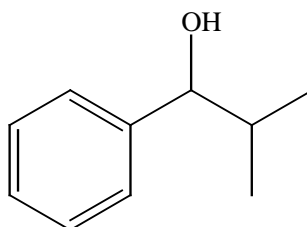
3. (a) Draw and name the monochlorination products you might obtain by radical chlorination of 2-methylbutane. Which of the products are chiral?

Lukis dan namakan hasil-hasil pemonoklorinan yang mungkin anda dapati dari pengklorinan radikal 2-metilbutana. Hasil manakah adalah kiral?

(10 marks/markah)

(b) Show how you would synthesise the following compound from an alcohol containing no more than four carbon atoms.

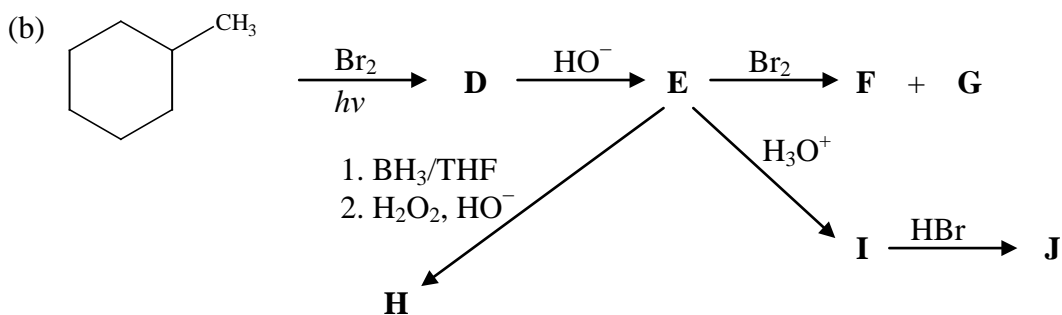
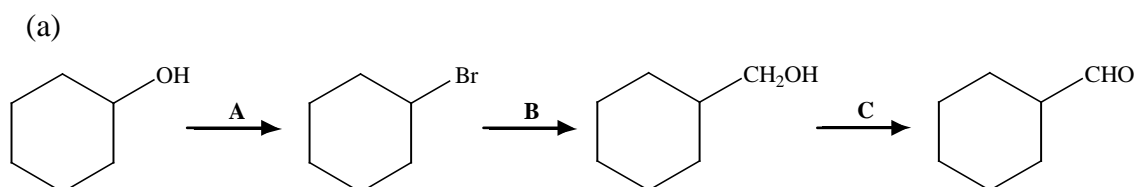
Tunjukkan bagaimana anda dapat mensintesis sebatian berikut daripada alkohol yang mengandungi tidak lebih dari empat atom karbon.



(10 marks/markah)

4. Give the reagents, reactants and structures of the product **A** to **J** for the following reactions.

Berikan reagen, reaktans dan struktur hasil A hingga J bagi tindak balas-tindak balas berikut.



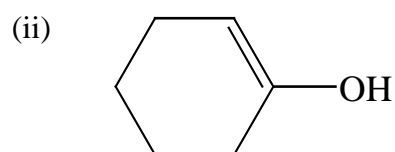
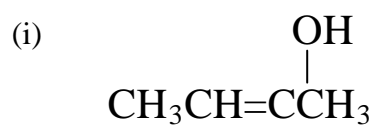
(20 marks/markah)

5. (a) What is meant by tautomerism?

Draw the keto tautomer for each of the following:

Apakah yang dimaksudkan dengan tautomerisme?

Lukis tautomer keto untuk setiap yang berikut:



(8 marks/markah)

(b) Show how you would accomplish the following synthetic conversions:

- (i) butan-1-ol from but-1-ene.
- (ii) but-1-yne from ethyne.
- (iii) *o*-bromobenzoic acid from benzene.

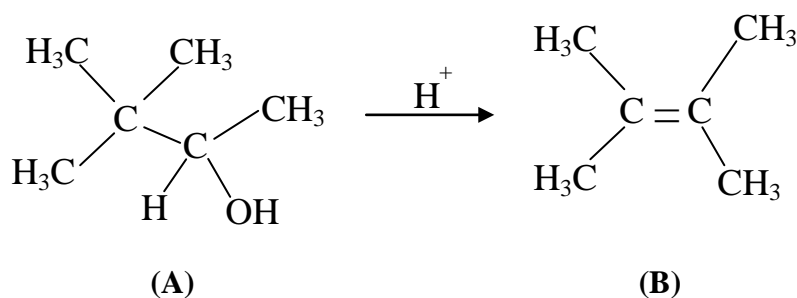
Tunjukkan bagaimana anda dapat membuat pertukaran sintetik berikut:

- (i) *butan-1-ol daripada but-1-ena.*
- (ii) *but-1-una daripada etuna.*
- (iii) *asid o-bromobenzoik daripada benzena.*

(12 marks/markah)

6. (a) You are given a reaction as below:

Anda diberikan tindak balas seperti berikut:



- (i) Name compounds (A) and (B) according to IUPAC system.
- (ii) Propose the mechanism for this reaction.
- (iii) Name the type of this reaction.

- (i) *Namakan sebatian (A) dan (B) mengikut sistem IUPAC.*
- (ii) *Berikan mekanisme bagi tindak balas ini.*
- (iii) *Namakan jenis tindak balas ini.*

(10 marks/markah)

- (b) Show how you would use a simple chemical test to distinguish between the following pairs of compounds. State your observation with each compound.
- (i) isopropyl alcohol and *tert*-butyl alcohol
 - (ii) isopropyl alcohol and butan-2-one

Tunjukkan bagaimana anda boleh menggunakan ujian kimia yang ringkas bagi membezakan antara pasangan sebatian berikut. Nyatakan pemerhatian anda bagi setiap sebatian.

- (i) isopropil alkohol dan tert-butil alkohol*
- (ii) isopropil alkohol dan butan-2-on*

(10 marks/markah)