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UNIVERSITI SAINS MALAYSIA

Second Semester Examination
Academic Session 2008/2009

April/May 2009

KOT 121 – Organic Chemistry I
[Kimia Organik I]

Duration: 3 hours
[Masa : 3 jam]

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

Instructions:

PART A (40 marks), comprising 40 multiple-choice questions (MCQ), **has to be answered within the first hour of the examination on the OMR forms provided. The completed OMR forms will be collected one hour after the commencement of the examination.**

PART B (60 marks) consists of essay-type questions. Answer any **THREE ONLY**, beginning the answer to each question on a new page.

You may answer the question either in Bahasa Malaysia or in English.

Ensure that your OMR form is complete [with your index number, course code, answers to the questions]. Use only a 2B pencil on your OMR form.

Submit the answer scripts and question paper to the invigilator before you leave the examination hall at the end of the examination.

SECTION B (60 MARKS)

Answer THREE questions.
Only the first THREE questions answered in the answer book will be marked.
You must start each question on a new page.

This section contains FOUR questions.

1. Free-radical chlorination of (*S*)-(+)-1-chloro-2-methylbutane gave a total of six fractions of formula $C_5H_{10}Cl_2$. Four fractions were found to be optically active, and two fractions optically inactive.

   (a) Draw Fisher projections for the compounds making up each fraction.

   (12 marks)

   (b) Account in detail for optical activity or inactivity in each case.

   (8 marks)

2. (a) Consider compounds, NH_3, HF, and H_2O. Rank these compounds in order of increasing acidity. Give reasons for your choice.

   (5 marks)

   (b) (i) Explain why the free rotation about the carbon-carbon bond in CH_3-CH_3 is not present in H_2C=CH_2.

   (ii) From the perspective of viewing down the C_2-C_3 bond, draw the Newman projection of the most stable conformation of 2,3-dimethylbutane.

   (5 marks)

(c) Give the IUPAC names for each of the following compounds:

(i)

(ii)

(iii)

(6 marks)

(d) Draw the most stable chair conformer for glucose.

(4 marks)

3. (a) Draw and name the six alkenes which have the molecular formula C_5H_{10}.

(6 marks)

(b) Give the major organic product of each of the following reactions below. Provide a detailed, stepwise mechanism which accounts for its formation.

(i)

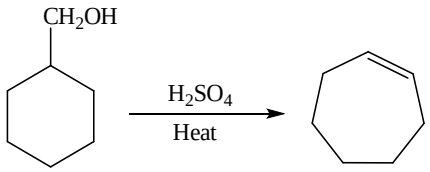
(ii)

(iii)

(iv)

(10 marks)

(c) Propose a detailed, step-by-step mechanism for the reaction shown below.



(4 marks)

4. (a) Consider the reaction of ethylacetylene with the following sets of reagents:

(I) H_2O, H_2SO_4, $HgSO_4$; and

(II) BH_3; then H_2O_2, HO^-.

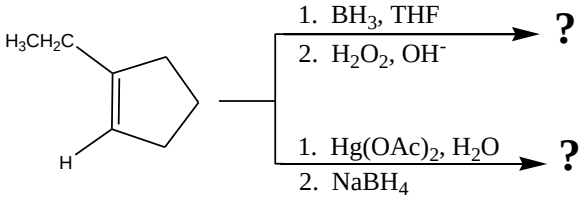
(i) Draw the products formed in both reactions.
(ii) Name the final products of both reactions.

(8 marks)

(b) Identify the organic products **A** and **B** in the following reaction sequence.

(4 marks)

(c) What products would you obtain from the following reactions? Explain your answer.



(8 marks)

...20/-

TERJEMAHAN

Arahan:

BAHAGIAN A (40 markah) mengandungi 40 soalan berbentuk objektif (MCQ), **perlu dijawab dalam masa satu jam pertama di dalam borang jawapan OMR yang disediakan. Borang OMR akan dikutip satu jam selepas peperiksaan bermula.**

BAHAGIAN B (60 Markah) mengandungi soalan bertulis. Jawab TIGA soalan sahaja. Jawab tiap-tiap soalan di muka surat yang baru.

Anda dibenarkan menjawab soalan ini sama ada dalam Bahasa Malaysia atau Bahasa Inggeris.

Pastikan borang OMR diisi dengan lengkap [nombor angka giliran, kod kursus, jawapan]. Gunakan hanya pensil 2B bagi borang OMR anda.

Sila serahkan buku jawapan dan kertas soalan ini kepada Pengawas sebelum anda keluar dari dewan peperiksaan.

BAHAGIAN B (60 MARKAH)

Jawab sebarang TIGA soalan.
Hanya TIGA jawapan yang pertama akan diperiksa.
Jawab tiap-tiap soalan pada muka surat yang baru.

Bahagian ini mengandungi EMPAT soalan.

1. Pengklorinan radikal bebas terhadap (S)-(+)-1-kloro-2-metilbutana menghasilkan enam pecahan yang berformula $C_5H_{10}Cl_2$. Empat pecahan didapati aktif optik, dan dua pecahan tidak aktif optik.

   (a) Lukis unjuran Fischer bagi sebatian-sebatian di dalam setiap pecahan tersebut.

   (12 markah)

   (b) Beri penjelasan tentang keaktifan atau ketidakaktifan optik di dalam setiap kes.

   (8 markah)

2. (a) Susun sebatian-sebatian NH_3, HF dan H_2O menurut kekuatan acid dalam tertib menaik. Berikan sebab untuk pilihan anda.

   (5 markah)

   (b) (i) Terangkan sebab putaran bebas ikatan karbon-karbon dalam $H_3C\text{-}CH_3$ tidak hadir dalam $H_2C{=}CH_2$.

   (ii) Lukis unjuran Newman bagi sebatian 2,3-dimetilbutana dalam konformasi paling stabil, dari pandangan ikatan $C_2\text{-}C_3$.

   (5 markah)

(c) Berikan nama IUPAC yang sesuai untuk sebatian-sebatian berikut:

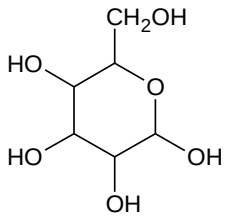
(i)

(ii)

(iii)

(6 markah)

(d) Lukis conformasi kerusi yang paling stabil bagi molekul glukosa berikut:



(4 markah)

3. (a) Lukis dan namakan enam alkena yang mempunyai formula molekul C_5H_{10}.

(6 markah)

(b) Berikan hasil organik utama bagi setiap tindak balas yang berikut. Berikan mekanisme lengkap dengan langkah-langkah terperinci yang menjelaskan pembentukannya.

(i)

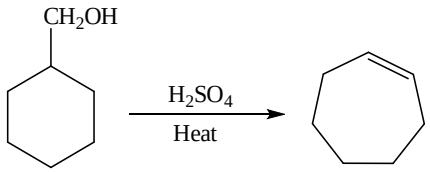
(ii)

(iii)

(iv)

(10 markah)

(c) Cadangkan suatu mekanisme dengan langkah-langkah terperinci bagi tindak balas yang berikut:



(4 markah)

5. (a) Pertimbangkan tindak balas etilasetilina dengan set reagen yang berikut:

(I) H_2O, H_2SO_4, $HgSO_4$; dan

(II) BH_3; kemudian H_2O_2, HO^-.

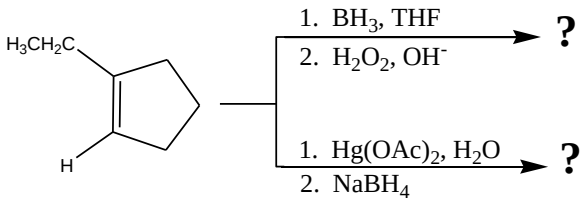
(iii) Lukis hasil yang terbentuk daripada kedua-dua tindak balas.
(iv) Berikan nama untuk hasil akhir kedua-dua tindak balas.

(8 markah)

(b) Kenalpasti hasil-organik **A** dan **B** di dalam turutan tindak balas berikut.

(4 markah)

(c) Apakah hasil yang anda perolehi daripada tidak balas berikut. Jelaskan jawapan anda.



(8 markah)