
UNIVERSITI SAINS MALAYSIA

Second Semester Examination
2009/2010 Academic Session

April/May 2010

KOT 323 – Organic Chemistry III
[Kimia Organik III]

Duration : 3 hours
[Masa : 3 jam]

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

Instructions:-

Answer **FIVE** (5) questions.

Answer each question on a new page.

You may answer either in Bahasa Malaysia or in English.

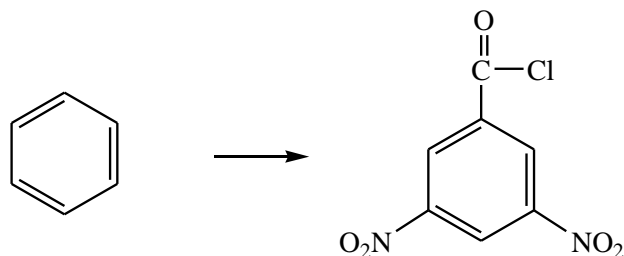
If a candidate answers more than five questions, only the answers to the first five questions in the answer sheet will be graded.

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

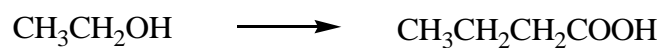
- 2 -

1. (a) Propose a synthetic method for each of the following conversions. No mechanism is needed.

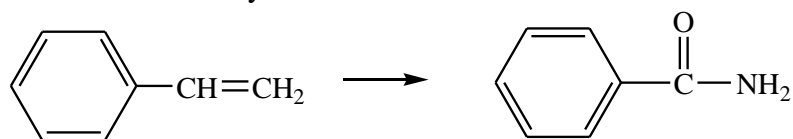
- (i) 3,5-Dinitrobenzoyl chloride from benzene



- (ii) Butanoic acid from ethanol

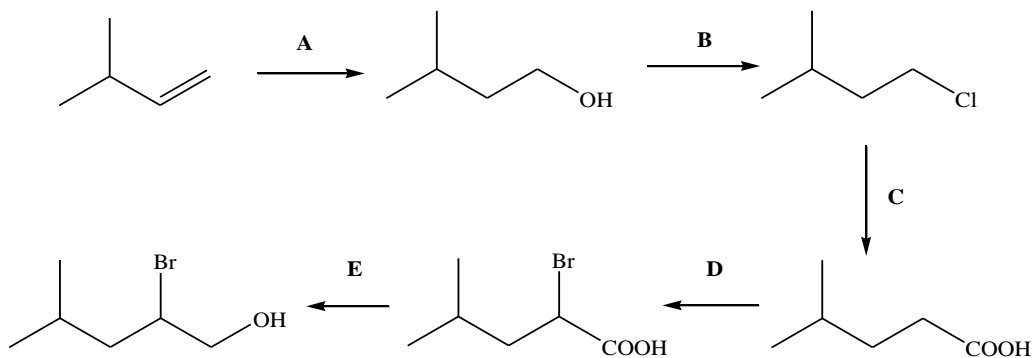


- (iii) Benzamide from styrene



(10 marks)

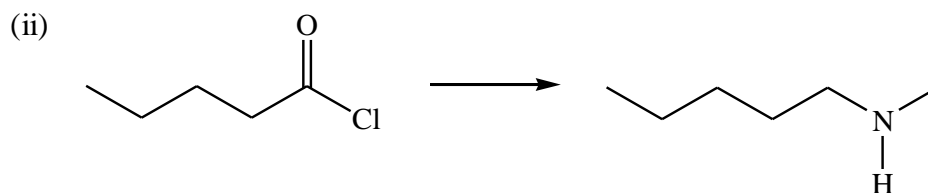
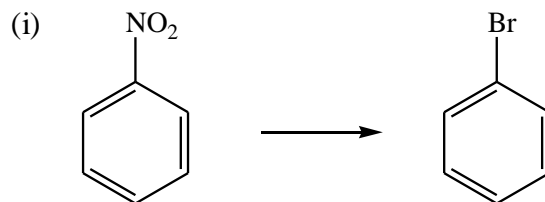
- (b) Identify the reagent(s) in **A** to **E** in the reaction scheme below:



(10 marks)

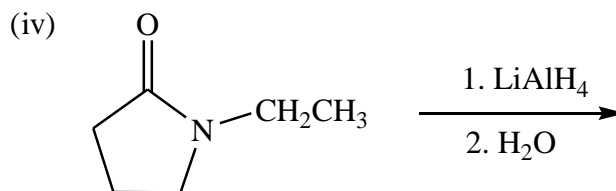
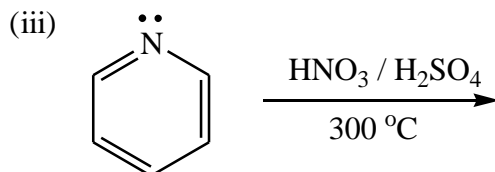
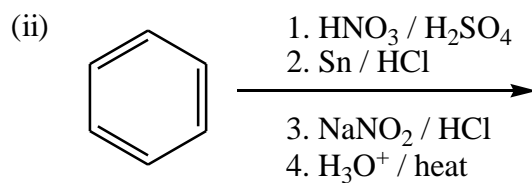
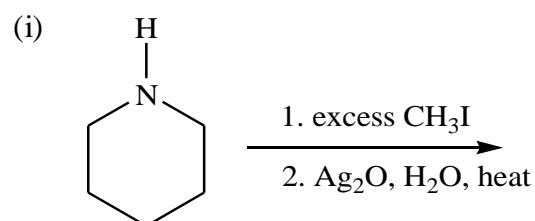
- 3 -

2. (a) Propose a synthetic method for each of the following conversions. No mechanism is needed.

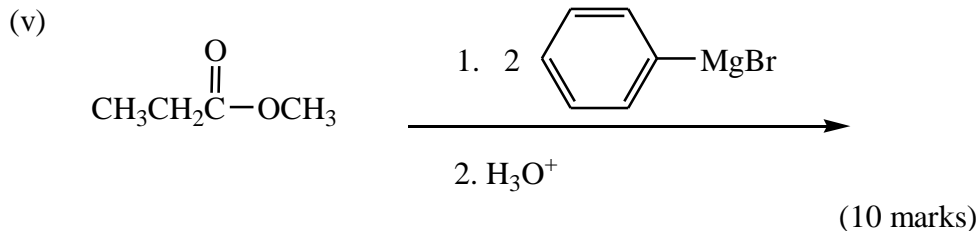


(10 marks)

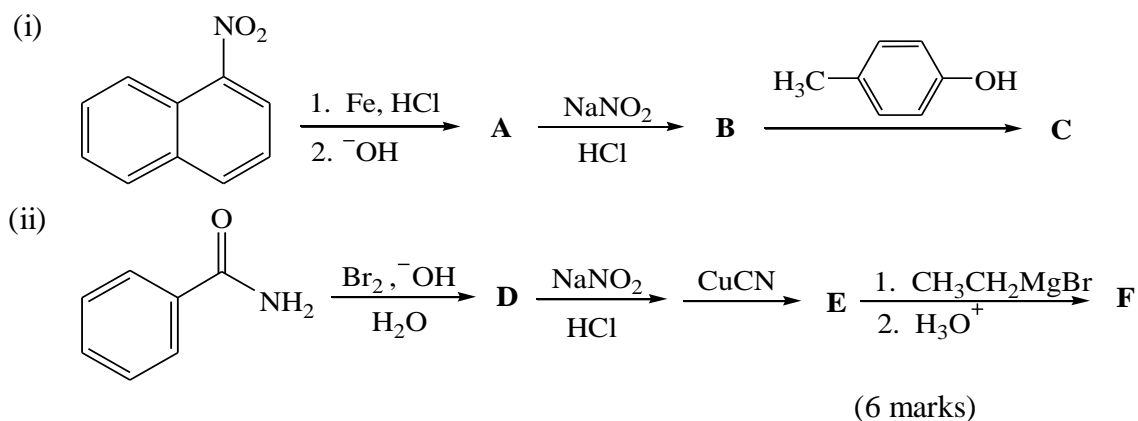
- (b) Give the product of each of the following reactions:



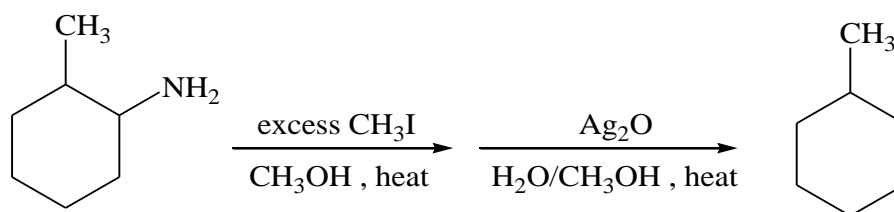
- 4 -



3. (a) Give the structures for compounds **A** through **J** in the reactions below:

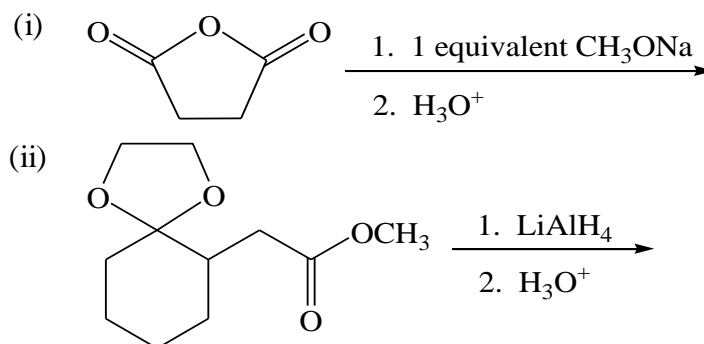


(b) Provide a mechanism for the elimination reaction below.

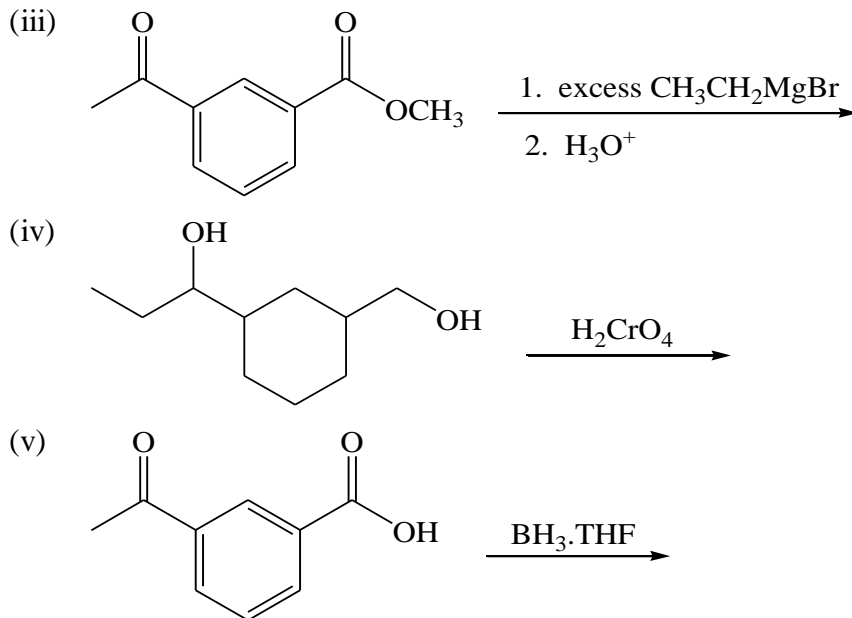


(4 marks)

(c) Give the product of each of the following reactions:



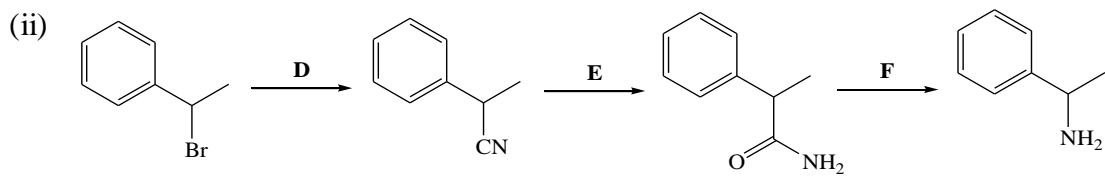
- 5 -



(10 marks)

4. (a) Give the reagents and conditions for the following reactions:

(i)



(6 marks)

- 6 -

- (b) δ -Hydroxyvaleric acid forms δ -valerolactone, a cyclic ester, in the presence of an acid. Propose a mechanism for this reaction.

 δ -hydroxyvaleric acid δ -valerolactone

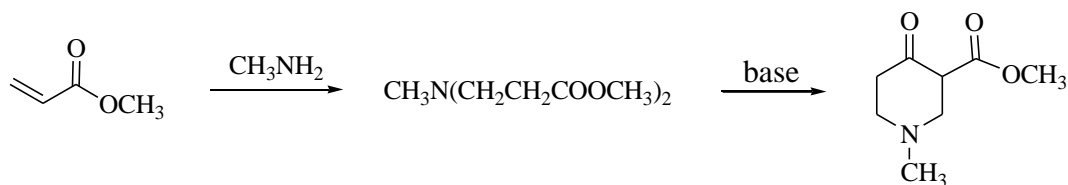
(4 marks)

- (c) Draw the structures of the following nucleotides and sugar derivatives:

- (i) Guanosine triphosphate (GTP)
- (ii) Deoxycytidine monophosphate (dCMP)
- (iii) 4-*O*-(α -D-glucopyranosyl)-D-galactopyranose
- (iv) 6-*O*-(β -D-galactopyranosyl)-D-glucopyranose

(4 marks)

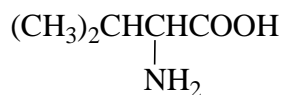
- (d) Propose a mechanism for the following reaction:



(6 marks)

5. (a) Show how you would make valine using

- (i) the Strecker synthesis, and
- (ii) the Gabriel-malonic ester synthesis.

**valine**

In each case, what stereochemistry would you expect in your synthetic product? Draw the three-dimensional representation of L-valine.

(8 marks)

- 7 -

- (b) Show the steps and intermediates in the synthesis of Gly-Ala-Phe by the solution-phase process.

(6 marks)

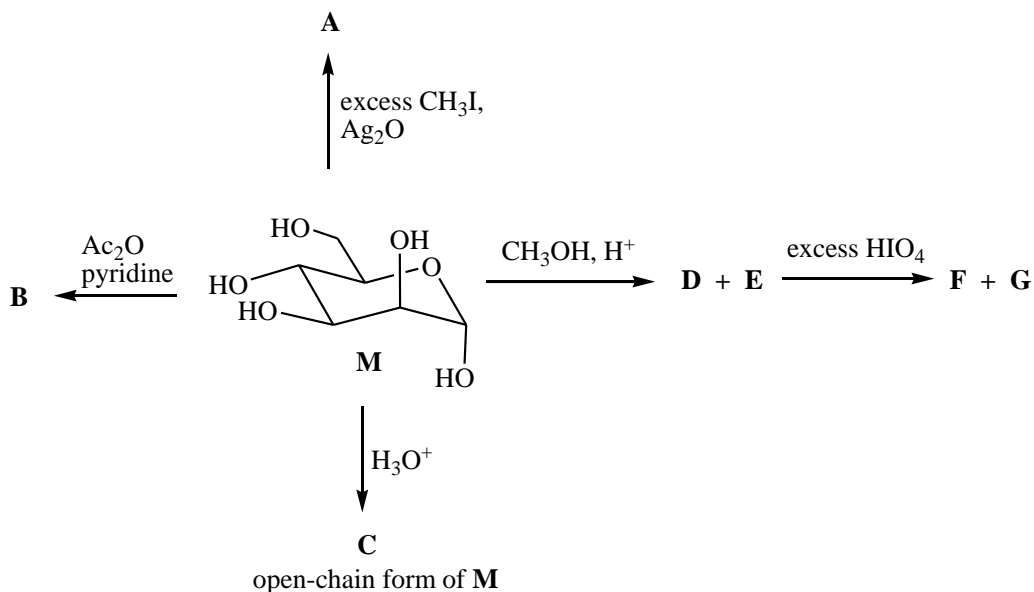
- (c) Bradykinin is a nonapeptide with molecular formula Arg₂, Gly, Phe₂, Pro₃, Ser. The use of 2,4-dinitrofluorobenzene and carboxypeptidase shows that both terminal residues are arginine. Partial acid hydrolysis of bradykinin gives:



What is the amino acid sequence of bradykinin?

(6 marks)

6. (a) Give the structures of compounds **A** through **G** in the reactions below:



(7 marks)

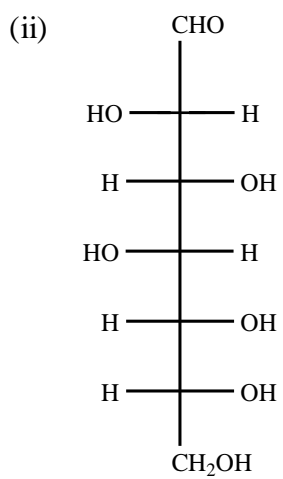
- (b) Treatment with sodium borohydride converts aldose **H** into an optically inactive alditol. Ruff degradation of **H** forms **J**, whose alditol is optically inactive. Ruff degradation of **J** forms D-glyceraldehyde. Identify **H** and **J**.

(5 marks)

- 8 -

(c) Show how D-(+)-glucose can be converted into

(i) D-fructose



(8 marks)

7. (a) Predict the products of the following reactions:

(i)

(ii)

(iii)

(8 marks)

(b) Show how you would make each of the following compounds:

(i)

(ii)

(iii)



(12 marks)

TERJEMAHAN

Arahan:

Jawab **LIMA** (5) soalan sahaja.

Jawab setiap soalan pada muka surat yang baru.

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

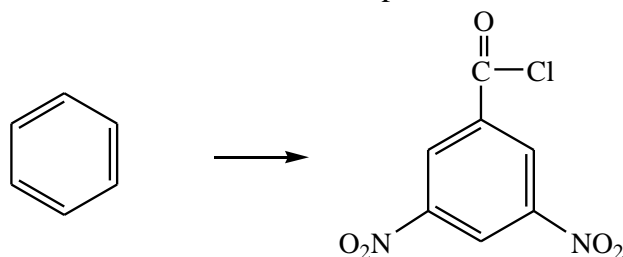
Jika calon menjawab lebih daripada lima soalan, hanya lima soalan pertama mengikut susunan dalam skrip jawapan akan diberi markah.

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

- 11 -

1. (a) Cadangkan suatu cara sintesis bagi setiap penukaran berikut. Mekanisme tidak diperlukan.

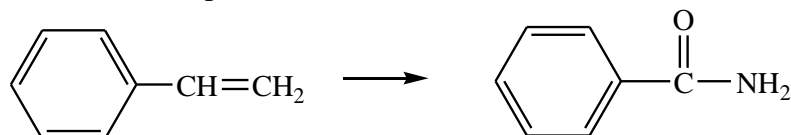
- (i) 3,5-Dinitrobenzoil klorida daripada benzena



- (ii) Asid butanoik daripada etanol

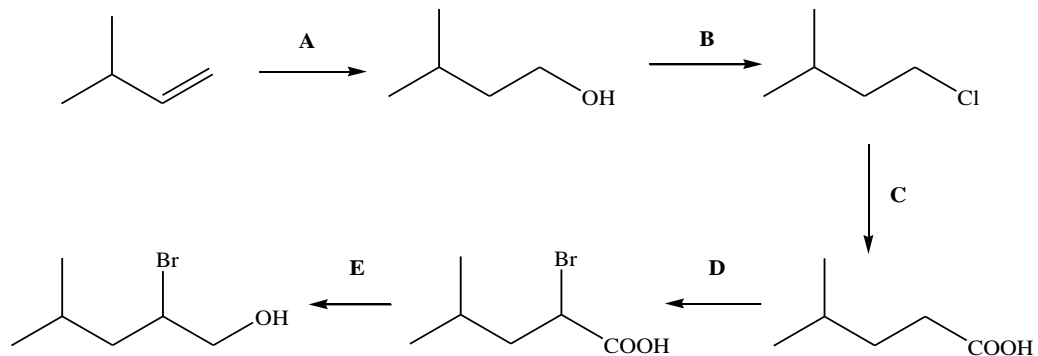


- (iii) Benzamida daripada stirena



(10 markah)

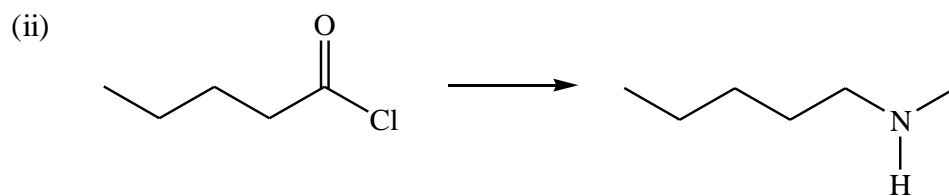
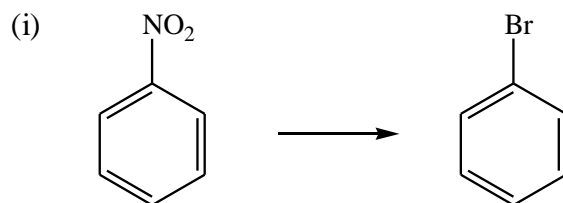
- (b) Kenalpastikan reagen bagi **A** hingga **E** dalam skema tindak balas berikut:



(10 markah)

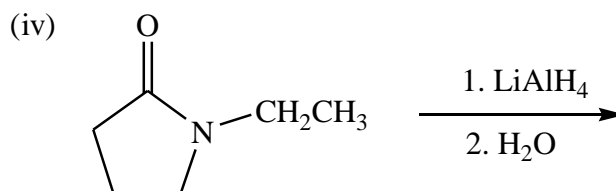
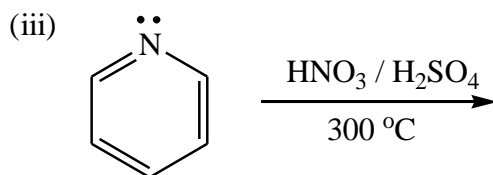
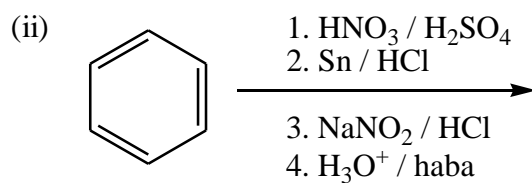
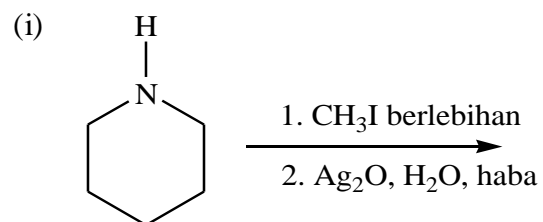
- 12 -

2. (a) Cadangkan suatu cara sintesis bagi setiap penukaran berikut. Mekanisme tidak diperlukan.

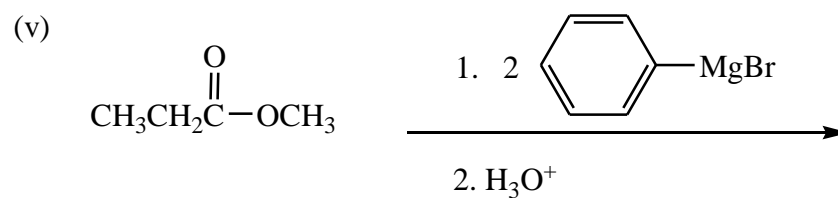


(10 markah)

- (b) Berikan hasil bagi setiap tindak balas berikut:



- 13 -



(10 markah)

3. (a) Berikan struktur bagi sebatian **A** hingga **F** dalam tindak balas berikut:

(i)

(ii)

(6 markah)

(b) Berikan suatu mekanisme bagi tindak balas penyingkiran berikut.

(4 markah)

(c) Berikan hasil bagi setiap tindak balas berikut:

(i)

- 14 -

(ii)

(iii)

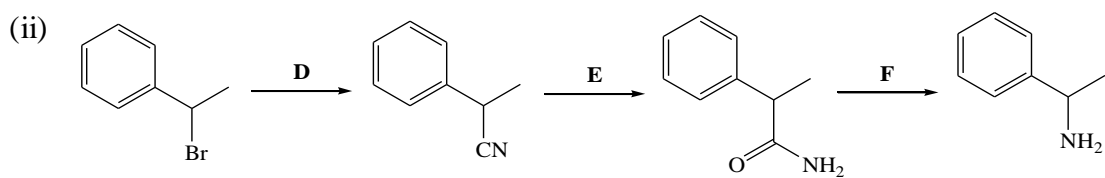
(iv)

(v)

(10 markah)

4. (a) Berikan reagen dan keadaan bagi setiap tindak balas berikut:

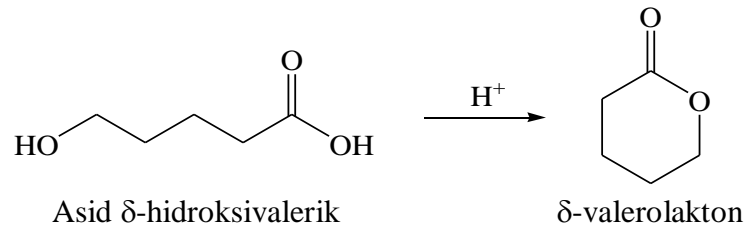
(i)



(6 markah)

- 15 -

- (b) Asid δ -hidroksivalerik membentuk δ -valerolakton, suatu ester siklik, dalam kehadiran suatu asid. Cadangkan suatu mekanisme bagi tindak balas ini.



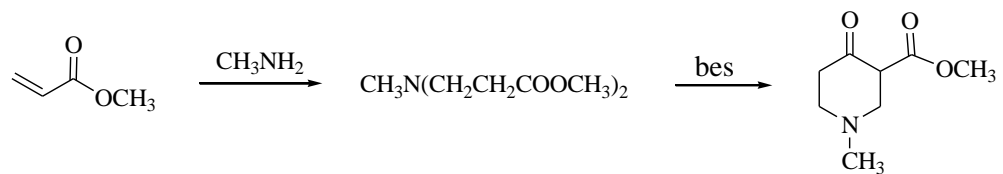
(4 markah)

- (c) Lukis struktur bagi setiap nukleotida dan terbitan gula berikut:

- (i) Guanosina trifosfat (GTP)
- (ii) Deoksitisidina monofosfat (dCMP)
- (iii) 4-*O*-(α -D-glukopiranosil)-D-galaktopiranosida
- (iv) 6-*O*-(β -D-galaktopiranosil)-D-glukopiranosida

(4 markah)

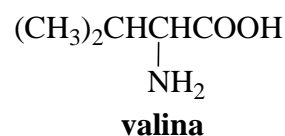
- (d) Cadangkan suatu mekanisme bagi tindak balas berikut:



(6 markah)

5. (a) Tunjukkan bagaimana anda dapat menyediakan valina menggunakan

- (i) sintesis Strecker, dan
- (ii) sintesis ester Gabriel-malonik.



- 16 -

Dalam setiap kes, apakah stereokimia yang anda jangkakan dalam hasil sintesis anda? Lukis suatu perwakilan tiga-dimensi bagi L-valina.

(8 markah)

- (b) Tunjukkan semua langkah dan bahan perantara dalam sintesis Gly-Ala-Phe melalui proses fasa larutan.

(6 markah)

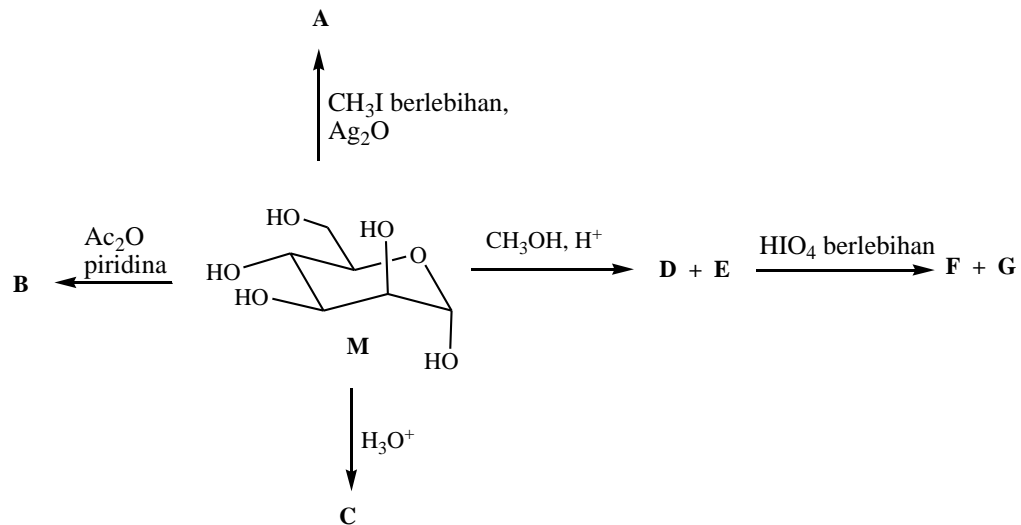
- (c) Bradykinin ialah suatu nonapeptida yang mempunyai formula molekul Arg₂, Gly, Phe₂, Pro₃, Ser. Penggunaan 2,4-dinitrofluorobenzena dan karbopeptidase menunjukkan kedua-dua penghujung ialah arginina. Hidrolisis separa dalam asid memberi:

Phe-Ser + Pro-Gly-Phe + Pro-Pro + Ser-Pro-Phe + Phe-Arg + Arg-Pro

Apakah urutan asid amino bagi bradykinin?

(6 markah)

6. (a) Berikan struktur bagi sebatian **A** hingga **G** dalam tindak balas di bawah.



bentuk rantai terbuka bagi M

(7 markah)

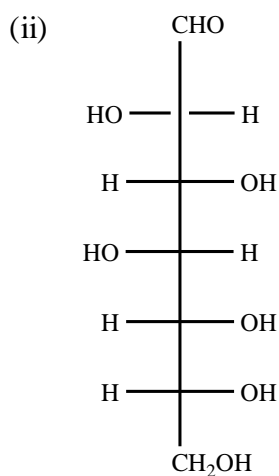
- 17 -

- (b) Pengolahan dengan natrium borohidrida menukarkan aldosa **H** kepada suatu alditol tidak aktif optik. Degradasi Ruff terhadap **H** membentuk **J** yang alditolnya tidak aktif optik. Degradasi Ruff terhadap **J** membentuk D-gliseraldehid. Kenalpastikan **H** dan **J**.

(5 markah)

- (c) Tunjukkan bagaimana D-(+)-glukosa dapat ditukarkan kepada

(i) D-fruktosa



(8 markah)

7. (a) Ramalkan hasil bagi setiap tindak balas berikut:

(i)

(ii)

(iii)



(8 markah)

- 18 -

(b) Tunjukkan bagaimana anda menyediakan setiap sebatian berikut:

(i)

(ii)

(iii)

(12 markah)

-oooOooo-