UNIVERSITI SAINS MALAYSIA

First Semester Examination
Academic Session 2008/2009

November 2008

KIT 356 – Chemical Processes
[Pemprosesan Kimia]

Duration: 3 hours
[Masa : 3 jam]

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

Instructions:

Answer any **FIVE** (5) questions.

You may answer the questions 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.

...2/-

1. Show how the following products can be prepared from the given chemicals:

   (a) Methyl tert-butyl ether (MTBE) from isobutene

   (b) Bio-diesel (methyl esters) from vegetable oils

   (c) Styrene from any component of BTX

   (d) Diethyleneglycol, $HOCH_2CH_2OCH_2CH_2OH$, from ethene

   (e) Nylon 6 from benzene

   (20 marks)

2. (a) Explain how every component of synthesis gas (syngas) is isolated and purified from coal.

   (6 marks)

   (b) Discuss the production of ethene dan propene from petroleum. Show the mechanism involved.

   (6 marks)

   (c) Discuss the preparation of high density polyethylene (HDPE) and low density polyethylene (LDPE). Show the mechanisms involved.

   (8 marks)

3. (a) Nylon fibre can be prepared from petroleum products and also from vegetable oils. Discuss.

   (6 marks)

   (b) Methanol and urea plants are always built near to each other. Explain with regards to the processes involved.

   (8 marks)

   (c) Write briefly about the Hock Process.

   (6 marks)

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4. (a) Discuss the production and uses of the following chemicals:

(i) Formaldehyde

(ii) Dinitrotoluene

(iii) Fatty alcohols (long chain alcohols)

(iv) Vinyl acetate

(v) Glycerol

(10 marks)

(b) Write a short note on the industrial production and uses of **EITHER** carbon dioxide, CO_2, **OR** sulfur dioxide, SO_2.

(10 marks)

5. Air and water are two of the important raw materials in manufacturing industries.

(a) Discuss their industrial significance.

(8 marks)

(b) Choose **ONE** of the above raw materials. Elaborate its separation and / or purification for industrial use.

(12 marks)

6. Metals play a major role in the well being of mankind. The main extraction processes are pyrometallurgy, electrometallurgy and hydrometallurgy.

(a) Briefly describe each of the metal extraction process above.

(6 marks)

(b) Discuss the advantage and limitation of each extraction process.

(6 marks)

(c) Choose **ONE** example of the metal extraction procedure related to any one of the process above. Write a short note.

(8 marks)

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7. (a) Give various main equations in the industrial production of silicon from silica.

(4 marks)

(b) Elaborate the role of structure-property relationship that determine the liquid, gel, elastomer and resin phases in polysiloxanes.

(6 marks)

(c) Write a short essay on the industrial production of polysiloxane from silicon tetrachloride.

(10 marks)

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TERJEMAHAN

Arahan:

Jawab **LIMA** (5) soalan.

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.

...6/-

1. Tunjukkan bagaimana hasil yang berikut dapat disediakan daripada bahan kimia yang diberikan:

   (a) Metil ter-butil eter (MTBE) daripada isobutena

   (b) Bio-diesel (metil ester) daripada minyak sayuran

   (c) Stirena daripada sebarang komponen BTX

   (d) Dietilenaglikol, $HOCH_2CH_2OCH_2CH_2OH$, daripada etena

   (e) Nilon 6 daripada benzena

   (20 markah)

2. (a) Terangkan bagaimana setiap komponen gas sintesis (syngas) dapat diasing dan ditulenkan daripada arang batu.

   (6 markah)

   (b) Bincangkan penghasilan etena dan propena daripada bahan petroleum. Tunjukkan mekanisme yang terlibat.

   (6 markah)

   (c) Bincangkan penyediaan polietilena berketumpatan tinggi (HDPE) dan polietilena berketumpatan rendah (LDPE). Tunjukkan mekanisme yang terlibat.

   (8 markah)

3. (a) Gentian nilon boleh disediakan daripada bahan petroleum dan juga daripada minyak sayuran. Bincangkan.

   (6 markah)

   (b) Loji metanol dan urea selalunya dibina berdekatan di antara satu sama lain. Terangkan dengan proses-proses yang terlibat.

   (8 markah)

   (c) Tulis secara ringkas tentang Proses Hock.

   (6 markah)

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4. (a) Bincangkan penghasilan dan penggunaan bahan kimia yang berikut:

(i) Formaldehid

(ii) Dinitrotoluena

(iii) Alkohol lemak (alcohol berantai panjang)

(iv) Vinil asetat

(v) Gliserol

(10 markah)

(b) Tulis satu nota pendek penghasilan industri dan kegunaan **SAMA ADA** karbon dioksida, CO_2, **ATAU** sulfur dioksida, SO_2.

(10 markah)

5. Udara dan air adalah dua daripada bahan mentah utama dalam industri pembuatan.

(a) Bincangkan kepentingan industrinya.

(8 markah)

(b) Pilih **SATU** daripada bahan mentah di atas. Huraikan pemisahan dan atau penulinannya bagi kegunaan industri.

(12 markah)

6. Logam memainkan peranan penting dalam kesejahteraan manusia sejagat. Proses-proses utama pengekstrakan logam adalah pirometalurgi, elektrometalurgi dan hidrometalurgi.

(a) Terangkan secara ringkas setiap proses pengekstrakan logam di atas.

(6 markah)

(b) Bincangkan kelebihan dan kekurangan setiap proses pengekstrakan itu.

(6 markah)

(c) Pilih **SATU** contoh prosedur pengekstrakan logam bersabit mana-mana proses di atas. Tuliskan satu nota pendek.

(8 markah)

...8/-

7. (a) Berikan rangkaian tindakbalas utama untuk penghasilan industri silikon daripada silika.

(4 markah)

(b) Huraikan peranan hubungan ciri-struktur bagi penentuan fasa cecair, gel, elastomer dan resin dalam polisiloksana.

(6 markah)

(c) Tuliskan esei pendek mengenai penghasilan industri polisiloksana daripada silikon tetraklorida.

(10 markah)

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