UNIVERSITI SAINS MALAYSIA

First Semester Examination
Academic Session 2008/2009

November 2008

EKC 483 – Petroleum & Gas Processing Engineering
[Kejuruteraan Pemprosesan Petroleum & Gas]

Duration : 3 hours
[Masa : 3 jam]

Please check that this examination paper consists of SIX pages of printed material and THREE pages of Appendix before you begin the examination.

[Sila pastikan bahawa kertas peperiksaan ini mengandungi ENAM muka surat yang bercetak dan TIGA muka surat Lampiran sebelum anda memulakan peperiksaan ini.]

Instructions: Answer **FOUR** (4) questions. Answer **TWO** (2) questions from Section A. Answer **TWO** (2) questions from Section B.

*[**Arahan:** Jawab **EMPAT** (4) soalan. Jawab **DUA** (2) soalan dari Bahagian A. Jawab **DUA** (2) soalan dari Bahagian B.]*

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

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

Section A : Answer any TWO questions.
Bahagian A : Jawab mana-mana DUA soalan.

1. [a] Define each of the following:
Takrifkan setiap yang berikut:

[i] API gravity
Graviti API

[ii] Carbon residue
Baki karbon

[iii] Asphaltene
Asfaltena

[iv] Naphthene
Naftena

[v] Aromatic
Aromatik

[5 marks/markah]

[b] [i] Discuss briefly the basic refinery operations in a conventional petroleum refinery.
Bincangkan secara ringkas operasi asas dalam sebuah kilang penapis petroleum lazim.

[5 marks/markah]

[ii] List the products of crude distillation.
Senaraikan produk-produk penyulingan minyak mentah.

[3 marks/markah]

[c] [i] Discuss briefly the delayed coking process.
Bincangkan secara ringkas proses pengkokan terlengah.

[7 marks/markah]

[ii] Give the common types of petroleum coke and their main uses.
Berikan jenis-jenis kok petroleum yang biasa dan kegunaan utamanya.

[5 marks/markah]

2. [a] The following ASTM laboratory data were obtained for light oil cut. Convert these ASTM data to True Boiling Point (TBP) data.
Data makmal ASTM yang berikut diperolehi bagi pecahan minyak ringan. Tukarkan data ASTM ini kepada data takat didih sebenar.

Vol. % *Isipadu %*	IBP *Takat didih mula*	10	30	50	70	90	FBP *Takat didih akhir*
ASTM Temperature, °F *Suhu ASTM, °F*	424	453	484	502	504	536	570

[5 marks/markah]

...3/-

[b] Using the crude oil analysis given in Appendix, construct the True Boiling Point curve and gravity-mid percent curve.

Gunakan analisa minyak mentah yang diberi di Lampiran, binakan Lengkung Takat Didih Sebenar dan lengkung graviti-peratus tengah.

[10 marks/markah]

[c] Discuss the feed characteristic for a catalytic cracker. How does it differ from the feed for a hydrocracker?

Bincangkan ciri suapan bagi sebuah pemecah bermangkin. Bagaimana ia berbeza dengan ciri suapan bagi sebuah reaktor penghidropecahan?

[5 marks/markah]

[d] Briefly discuss the Fluid Catalytic Cracking (FCC) process.

Bincangkan secara ringkas proses Pemecahan Bermangkin Bendalir.

[5 marks/markah]

3. [a] Sketch an ebullated bed reactor and briefly discuss its advantages in the processing of heavy stock.

Lakarkan sebuah reaktor lapisan ebulasi dan bincangkan secara ringkas kelebihan reaktor ini dalam pemprosesan stok berat.

[8 marks/markah]

[b] Discuss the effect of the operating variables: temperature, hydrogen partial pressure and space velocity in the hydrotreating process.

Bincangkan kesan operasi pembolehubah: suhu, tekanan separa hidrogen dan halaju ruang dalam proses penghidrorawatan.

[4 marks/markah]

[c] Outline the main goal of catalytic reforming and the common catalyst used in a catalytic reformer. Outline the major chemical reactions occur in a catalytic reformer during an operation.

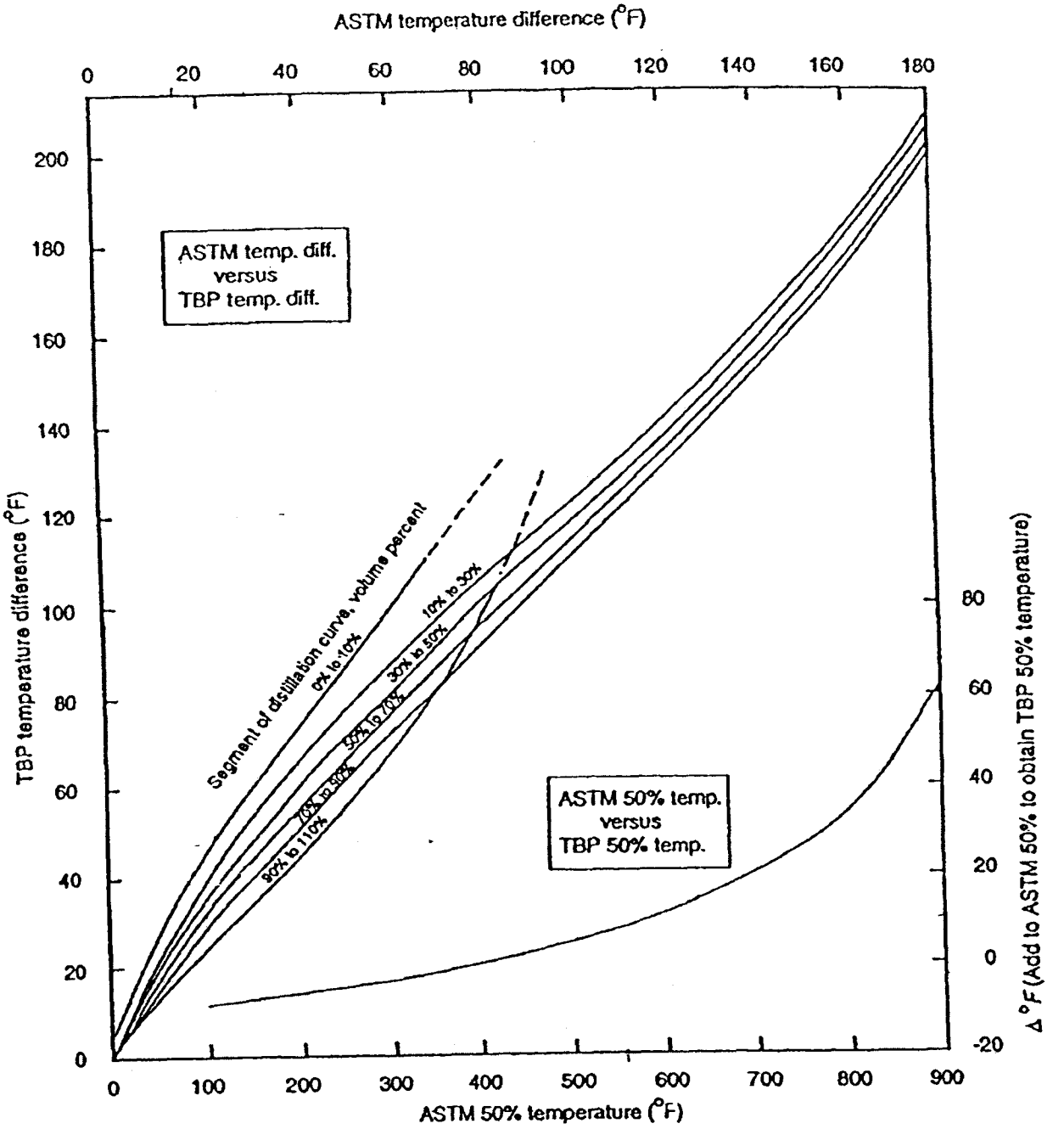
Bincangkan matlamat utama proses bentuk semula bermangkin dan pemangkin yang biasa digunakan dalam reaktor bentuk semula bermangkin. Jelaskan tindakbalas-tindakbalas kimia utama yang berlaku dalam sebuah reaktor bentuk semula bermangkin semasa beroperasi.

[8 marks/markah]

[d] Explain the operations of a typical semi-regenerative catalytic reformer unit based on Figure Q.3.[d].

Jelaskan pengendalian suatu unit reaktor bentuk semula bermangkin kitar-jana separuh berdasarkan Rajah S.3.[d].

[5 marks/markah]



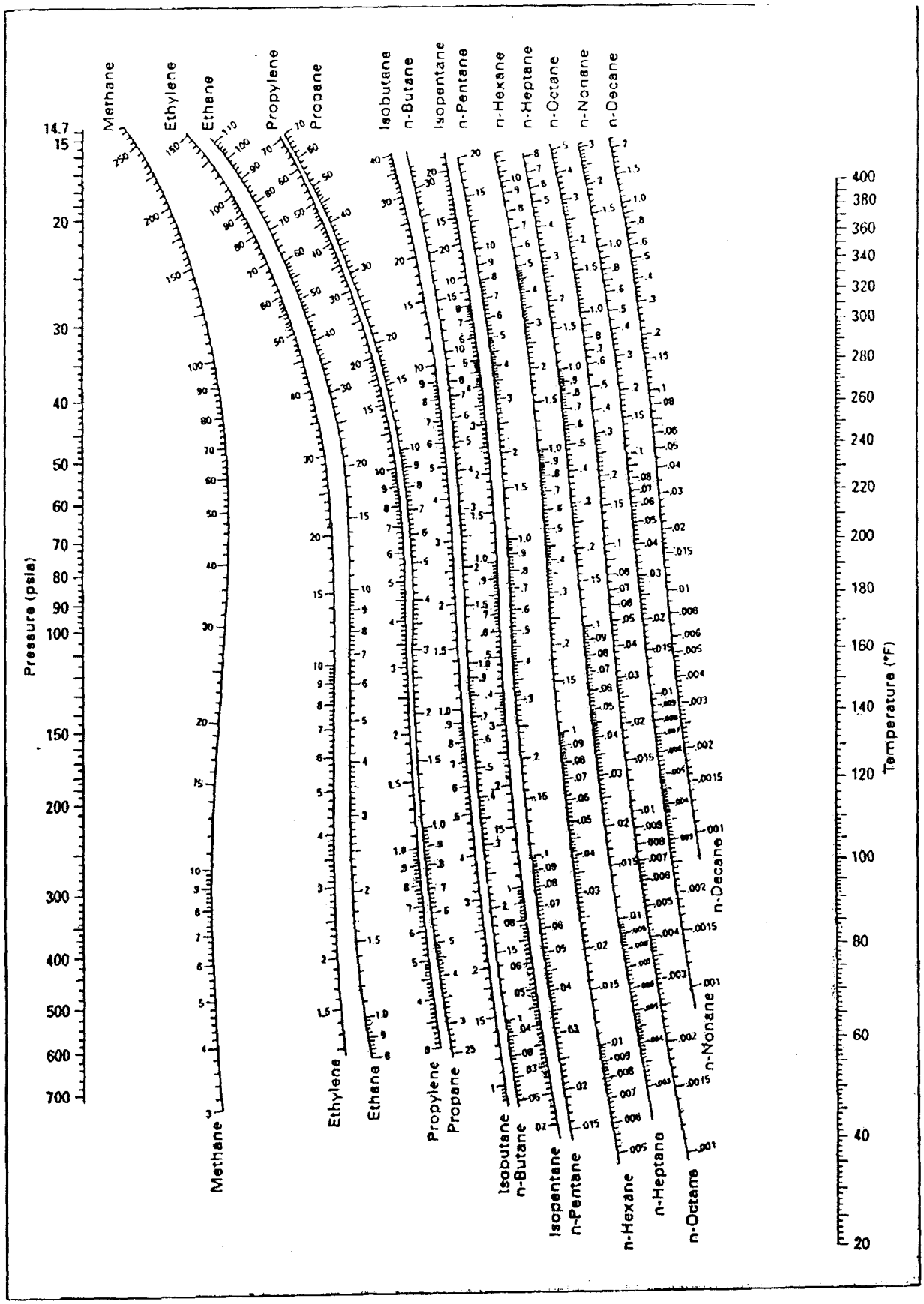


Figure *K*-values for systems of light hydrocarbons. High-temperature range.