INSTRUCTION:

This section consists of **FOUR (4)** structured questions. Answer **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan berstruktur. Jawab **SEMUA** soalan.*

QUESTION 1

SOALAN 1

CLO1 (a) Define crystallisation process.

Takrifkan proses penghabluran.

[3 marks]

[*3 markah*]

CLO1 (b) The two-phase pair extraction can be gas-liquid, vapour-liquid and liquid-liquid or fluid-solid extraction.

Penyulingan pasangan dua fasa boleh menjadi gas-cecair, wap-cecair dan cecair-cecair atau pengekstrakan cecair-pepejal.

i. Explain the definition of liquid-liquid extraction.

Terangkan definisi pengekstrakan cecair-cecair.

[4 marks]

[*4 markah*]

ii. Choose **FOUR (4)** applications of liquid-liquid extraction as listed in Table 1 (b).

*Pilih **EMPAT (4)** aplikasi pengekstrakan cecair-cecair seperti yang disenaraikan di dalam Jadual 1 (b).*

Table 1 (b) / *Jadual 1 (b)*

• processing of distilled water	• production of ammonia	• processing of perfumes
• ore processing	• production of fine organic compounds	• production of biodiesel

[4 marks]

[*4 markah*]

(c) Diagram 1 (c) shows the process flow of the absorption of solute-rich feed gas mixture.

Rajah 1 (c) menunjukkan aliran proses penyerapan campuran gas masukan yang mengandungi bahan larut.

i. Expose **THREE (3)** principles of absorption rate.

*Dedahkan **TIGA (3)** prinsip kadar penyerapan.*

[6 marks]

[*6 markah*]

ii. Provide the process description in equipment (a) and equipment (b).

Berikan penjelasan proses dalam alatan (a) dan alatan (b).

[8 marks]

[*8 markah*]

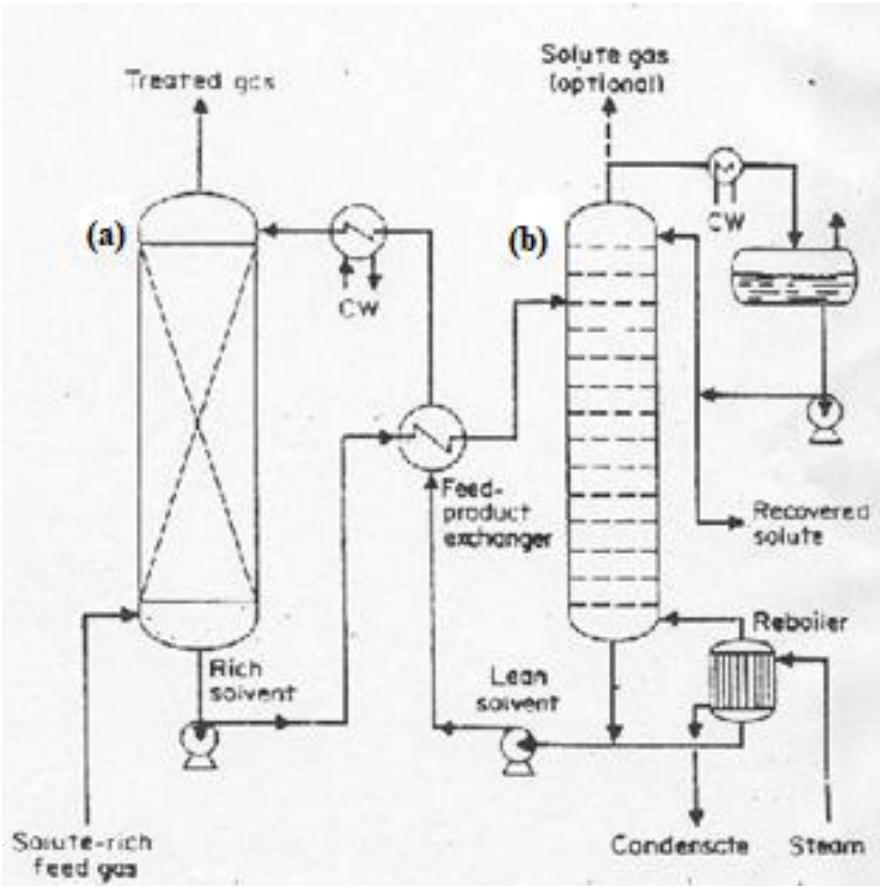

Diagram 1 (c) / *Rajah 1 (c)*

QUESTION 2

SOALAN 2

CLO1

(a) Crude oil fractional distillation is the separation of crude oil into its component products, or fractions. List out the **THREE (3)** products from this process.
*Penyulingan pecahan minyak mentah ialah pengasingan minyak mentah kepada produk komponennya, atau pecahan. Senaraikan **TIGA (3)** produk dari proses ini.*

[3 marks]
[*3 markah*]

CLO1

(b) In a catalytic cracker, heavy gas oil feeds are subjected to heat in the presence of a catalyst and large molecules crack into smaller molecules.
Dalam pemecah pemangkin, suapan minyak gas berat tertakluk kepada haba dengan kehadiran mangkin dan molekul besar pecah menjadi molekul yang lebih kecil.

i. Explain **TWO (2)** advantages of catalytic cracking.
*Terangkan **DUA (2)** kelebihan pemecahan pemangkin.*

[4 marks]
[*4 markah*]

ii. Elaborate oxidation process in regeneration section by showing chemical formula.
Huraikan proses pengoksidaan dalam bahagian penjanaan semula dengan menunjukkan formula kimia.

[4 marks]
[*4 markah*]

CLO2

(c) There are three parts to the catalytic cracking hardware which are reaction chamber, regenerator and fractionator.
Terdapat tiga bahagian penting dalam peralatan pemecahan bermangkin iaitu bahagian tindakbalas, penjanaan semula dan pemecahan.

i. Write the process of regeneration in catalytic cracking unit.
Tuliskan proses bagi penjaan semula dalam unit pemecahan bermangkin.

[6 marks]
[*6 markah*]

ii. Draw the process flow diagram of catalytic cracking unit.
Lukiskan rajah aliran proses bagi unit pemecahan bermangkin.

[8 marks]
[*8 markah*]

QUESTION 3
SOALAN 3

CLO1

(a) Development of the gas industry in Malaysia started with the finding of gas wells in several states. Name the **THREE (3)** states.
*Perkembangan industri gas di Malaysia bermula dengan penemuan telaga gas di beberapa buah negeri. Namakan **TIGA (3)** negeri tersebut.*

[3 marks]
[*3 markah*]

CLO1

(b) Gas processing plant (GPP) is designed and built to treat the mixtures of natural gas that received from gas fields and off-gas.
Loji pemprosesan gas (GPP) direka bentuk dan dibina untuk merawat campuran gas asli yang diterima daripada medan gas dan luar gas.

i. Outline **FOUR (4)** main units in GPP.
*Tunjukkan **EMPAT (4)** unit utama di dalam GPP.*

[4 marks]
[*4 markah*]

ii. Explain **TWO (2)** factors to be considered in designing gas processing plant.
*Huraikan **DUA (2)** faktor yang diambilkira dalam merebentuk loji pemprosesan gas.*

[4 marks]
[*4 markah*]

CLO2

(c) The function of Acid Gas Removal Unit (AGRU) is to remove hydrogen sulfide contained in sales gas.
Fungsi Unit Penyingkiran Gas Asid (AGRU) adalah untuk menyingkirkan hidrogen sulfida yang terkandung dalam gas jualan.

i. Discuss the process that occurred in Acid Gas Removal Unit (AGRU).
Bincangkan proses yang berlaku dalam Unit Penyingkiran Gas Asid (AGRU).

[6 marks]
[*6 markah*]

ii. Draw a block flow diagram of Acid Gas Removal Unit (AGRU).
Lukiskan gambarajah aliran blok loji penyingkiran gas asid (AGRU).

[8 marks]
[*8 markah*]

QUESTION 4

SOALAN 4

CLO1

a) Ammonia is widely used in various industries. List out **THREE (3)** characteristics of ammonia.
*Ammonia digunakan secara meluas dalam pelbagai industri. Senaraikan **TIGA (3)** ciri-ciri ammonia.*

[3 marks]
[*3 markah*]

CLO1

b) Ammonia is one of the most commonly produced industrial chemicals in Malaysia.
Ammonia adalah salah satu bahan kimia industri yang paling biasa dihasilkan di Malaysia.

i. Elaborate **TWO (2)** applications of ammonia in industry.
*Huraikan **DUA (2)** penggunaan ammonia dalam industri.*

[4 marks]
[*4 markah*]

ii. Explain the chemical reaction of ammonia production in ammonia converter.
Terangkan tindakbalas kimia penghasilan ammonia dalam 'ammonia converter'.

[4 marks]
[*4 markah*]

c) Based on Diagram 4 (c), sketch a process flow diagram of the followings units:
Berdasarkan Rajah 4 (c), lakarkan gambarajah aliran proses unit-unit berikut:

i. Natural Gas Desulphurization Unit.
Unit Penyahsulfuran Gas Asli.

[8 marks]
[*8 markah*]

ii. Air Compression Unit.

Unit Pemampatan Udara.

[6 marks]

[*6 markah*]

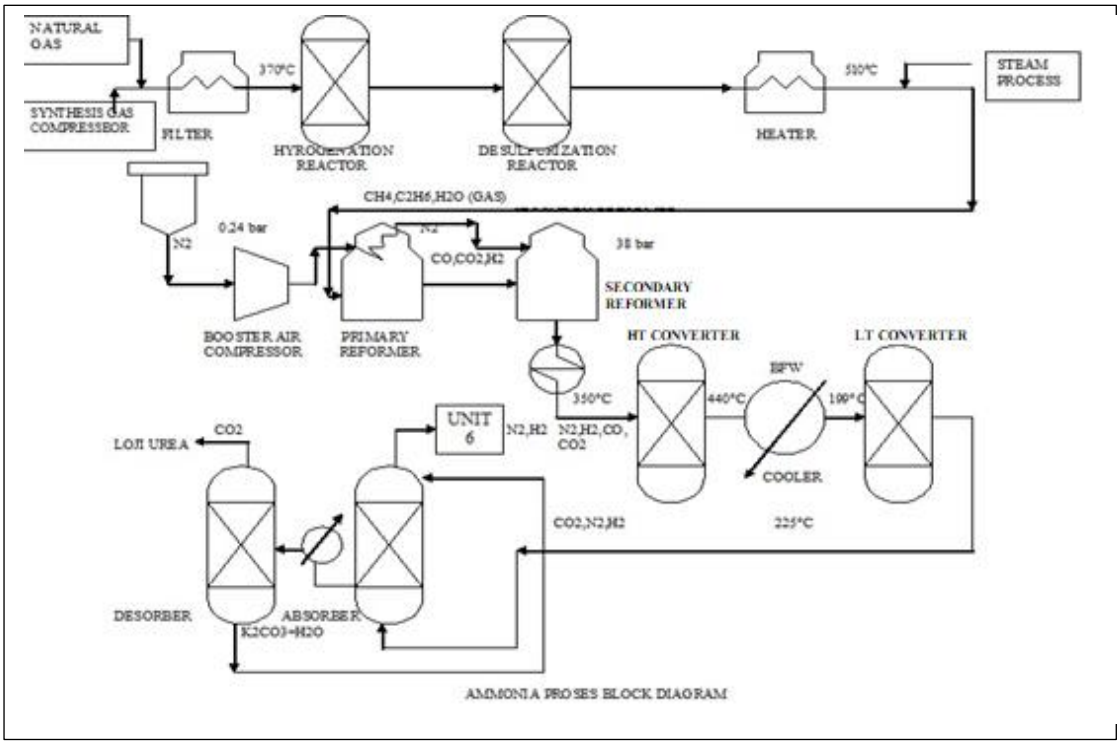

Diagram 4 (c) / *Rajah 4 (c)*

SOALAN TAMAT