

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
C1

- a) To obtain a dry natural gas, acid gases must be removed and water vapour reduced. List **THREE (3)** methods of acid gas treatment.

*Untuk mendapatkan gas asli kering, gas asid mesti disingkirkan dan wap air dikurangkan. Kenalpasti **TIGA (3)** kaedah untuk rawatan gas asid.*

[3 marks]

[3 markah]

CLO1
C2

- b) Acid gases can be reduced or removed by chemical absorption, physical absorption and physical adsorption. Explain the following processes of acid gas treatment:

Gas asid boleh dikurangkan atau dikeluarkan melalui penyerapan kimia, penyerapan fizikal dan penjerapan fizikal. Terangkan proses rawatan gas asid berikut:

- i. physical absorption process.
proses penyerapan fizikal.

[5 marks]

[5 markah]

- ii. physical adsorption proses.
proses penjerapan fizikal.

[5 marks]

[5 markah]

CLO1
C3

- c) The non-hydrocarbon compounds portion may be composed of nitrogen (N_2), carbon dioxide (CO_2), helium (He), hydrogen sulphide (H_2S), water vapor (H_2O), other sulphur compounds such as carbonyl sulphide (COS) and mercaptans (CH_3SH) and trace amounts of other gases. Write the characteristics of the following non-hydrocarbon compounds in crude oil:

Sebatian bukan hidrokarbon mungkin terdiri daripada nitrogen (N_2), karbon dioksida (CO_2), helium (He), hidrogen sulfida (H_2S), wap air (H_2O), sebatian sulfur lain seperti karbonil sulfida (COS) dan mercaptans (CH_3SH) dan mengesan jumlah gas lain. Tuliskan ciri-ciri sebatian bukan hidrokarbon berikut dalam minyak mentah:

- i. nitrogen compounds.
sebatian nitrogen.

[4 marks]
[4 markah]

- ii. non basic nitrogen compounds.
sebatian nitrogen bukan asas.

[4 marks]
[4 markah]

- iii. sulphur compounds.
sebatian sulphur.

[4 marks]
[4 markah]

QUESTION 2

SOALAN 2

CLO1
C1

- a) Alkanes are organic compounds that consist of single-bonded carbon and hydrogen atoms. Identify **THREE (3)** physical properties of alkanes.
*Alkana adalah sebatian organik yang terdiri daripada karbon terikat tunggal dan atom hidrogen. Kenalpasti **TIGA (3)** sifat fizikal alkana.*

[3 marks]
[3 markah]

CLO1
C2

- b) 1-hexene is a colourless liquid with a gasoline-like odour. It is used in fuels and to make flavours, perfumes, dyes, and plastic resins. Express the balanced chemical equation for 1-hexene with the following reactions:

1-hexene ialah cecair tidak berwarna dengan bau seperti gasolin. Ia digunakan dalam bahan api dan untuk membuat perisa, minyak wangi, pewarna, dan resin plasti. Ekspresikan persamaan kimia seimbang bagi 1-hexene untuk tindak balas berikut:

- i. hydration and hydrogenation.
penghidratan dan penghidrogenan.

[5 marks]
[5 markah]

- ii. halogenation and hydrohalogenation.
halogenasi dan hidrohalogenasi.

[5 marks]
[5 markah]

CLO1
C3

- c) Draw the molecular structure for each of the following hydrocarbons:
Lukiskan struktur molekul bagi setiap hidrokarbon berikut:

- i. 2-chloro-2,3-dimethylbutane.
2-kloro-2,3-dimetilbutana.

[4 marks]
[4 markah]

- ii. 3-bromo-1,2-dimethylcyclohexane.
3-bromo-1,2-dimetilsikloheksana.

[4 marks]
[4 markah]

- iii. 3,5-dimethyl-1,3-hexadiene.
3,5-dimetil-1,3-heksadiena.

[4 marks]
[4 markah]

QUESTION 3
SOALAN 3

- CLO1
C1
- a) Benzene is a chemical that is a colourless or light-yellow liquid at room temperature. Give **THREE (3)** physical properties of benzene.
*Benzena ialah bahan kimia yang merupakan cecair tidak berwarna atau kuning muda pada suhu bilik. Berikan **TIGA (3)** sifat fizikal benzena.*
- [3 marks]
[3 markah]
- CLO1
C2
- b) Benzene is found in crude oil as a major part of gasoline. Explain the following reactions of benzene in terms of catalyst, chemical reaction and applications:
Benzena terdapat dalam minyak mentah sebagai sebahagian besar gasolin. Terangkan tindak balas benzena berikut daripada segi mangkin, tindak balas kimia dan aplikasi:
- i. Chlorination of benzene / Pengklorinan benzena
- [5 marks]
[5 markah]
- ii. Hydrogenation of benzene / Penghidrogenan benzena
- [5 marks]
[5 markah]
- CLO1
C3
- c) Draw the molecular structure for the following benzene and its derivatives:
Lukiskan struktur molekul bagi benzena dan terbitan berikutnya:
- i. 2,4,6-trimethyltoluene.
2,4,6-trimetiltoluena.
- [4 marks]
[4 markah]
- ii. 2,4-dinitro-ethylbenzene.
2,4-dinitro-etilbenzena.
- [4 marks]
[4 markah]

- iii. 4-bromo-1,2-dimethylbenzene.
4-bromo-1,2-dimetilbenzena.

[4 marks]

[4 markah]

QUESTION 4**SOALAN 4**CLO1
C1

- a) A few intermediates produced from natural gas, crude oils and other fossil materials such as coal, are not hydrocarbon compounds. State **THREE (3)** non-hydrocarbon intermediate compounds except for hydrogen.

Beberapa perantaraan dihasilkan daripada gas asli, minyak mentah dan bahan fosil lain seperti arang batu, bukan sebatian hidrokarbon. Nyatakan TIGA (3) sebatian bukan hidrokarbon kecuali hidrogen.

[3 marks]

[3 markah]

CLO1
C2

- b) Ethylene is sometimes known as the “king of petrochemicals” because more commercial chemicals are produced from ethylene than from any other intermediate. Explain the following reactions of ethylene in terms of chemical reaction and applications:

Etilena kadangkala dikenali sebagai "raja petrokimia" kerana lebih banyak bahan kimia komersial dihasilkan daripada etilena berbanding mana-mana perantaraan lain. Terangkan tindak balas etilena berikut dari segi tindak balas kimia dan aplikasi:

- i. Chlorination of ethylene.
Pengklorinan etilena.

[5 marks]

[5 markah]

- ii. Hydration of ethylene.
Penghidratan etilena.

[5 marks]

[5 markah]

CLO1
C3

- c) More than 90% of the world's propylene is made as a co-product from ethylene steam which convert a range of hydrocarbon molecules into ethylene and other basic chemicals or from fluid catalytic crackers at oil refineries. Write the balanced chemical equation for the following reactions:

Lebih daripada 90% propilena di dunia dibuat sebagai hasil bersama daripada stim etilena yang menukarkan pelbagai molekul hidrokarbon kepada etilena dan bahan kimia asas lain atau daripada keropok pemangkin cecair di kilang penapisan minyak. Tuliskan persamaan kimia seimbang bagi tindak balas berikut:

- i. Chlorination and hydration of propylene.

Pengklorinan dan penghidratan propilena.

[4 marks]

[4 markah]

- ii. Oxidation of propylene to produce acrylic acid.

Pengoksidaan propilena untuk menghasilkan asid akrilik.

[4 marks]

[4 markah]

- iii. Oxyacylation of propylene.

Oksiasilasi propilena.

[4 marks]

[4 markah]

SOALAN TAMAT