



KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN TINGGI

JABATAN KEJURUTERAAN PETROKIMIA

PEPERIKSAAN AKHIR

SESI II : 2025/2026

DGP40192 : UTILITY PLANT

TARIKH : 06 MEI 2026

MASA : 8.30 PAGI - 10.30 PAGI (2 JAM)

Kertas soalan ini mengandungi **SEMBILAN (9)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Tiada

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

INSTRUCTION:

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

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan. Jawap **SEMUA** soalan.*

QUESTION 1**SOALAN 1**

CLO1

- (a) Compressors are the main equipment in compressed air system. List **THREE (3)** uses of compressed air.

*Pemampat adalah peralatan utama dalam sistem udara termampat. Senaraikan **TIGA (3)** kegunaan udara termampat.*

[3 marks]

[3 markah]

- (b) Compressed air system components are divided into generation, distribution and end system. Each component has important role to produce the compressed air.

Komponen sistem udara termampat dibahagikan kepada penjanaan, pengedaran dan sistem akhir. Setiap komponen mempunyai peranan penting untuk menghasilkan udara termampat.

CLO2

- i. Explain the functions of Intake Air Filter and Moisture Drain Traps.

Terangkan fungsi Penapis Udara Masukan dan 'Moisture Drain Traps.

[4 marks]

[4 markah]

CLO2

- ii. Draw a complete process flow diagram of compressed air system.

Lukis gambarajah aliran proses lengkap sistem udara termampat.

[6 marks]

[6 markah]

	(c) Water treatment is a process that improves the quality of water to make it appropriate for a specific end use. <i>Rawatan air adalah proses yang meningkatkan kualiti air agar sesuai untuk penggunaan akhir tertentu.</i>
CLO1	i. Explain the function of aeration and disinfection in water treatment process. <i>Terangkan fungsi pengudaraan dan pembasmian kuman dalam proses rawatan air.</i> [4 marks] [4 markah]
CLO2	ii. Draw a process flow diagram of water treatment system with complete labelling. <i>Lukiskan rajah aliran proses bagi sistem rawatan air beserta label yang lengkap.</i> [8 marks] [8 markah]

QUESTION 2

SOALAN 2

CLO1

- (a) The function of a cooling system is to remove heat from processes and equipment. Water is used as a cooling agent. State **THREE (3)** factors of using water as an excellent cooling agent.

*Fungsi sistem penyejuk adalah untuk menyingkirkan haba daripada process dan peralatan. Air digunakan sebagai agen penyejuk. Nyatakan **TIGA (3)** faktor air digunakan sebagai agen penyejuk yang sangat baik..*

[3 marks]

[3 markah]

- (b) The once – through cooling system is a very simple design. This system often uses water from rivers, lakes or well networks.

Sistem penyejukan “once-through” adalah rekaan yang sangat mudah. Sistem ini sering menggunakan air dari sungai, tasik atau rangkaian telaga.

CLO 2

- i. Explain the once – through cooling system process.

Terangkan proses sistem penyejukan ‘once-through’.

[4 marks]

[4 markah]

CLO 2

- ii. Draw process flow diagram of the once – through cooling system process.

Lukis rajah aliran proses sistem penyejukan ‘once-through’.

[6 Marks]

[6 Markah]

- (c) Figure 2(c) shows a cooling water system that consists of cooling tower, pump and heat exchanger.

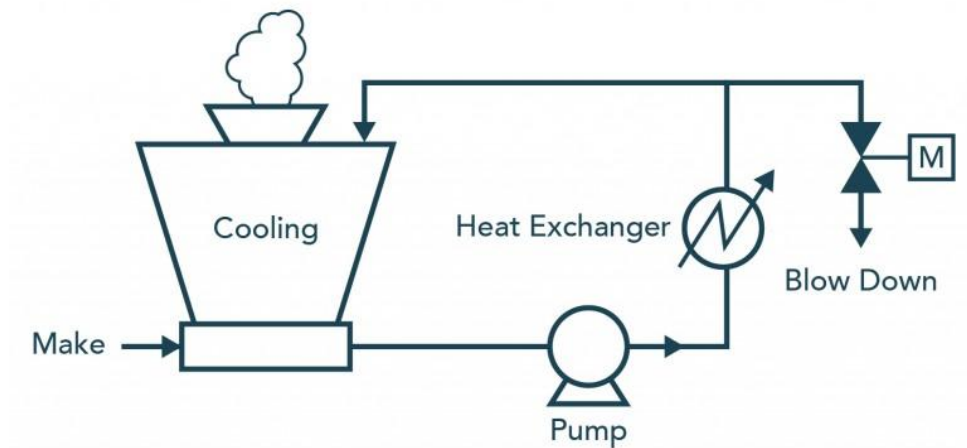


Figure 2(c) : Cooling Water System / Rajah 2(c): Sistem Air Penyejuk

CLO 1

- i. Explain the working operation for cooling water system in Figure 2(c).
Terangkan operasi pengendalian bagi sistem penyejukan air dalam Rajah 2(c).

[4 marks]

[4 markah]

CLO 2

- ii. The water-cooling system also has an impact on the environment. Write **FOUR (4)** impacts of cooling water to the environment.
*Sistem air penyejuk juga mengakibatkan kesan terhadap alam sekitar. Tuliskan **EMPAT(4)** kesan air penyejuk kepada alam sekitar*

[8 marks]

[8 markah]

QUESTION 3

SOALAN 3

CLO 1

- (a) Nitrogen gas (N_2) is a colorless, odorless, and tasteless gas that makes up about 78% of the Earth's atmosphere by volume. List **THREE (3)** applications of nitrogen in petrochemical industry.

*Gas nitrogen (N_2) ialah gas tidak berwarna, tidak berbau, dan tidak berasa yang membentuk kira-kira 78% daripada atmosfera Bumi mengikut isipadu. Senaraikan **TIGA (3)** aplikasi nitrogen dalam industri petrokimia.*

[3 marks]

[3 markah]

- (b) Figure 3(b) shows Pressure Swing Adsorption process that utilize carbon molecular sieve material to strip oxygen from the compressed air and separate the nitrogen gas.

Rajah 3(b) menunjukkan Proses 'Pressure Swing Adsorption' yang menggunakan bahan penapis molekul karbon untuk menjerap oksigen daripada udara mampat dan memisahkan gas nitrogen.

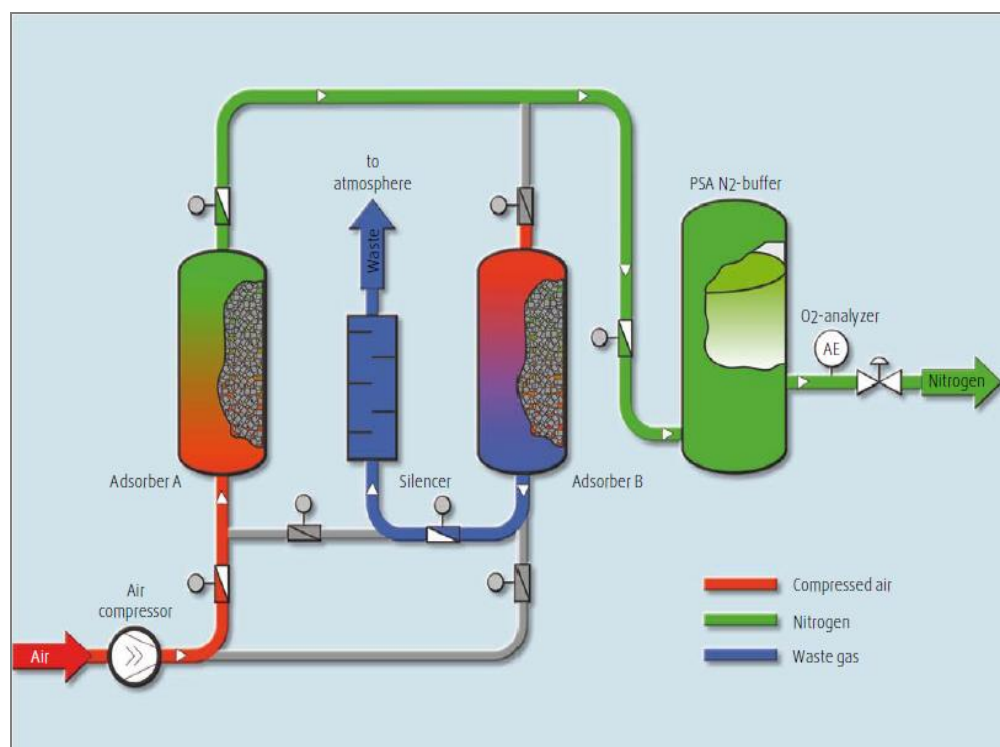


Figure 3(b) Pressure Swing Adsorption Process/Rajah 3(b) Proses 'Pressure Swing Adsorption'

CLO 2	i. Explain TWO (2) reasons buffer tanks are required in nitrogen production process. <i>Terangkan DUA (2) sebab tangki pemampan diperlukan dalam proses penghasilan nitrogen.</i> [4 marks] [4 markah]
CLO 2	ii. Based on Figure 3(b), write the operating mechanism of pressure swing adsorption process to produce nitrogen gas. <i>Berdasarkan Rajah 3(b), tuliskan mekanisme operasi 'pressure swing adsorption' bagi menghasilkan gas nitrogen.</i> [6 marks] [6 markah]
	(c) The steam process product cycle consists of four unit process namely a boiler, steam turbine, condenser (heat exchanger) and feed water pump. <i>Proses kitaran penghasilan stim terdiri daripada empat unit proses iaitu dandang, turbin stim, pemeluwap (penukar haba) dan pam air masuk.</i>
CLO 1	i. Explain the function of each unit process in steam process product cycle. <i>Terangkan fungsi setiap proses unit dalam proses kitaran penghasilan stim.</i> [4 marks] [4 markah]
CLO 2	ii. Draw the steam process product cycle diagram. <i>Lukiskan rajah proses kitaran penghasilan stim.</i> [8 marks] [8 markah]

QUESTION 4

SOALAN 4

CLO 1

- (a) The Flare System is a gas combustion device used in industrial plants such as petroleum refineries, chemical plants and natural gas processing plants. State **THREE (3)** functions of flare system.

*Sistem 'Flare' ialah peranti pembakaran gas yang digunakan dalam loji industri seperti loji penapisan petroleum, loji kimia dan loji pemprosesan gas asli. Nyatakan **TIGA (3)** fungsi sistem 'Flare'.*

[3 marks]

[3 markah]

- (b) Petrochemical processing plants generate significant amounts of waste products such as methane, volatile organic compounds and sulfur-related compounds.

Loji pemprosesan petrokimia menjana sejumlah besar bahan buangan seperti metana, sebatian organik meruap dan sebatian berkaitan sulfur.

CLO 2

- i. The components in flare system consist of some equipment such as knock out drum and flare stack. Explain the function of knock out drum and flare stack.

Komponen dalam sistem flare terdiri daripada beberapa peralatan seperti 'knock out drum' dan 'flare stack'. Terangkan fungsi 'knock out drum' dan 'flare stack'.

[4 marks]

[4 markah]

CLO 2

- ii. Draw a process flow diagram of flare system with complete labelling.

Lukiskan rajah aliran proses bagi sistem 'Flare' dengan label yang lengkap.

[6 marks]

[6 markah]

- (c) Terminal Operation is a system consists of storage, distribution, loading and unloading starting from raw material until the end product.

Operasi Terminal ialah sistem yang terdiri daripada penyimpanan, pengedaran, pemunggahan dan pemunggahan bermula daripada bahan mentah sehingga produk akhir.

CLO 1

- i. Discuss **TWO (2)** requirements of terminal operation in industry.

*Bincangkan **DUA (2)** keperluan operasi terminal dalam industri.*

[4 marks]

[4 markah]

CLO 2

- ii. Storage tank is one of storage unit types. Write **FOUR (4)** differences between spherical tank and cylindrical tank that are used in industry.

*Tangki simpanan adalah salah satu jenis unit simpanan. Tuliskan **EMPAT (4)** perbezaan antara tangki sfera dan tangki silinder yang digunakan dalam industri.*

[8 marks]

[8 markah]

SOALAN TAMAT