Chem Quest

2024

TINGKATAN 5

Jom A+ Kimia

SPM 2023

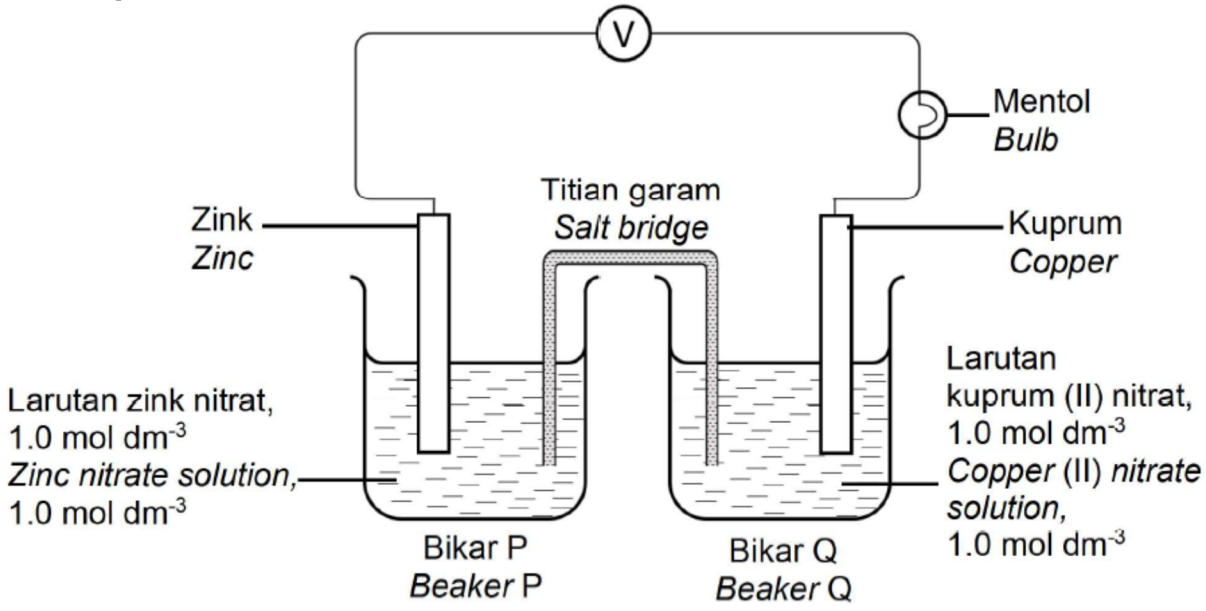
PERCUMA - TIDAK DIJUAL

[Johor – JB – Tangkak – Skudai]
[Kedah – Kelantan – Negeri Sembilan]
[Pahang – Perlis – Putrajaya – SBP]
[Selangor-Set 1&2 – Terengganu MPP3]
[JUJ-Set 1&2 – Melaka – MRSM = 17Set]

Nama : ..... Kelas : .....

Bab 1 Keseimbangan Redoks

[2023-Kelantan-07] Rajah 6 menunjukkan susunan radas bagi satu eksperimen untuk mengkaji beza keupayaan antara dua elektrod menggunakan elektrolit masing-masing dalam suatu tindak balas redoks.
Diagram 6 shows the arrangement of apparatus for an experiment to study the potential difference between two electrodes using their respective electrolytes in a redox reaction.



Rajah 6/ Diagram 6

(a) Apakah yang dimaksudkan dengan elektrolit?
What is meant by electrolyte?

.....

..... [1M]

(b) Senaraikan semua kation yang hadir dalam bikar Q
List all the cations present in beaker Q

..... [1M]

(c) Jadual 5 menunjukkan sebahagian daripada Siri Keupayaan Elektrod Piawai.
Table 5 shows a part of Standard Electrode Potential Series.

Tindak balas sel setengah *Half-cell reaction*	E°, V (297K)
$Mg^{2+}(aq) + 2e^- \rightarrow Mg(s)$	-2.38
$Zn^{2+}(aq) + 2e^- \rightarrow Zn(s)$	-0.76
$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$	+0.34
$Ag^{+}(aq) + e^- \rightarrow Ag(s)$	+0.80

Berdasarkan Rajah 6 dan Jadual 5/ *Based on Diagram 6 and Table 5*

(i) Tuliskan notasi sel untuk tindak balas itu
Write the cell notation for the reaction

..... [2M]

(ii) Kirakan nilai E°sei bagi tindak balas itu
Calculate the value of the E°sei for the reaction

[1M]

(iii) Pilih pasangan logam yang akan menghasilkan nyalaan mentol yang paling terang. Wajarkan pilihan anda.
Choose the pair of metals that will produce the brightest light of bulb. Justify your choice.

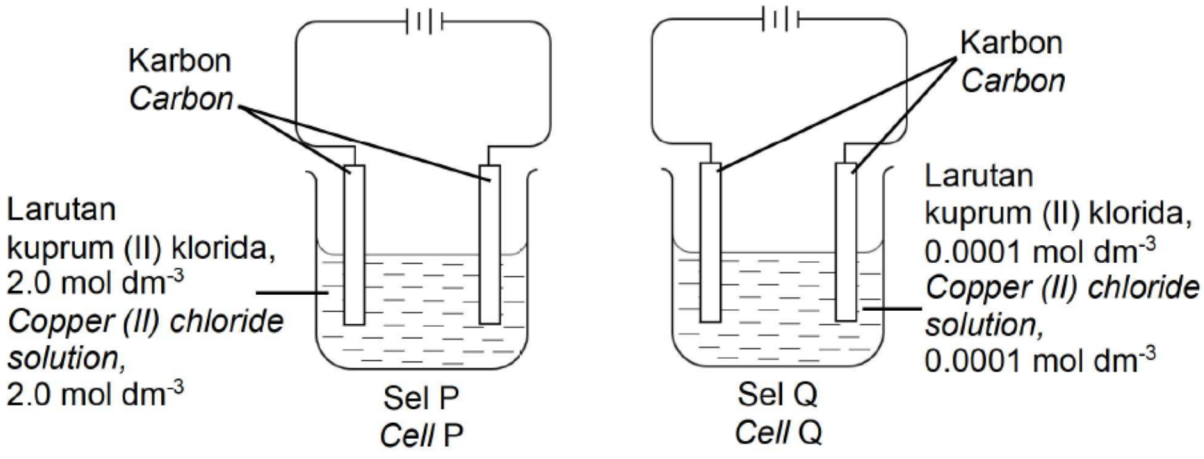
.....

..... [2M]

(iv) Berdasarkan jawapan anda di (c)(iii), tuliskan setengah persamaan bagi mewakili tindak balas yang berlaku pada terminal negatif sel.
Based on your answer in (c)(iii), write a half equation to represent the reaction that occurs at the negative terminal of the cell.

..... [1M]

(d) Rajah 7 menunjukkan susunan radas yang digunakan untuk mengkaji hasil elektrolisis larutan kuprum (II) klorida dengan menggunakan elektrod karbon.
Diagram 7 shows the arrangement of the apparatus used to study the results of electrolysis of copper (II) chloride solution using carbon electrodes.



Rajah 7/ Diagram 7

Diberi/ *Given*

Tindak balas sel setengah *Half-cell reaction*	E°, V (297K)
$2H^+(aq) + 2e^- \rightarrow H_2(g)$	0.00
$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$	+0.34
$O_2(g) + 2H_2O(l) + 4e^- \rightarrow 4OH^-(aq)$	+0.40
$Cl_2(g) + 2e^- \rightarrow 2Cl^-(aq)$	+0.80

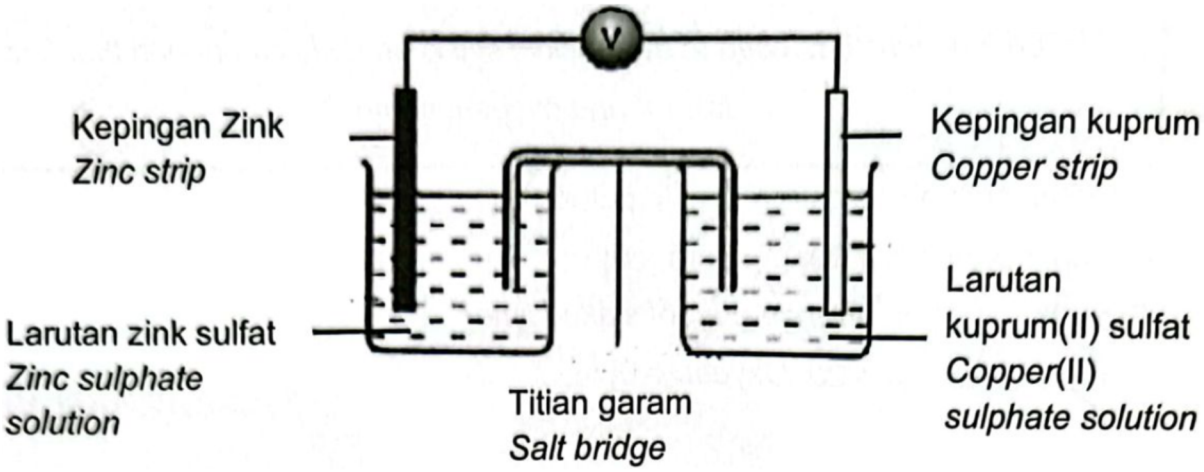
Terangkan perbezaan pemerhatian pada anod dalam kedua-dua sel elektrolisis yang ditunjukkan dalam Rajah 7.
Explain the difference observed at the anode in the two electrolysis cells shown in Diagram 7.

.....

.....

..... [2M]

[2023-Kedah-07] Rajah 7 menunjukkan susunan radas satu Sel Daniell.
Diagram 7 shows set up of the apparatus of a Daniell Cell.



Rajah 7 / *Diagram 7*

Diberi nilai keupayaan elektrod piawai bagi:
Given the value of standard electrode potential for:

Zn^{2+} (ak) + 2e → Zn(p) E° = -0.76 V
Zn^{2+} (aq) + 2e → Zn(s) E° = -0.76 V

Cu^{2+} (ak) + 2e → Cu(p) E° = + 0.34 V
Cu^{2+} (aq) + 2e → Cu(s) E° = + 0.34 V

Berdasarkan Rajah 7/ *Based on Diagram 7 :*

(a) Nyatakan semua formula ion yang hadir dalam larutan kuprum(II) sulfat.
State all the formula of ions present in copper(II) sulphate solution.

..... [1M]

(b) Fungsi titian garam ialah membenarkan ion mengalir melaluinya bagi melengkapkan litar. Cadangkan satu bahan kimia yang boleh digunakan sebagai titian garam.
The function of a salt bridge is allowing ions to flow through it to complete the circuit. Suggest a chemical that can be used as salt bridge.

..... [1M]

(c) Eksperimen dijalankan selama 20 minit. Terangkan perbezaan bagi pemerhatian pada kepingan zink dan kepingan kuprum.
The experiment is conducted for 20 minutes. Explain the differences in observation at zinc strip and copper strip.

.....

.....

.....

.....

..... [3M]

(d) Tuliskan setengah persamaan di anod.
Write the half equation at anode.

..... [1M]

(e) Tuliskan notasi sel dan kira nilai voltan bagi sel Daniell.
Write the cell notation and calculate the value of the voltage for Damell's cell.

[2M]

(f) Jadual 7 menunjukkan keupayaan elektrod piawai, E° bagi X, Y dan Z.
Table 7 shows standard electrode potential, E° for X, Y and Z.

Persamaan sel setengah *Half-cell equation*	E°(V)
X^{2+}(ak) + 2e → X(p) X^{2+}(aq) + 2e → X(s)	-2.38
Y^{2+}(ak) + 2e → Y(p) Y^{2+}(aq) + 2e → Y(s)	-0.44
Z^{2+}(ak) + 2e → Z(p) Z^{2+}(aq) + 2e → Z(s)	+0.34

Jadual 7 / Table 7

Lukiskan satu sel kimia ringkas yang dapat menghasilkan nilai voltan sebanyak +1.94 V.
Draw a simple chemical cell that can produce a voltage value of+1.94 V.

[2M]

[2023-Selangor-Set02-05] Jadual 5 menunjukkan nilai keupayaan elektrod piawai, E° bagi argentum, kuprum, ferum dan plumbum.
Table 5 shows standard electrode potential values, E° for silver, copper, iron and lead.

Set Set	Tindak balas sel setengah *Half-cell reaction*	E°/V
I	Ag^{+} (ak/aq) + e ⇌ Ag (p/s)	+ 0.87
II	Cu^{2+} (ak/aq) + 2c ⇌ Cu (p/s)	+ 0.34
III	Fe^{2+} (ak/aq) + 2e ⇌ Fe (p/s)	- 0.44
IV	Pb^{2+} (ak/aq) + 2e ⇌ Pb (p/s)	- 0.13

Jadual 5/ Table 5

(a) Apakah maksud tindak balas redoks?
What is the meaning of redox reaction?

..... [1M]

(b) Pasangan keupayaan elektrod piawai yang manakah digunakan sebagai sel setengah untuk menghasilkan voltan yang paling tinggi?
Which pair of standard electrode potential is used as a half-cell to produces the highest voltage?

..... [1M]

(c) Lukis susunan radas berlabel sel kimia yang menggabungkan dua sel setengah bagi jawapan anda di 5(b).
Draw a labelled diagram of a chemical cell that combines two half-cells for your answer in 5(b).

[2M]

(d) Berdasarkan susunan radas berlabel 5(c) dan nilai keupayaan elektrod piawai sel setengah.
Based on labelled diagram 5(c) and the standard electrode potential value of a half-cell.

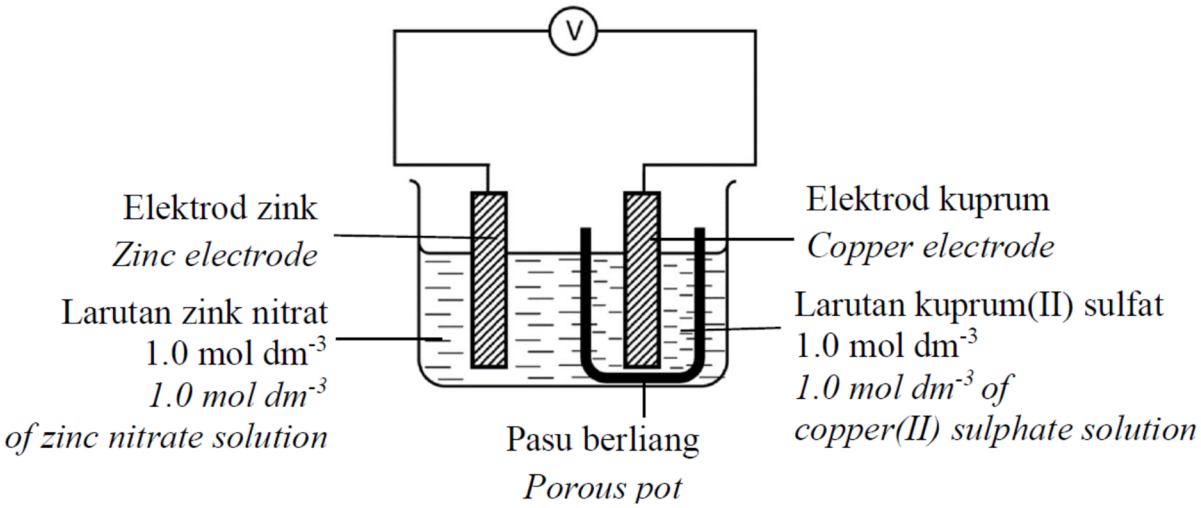
(i) Tulis persamaan ion keseluruhan bagi tindak balas redoks yang berlaku.
Write the overall ionic equation for the redox reaction occurs.

..... [2M]

(ii) Hitungkan voltan sel, E°sel./ *Calculate the voltage of the cell, E°cell.*

[2M]

[2023-JohorPPDTangkak-07] Rajah 5.1 menunjukkan susunan radas bagi satu eksperimen untuk mengkaji beza keupayaan antara dua elektrod dalam tindak balas redoks.
Diagram 5.1 shows the apparatus set-up for an experiment to study the potential difference between two electrodes in a redox reaction.



Rajah 5.1/ Diagram 5.1

(a) Nyatakan warna bagi larutan kuprum(II) sulfat.
State the colour of copper(II) sulphate solution.

..... [1M]

(b) Kenal pasti semua kation yang hadir dalam pasu berliang.
Identify all the cations present in the porous pot.

..... [1M]

(c) Jadual 5.1 menunjukkan sebahagian daripada Siri Keupayaan Elektrod Piawai.
Table 5.1 shows a part of Standard Electrode Potential Series.

Tindak balas sel setengah *Half- cell reaction*	E°/V (297K)
$Mg^{2+} + 2e \rightleftharpoons Mg$	-2.38
$Zn^{2+} + 2e \rightleftharpoons Zn$	-0.76
$Fe^{2+} + 2e \rightleftharpoons Fe$	-0.44
$Cu^{2+} + 2e \rightleftharpoons Cu$	+0.34

Jadual 5.1/ Table 5.1

Berdasarkan Rajah 5.1 dan Jadual 5.1,
Based on Diagram 5.1 and Table 5.1,

(i) tuliskan notasi sel untuk tindak balas itu.
write the cell notation for the reaction.

..... [1M]
[2 markah/marks]

(ii) hitung nilai E° sel bagi tindak balas itu.
calculate the value of the E° cell for the reaction.

..... [1M]

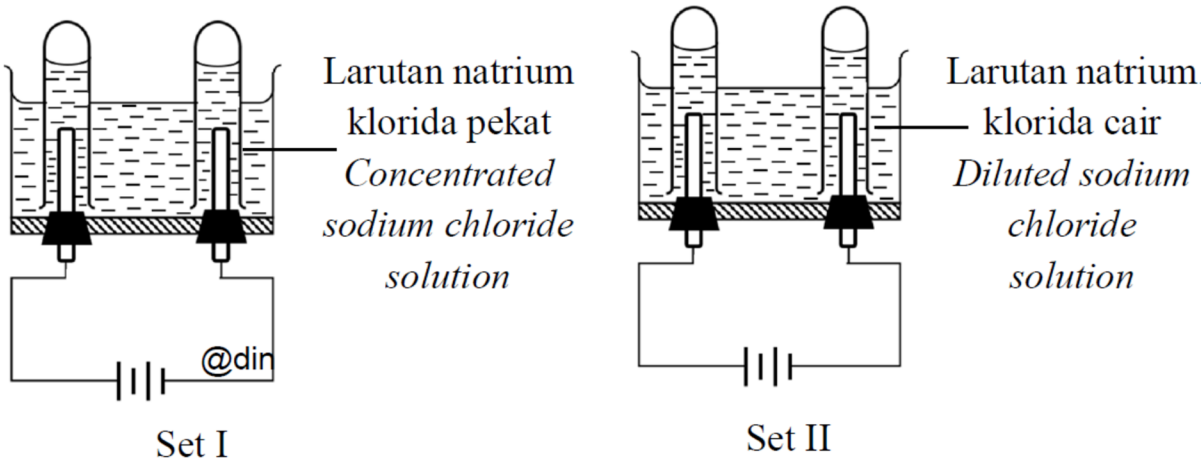
(iii) Berdasarkan jawapan anda di 8(c)(ii), apakah yang perlu anda lakukan kepada anod untuk meningkatkan nilai E° sel? Terangkan jawapan anda.
Based on your answer in 8(c)(ii), what should you do to the anode to increase the value of E° cell? Explain your answer.

.....

.....

..... [3M]

(d) Rajah 5.2 menunjukkan dua sel elektrolisis larutan natrium klorida, NaCl dengan kepekatan berbeza menggunakan elektrod karbon.
Diagram 5.2 shows the two-electrolysis cell of sodium chloride, NaCl solution with different concentration using carbon electrode.



Rajah 5.2/ Diagram 5.2

Jadual 5.2 menunjukkan nilai keupayaan elektrod piawai sel setengah bagi beberapa bahan.
Diagram 5.2 shows the standard electrode potential values of half-cells for some substance

Tindak balas sel setengah *Half- cell reaction*	E°/V (297K)
$Na^+ + 1e \rightleftharpoons Na$	– 2.71
$2H^+ + 2e \rightleftharpoons H_2$	0.00
$O_2 + 2H_2O + 4e \rightleftharpoons 4OH^-$	+ 0.40
$Cl_2 + 2e \rightleftharpoons 2Cl^-$	+ 1.36

Jadual 5.2 / Table 5.2

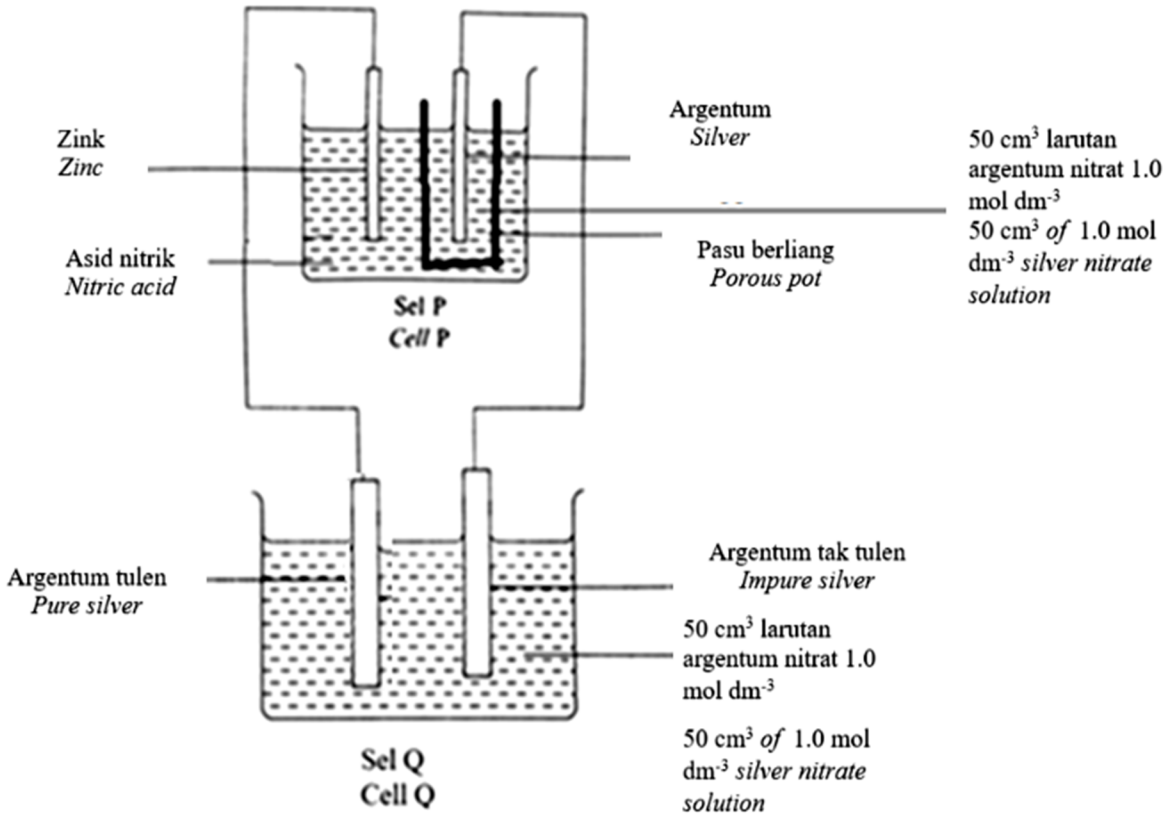
Berdasarkan Rajah 5.2 dan Jadual 5.2, terangkan perbezaan pemerhatian pada anod bagi kedua-dua set eksperimen itu.
Based on Diagram 5.2 and Table 5.2, explain the differences of observation at the anode for both set of the experiment.

.....

.....

..... [2M]

[2023-Perlis-07] Rajah 6 menunjukkan susunan radas bagi penulenan argentum tak tulen.
Diagram 6 shows the apparatus set up to purify the impure silver.



Rajah 6/ Diagram 6

(a) Apakah fungsi pasu berliang?
What is the function of a porous pot?

..... [1M]

(b) Nyatakan anod dan katod pada Sel Q.
State the anode and cathode of Cell Q.

Anod : .....
Anode

Katod : .....
Cathode *[2M]*

(c) Nyatakan pemerhatian di katod pada Sel P.
State the observations at the cathode of Cell P.

..... [1M]

(d) Hitung jisim maksimum argentum yang terenap pada sel P semasa penulenan.
Calculate the maximum mass of silver deposited at cell P during purifying.
[Jisim atom relative/ Relative atomic mass : Ag = 108]

[3M]

(e) Ahmad ingin meningkatkan nilai arus yang dihasilkan pada Sel P. Apakah yang perlu Ahmad lakukan? Terangkan.
Ahmad wants to increase the value of current in Cell P. What should Ahmad do? Explain.

Nilai E^o bagi beberapa sel setengah adalah :
The E^o value for a new half cells are :

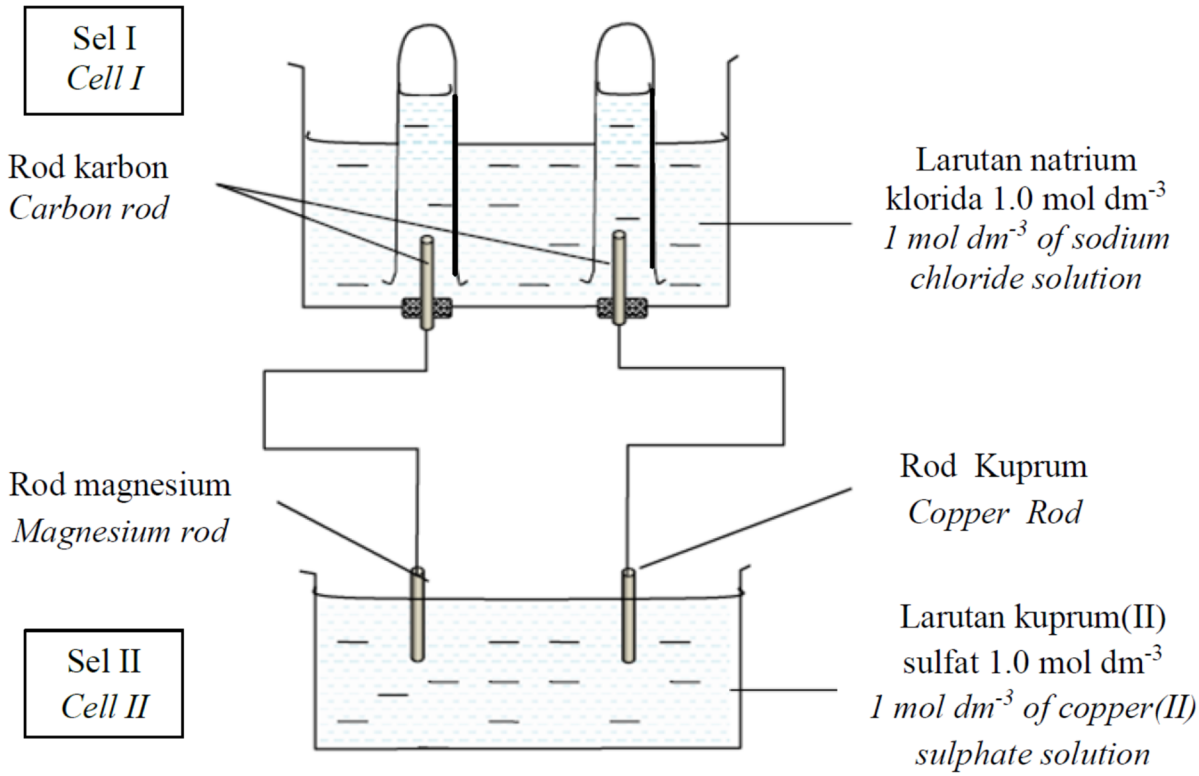
Zn^{2+} (ak/*aq*) + $2e^-$ ⇋ Zn (p/*s*)	E^o = -0.76 V
Mg^{2+} (ak/*aq*) + $2e^-$ ⇋ Mg (p/*s*)	E^o = -2.38 V
$2H^+$ (ak/*aq*) + $2e^-$ ⇋ H_2 (g)	E^o = +0.00 V
Cu^{2+} (ak/*aq*) + $2e^-$ ⇋ Cu (p/*s*)	E^o = +0.34 V
Ag^+ (ak/*aq*) + e^- ⇋ Ag (p/*s*)	E^o = +0.80 V
O_2 (g) + $2H_2O$(ce/ *l*) + $4e^-$ ⇋ $4OH^-$ (ak/*aq*)	E^o = +0.40 V
$S_2O_8^{2-}$(ak/*aq*) + $2e^-$ ⇋ $2SO_4^{2-}$(ak/*aq*)	E^o = +2.01 V
Fe^{2+} (ak/*aq*) + $2e^-$ ⇋ Fe (p/*s*)	E^o = -0.44 V

.....

.....

..... [3M]

[2023-Pahang-08] Rajah 8 menunjukkan gabungan satu sel kimia dengan satu sel elektrolisis.
Diagram 8 shows the combination between a chemical cell and an electrolytic cell.



Rajah 8 / Diagram 8

(a) Apakah maksud elektrolisis?/ *What is the meaning of electrolysis?*

.....

..... [1M]

(b) Merujuk kepada Sel I,/ *Referring to Cell I,*

(i) nyatakan semua ion yang hadir dalam larutan natrium klorida.
state all the ions present in the sodium chloride solution.

..... [1M]

(ii) nyatakan pemerhatian di anod./ *state the observation at anode.*

..... [1M]

(c) Merujuk kepada Sel II dan keupayaan elektrod piawai, Eo bagi setengah sel di bawah:
Referring to Cell II and standard electrode potential, Eo of the half cell below:

$Mg^{2+}(ak) + 2e^- \rightleftharpoons Mg\ (p)$ $\quad E^\circ = -2.38$ V
$Cu^{2+}(ak) + 2e^- \rightleftharpoons Cu\ (p)$ $\quad E^\circ = +0.34$ V

kenal pasti terminal negatif dan terminal positif bagi sel tersebut.
identify the negative terminal and positive terminal of the cell.

(i) terminal negatif/ negative terminal : .....

(ii) terminal positif/ positive terminal : .....
[2 markah/ 2 marks]

(d) (i) Anda dibekalkan dengan satu voltmeter dan dua bahan kimia tambahan iaitu larutan magnesium sulfat, 1.0 mol dm^{-3} dan larutan asid sulfurik, 1.0 mol dm^{-3}. Dengan menggunakan voltmeter, larutan tambahan yang dibekalkan dan radas lain yang sesuai di dalam makmal, lukiskan gambar rajah susunan radas dengan mengubah suai susunan radas di dalam Sel II supaya dapat berfungsi sebagai sel Daniell.
You are provided with a voltmeter and two additional chemicals which are 1.0 mol dm^{-3} of magnesium sulphate solution and 1.0 mol dm^{-3} of sulphuric acid solution. By using the voltmeter, the additional solutions provided and other suitable apparatus in the laboratory, draw a set-up apparatus diagram by modifying the set-up apparatus in Cell II so that it can function as a Daniell cell.

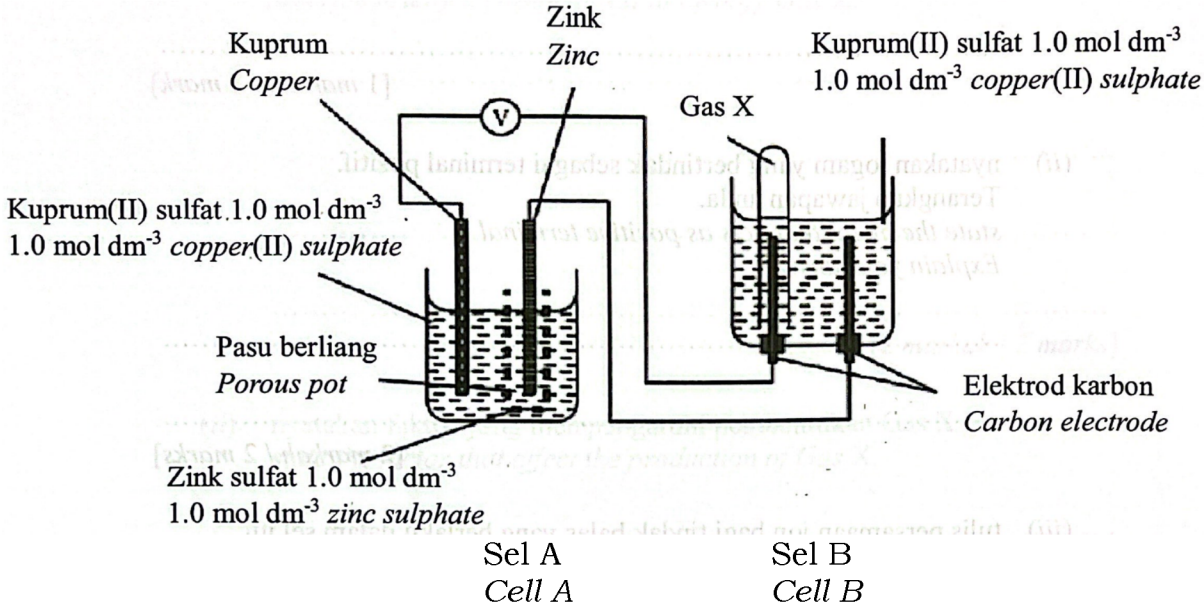
[2M]

(ii) tuliskan notasi sel dan hitungkan voltan sel bagi sel Daniell dalam (d)(i).
write the cell notation and calculate the cell voltage for Daniell cell in (d)(i).

Notasi sel : .....
Cell notation

Voltan sel : .....
Cell voltage [3M]

[2023-NegeriSembilan-05] Rajah 5 menunjukkan susunan radas bagi mengkaji suatu tindak balas redoks.
Diagram 5 shows an apparatus to study redox reactions.



Rajah 5
Diagram 5

Jadual 1 menunjukkan senarai nilai keupayaan elektrod piawai:
Table 1 shows the list of standard electrode potential values:

Tindak balas sel setengah Half-cell reaction	E° / V
$S_2O_8^{2-} + 2e \Leftrightarrow 2SO_4^{2-}$	+ 2.01
$O_2 + 2H_2O + 4e \Leftrightarrow 4OH^-$	+ 0.40
$Cu^{2+} + 2e \Leftrightarrow Cu$	+ 0.34
$2H^+ + 2e \Leftrightarrow H_2$	0.00
$Zn^{2+} + 2e \Leftrightarrow Zn$	-0.76

Jadual 1
Table 1

(a) Merujuk kepada Sel A,
Referring to Cell A,

(i) apakah kegunaan pasu berliang?
what is the use of porous pot?

..... [1M]

(ii) nyatakan logam yang bertindak sebagai terminal positif. Terangkan jawapan anda.
state the metal that acts as positive terminal. Explain your answer.

..... [2M]

(iii) tulis persamaan ion bagi tindak balas yang berlaku dalam sel itu.
write the ionic equation for the reaction that occured in the cell.

..... [1M]

(iv) hitung voltan bagi sel, E° Sel./ *calculate the voltage of cell, E° cell*

[1M]

(b) Merujuk kepada sel B,/ *Refer to cell B,*

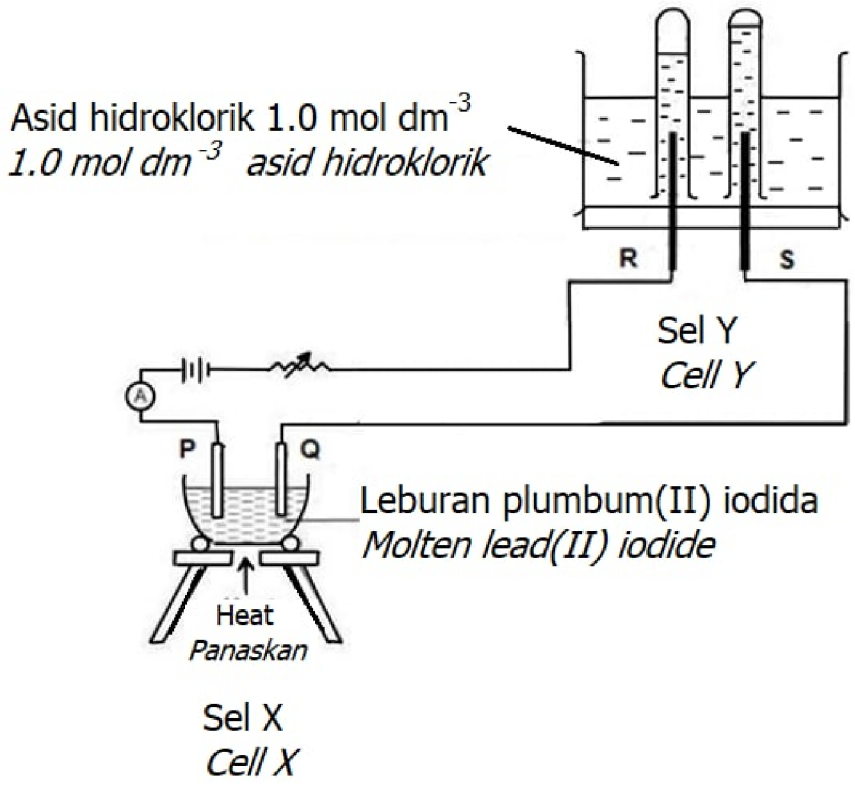
(i) terangkan satu ujian kimia untuk mengesahkan Gas X.
describe briefly a chemical test to identify Gas X.

..... [2M]

(ii) nyatakan faktor yang mempengaruhi pembentukan Gas X.
state the factor that affect the production of Gas X.

..... [1M]

[2023-JohorSkudai-07] Rajah 7.1 menunjukkan susunan radas bagi sel X dan sel Y menggunakan elektrod karbon P, Q, R dan S.
Diagram 7.1 shows apparatus set-up for cell X and Y using carbon electrodes P, Q, R and S.



(a) Berdasarkan Rajah 7.1,/ *Based on Diagram 7.1,*

(i) Tuliskan formula ion bagi semua ion yang hadir dalam leburan plumbum (II) iodida.
Write ionic formulae for all the ions present in molten lead (II) iodide.

..... [1M]

(ii) Nyatakan katod bagi sel Y./ *State the cathodes for cell Y.*

..... [1M]

(iii) Tuliskan setengah persamaan bagi tindak balas yang berlaku di elektrod P dan elektrod Q di sel X.
Write half equation for the reaction occur at electrode P and Q in cell X.

Elektrod P: .....
Electrode P:

Elektrod Q: ..... [2M]
Electrode Q:

(iv) Tulis persamaan kimia apabila hasil di elektrod S bertindak balas dengan air.
Write chemical equation when product at electrode S reacts with water.

..... [1M]

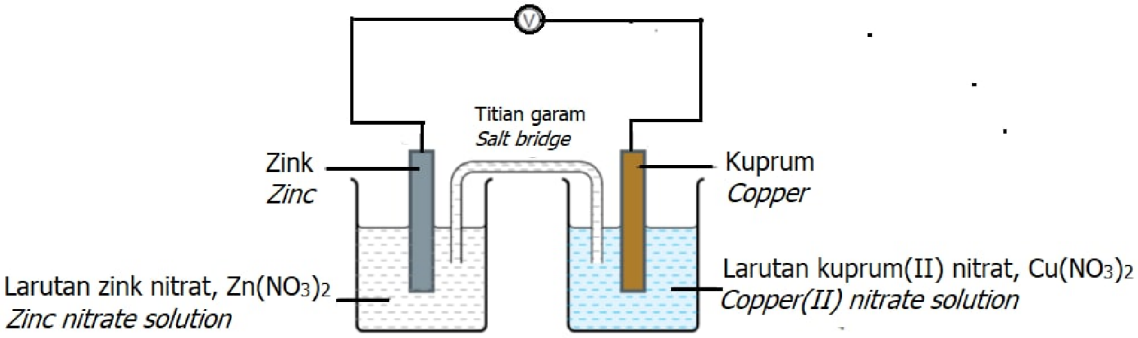
(v) Larutan yang terhasil di 7 (a) (iv) diuji dengan satu ujian X. Nyatakan ujian X dan pemerhatian itu.
The solution formed in 7 (a) (iv) is tested with X test. State the X test and its observation.

.....

.....

..... [2M]

(b) Rajah 7.2 menunjukkan susunan radas bagi satu sel kimia.
Diagram 7.2 shows an apparatus setup for a chemical cell.



Rajah 7.2 / Diagram 7.2

Nilai keupayaan elektrod piawai sel setengah adalah seperti berikut.
Standard electrode potential for half-cell as follows.

Zn^{2+} (ak/aq) + 2e ⇌ Zn(p/s) E° = -0.76 V
Cu^{2+} (ak/aq) + 2e ⇌ Cu(p/s) E° = +0.34 V

Berdasarkan Rajah 7.2,/ *Based on Diagram 7.2,*

(i) hitung voltan sel itu./ *calculate the voltage of the cell.*

..... [1M]

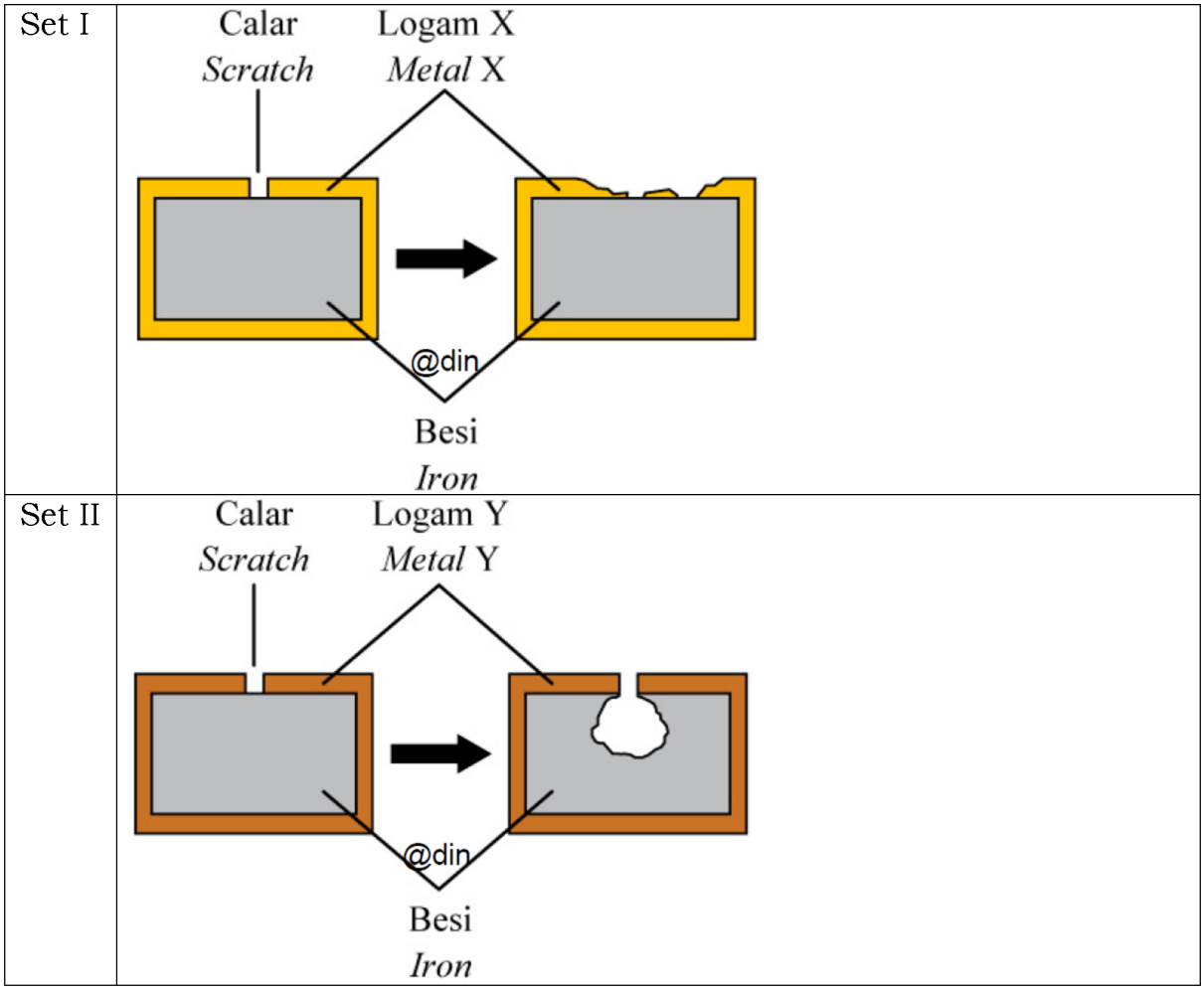
(iii) Anda dibekalkan sebiji buah tomato, wayar penyambung, LED, satu kepingan magnesium dan satu kepingan plumbum. Bagaimanakah anda merekacipta satu sel kimia ringkas.
You are provided with a tomato, connecting wire, LED, a magnesium plate and a plumbum plate. How you can create a simple chemical cell.

.....

.....

..... [2M]

[2023-Selangor-Set01-05] Rajah 5.1 menunjukkan pemerhatian bagi dua set eksperimen apabila besi bersentuhan dengan dua logam yang berlainan, iaitu logam X dan logam Y. Apabila lapisan logam X dan logam Y tercalar, besi terdedah kepada oksigen dan air.
Diagram 5.1 shows the observation of two sets of experiments when iron is in contact with two different metals, metal X and metal Y. When the layers of metal X and metal Y are scratched, the iron is exposed to oxygen and water.



Rajah 5.1/ *Diagram* 5.1

(a) Cadangkan logam X dan logam Y.
Suggest metal X and metal Y.

X : ..... Y : .....

[2M]

(b) Terangkan pemerhatian dalam Set I.
Explain the observations in Set I.

.....

.....

..... [2M]

(c) Tulis setengah persamaan pengoksidaan yang berlaku dalam Set II.
Write the oxidation half-equation that takes place in Set 11.

..... [1M]

(d) Berdasarkan pemerhatian, susun logam X, Y dan besi secara meningkat mengikut keelektropositifannya.
Based on the observations, arrange the metal X, Y and iron in an ascending order of their electropositivity.

..... [1M]

(e) Tin makanan diperbuat daripada keluli bersalut timah. Rajah 5.2 menunjukkan makanan dalam tin yang kemek.
Food cans are made of tin coated steel. Diagram 5.2 shows a dented canned food.

Rajah 5.2/ *Diagram* 5.2

Makanan dalam tin yang tinnya telah kemek atau tercalar tidak boleh dimakan. Terangkan mengapa.
Canned food in the denied or scratched tin should not be consumed. Explain why.

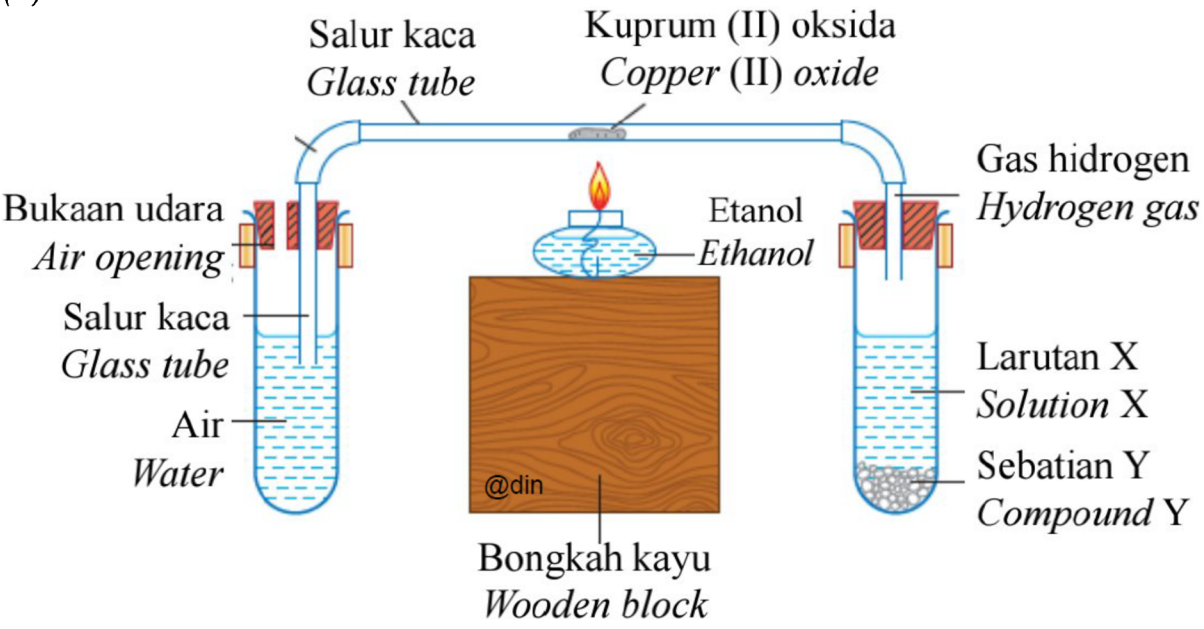
.....

.....

..... [2M]

Esei/ Essay

[2023-Melaka-10] (a) Rajah 8.1 menunjukkan susunan radas untuk mengkaji penurunan kuprum (II) oksida.
Diagram 8,1 shows the apparatus setup to investigate the reduction of copper (II) oxide.



Rajah 8.1/ *Diagram* 8.1

Selepas kuprum(II) oksida dipanaskan pepejal perang terbentuk di dalam tiub pembakaran itu.
After the copper(II) oxide is heated, brown solid is formed in the combustion tube.

(i) Nyatakan jenis zarah yang hadir dalam gas hidrogen dan nyatakan warna kuprum(II) oksida.
State the type of particle present in the hydrogen gas and state the colour of copper(II) oxide.

[2 markah/ marks]

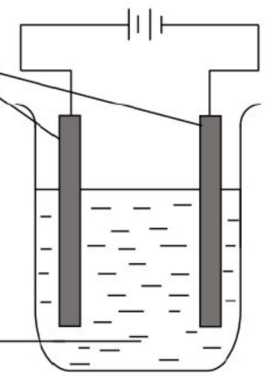
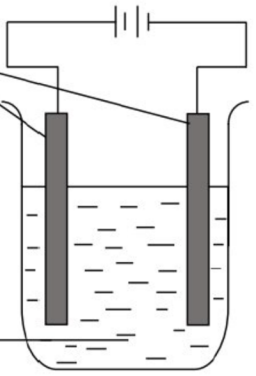
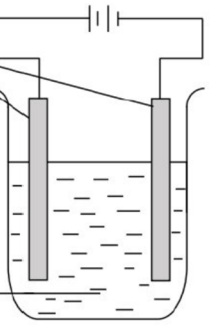
(ii) Kenal pasti larutan X dan sebatian Y yang digunakan dalam Rajah 8.1
Identify the solution X and compound Y used in Diagram 8.1.

[2 markah/ marks]

(iii) Tuliskan persamaan kimia bagi tindak balas yang berlaku dalam Rajah 8.1. Hitungkan jisim pepejal perang yang terhasil sekiranya 2 g kuprum(II) oksida dipanaskan dengan lengkap.
[Jisim atom relatif: H = 1 , O = 16 , Cu = 64]
Write a chemical equation for the reaction that occurred in Diagram 8.1. Calculate the mass of the brown solid formed when 2 g of the copper (II) oxide is heated completely.
[Relative atomic mass : H = 1, O = 16 , Cu = 64]

[6 markah/ marks]

(b) Rajah 8.2 menunjukkan liga set susunan radas dan pemerhatian di anod dan katod bagi elektrolisis larutan kuprum(II) klorida, $CuCl_2$.
Diagram 8.2 shows the apparatus setup and the observations at anode and cathode for the electrolysis of copper(II) chloride solution, $CuCl_2$.

Set	Elektrolit *Electrolyte*	Pemerhatian *Observations*	
		Anod *Anode*	Katod *Cathode*
I	Elektrod karbon *Carbon electrodes* Larutan kuprum (II) klorida, 0.001 mol dm^{-3} 0.001 mol dm^{-3} of *copper* (II) *chloride solution* 	Gas tidak berwarna dibebaskan *Colourless gas released*	Pepejal perang terbentuk *Brown solid formed*
II	Elektrod karbon *Carbon electrodes* Larutan kuprum (II) klorida, 1.0 mol dm^{-3} 1.0 mol dm^{-3} of *copper* (II) *chloride solution* 	Gas kuning-kehijauan dibebaskan *Greenish-yellow gas released*	Pepejal perang terbentuk *Brown solid formed*
III	Elektrod kuprum *Copper electrodes* Larutan kuprum (II) klorida, 1.0 mol dm^{-3} 1.0 mol dm^{-3} of *copper* (II) *chloride solution* 	Kuprum menipis *Copper gets thinner*	Kuprum menipis *Copper gets thinner*

Rajah 8.2/ *Diagram* 8.2

Jadual 4 menunjukkan sebahagian daripada siri keupayaan elektrod piawai.
Table 4 shows part of the standard electrode potential

Tindak balas sel setengah *Half-cell equations*	E°/ V (298K)
$2H^+(ak) + 2e \rightleftharpoons H_2(g)$	0.00
$Cu^{2+}(ak) + 2e \rightleftharpoons Cu$	+0.34
$O_2(g) + 2H_2O(ce) + 4e \rightleftharpoons 4OH^-$ lak)	+0.40
$Cl_2(g) + 2e \rightleftharpoons 2Cl^-$ (ak)	+ 1.36

Jadual 4 / Table 4

Berdasarkan Rajah 8.2 dan Jadual 4, terangkan perbezaan pemerhatian di anod dalam Set I, Set II, dan Set III. Tuliskan setengah persamaan bagi tindak balas yang berlaku di katod dalam ketiga-tiga set itu.
Based on Diagram 8.2 and Table 4, explain the difference in observations at anode in Set I, Set II, and Set III. Write the half-equation for the reaction that occurs at the cathode of the three sets.

[10 markah/ marks]

[2023-JUJ-Set02-11] (a) Berikut adalah persamaan kimia bagi tindak balas redoks.
The following is the chemical equation for the redox reaction.

$2NH_3$ (g) + 3CuO (p) → N_2 (g) + 3Cu (p) + $3H_2O$ (ce)
$2NH_3$ (g) + 3CuO (s) → N_2 (g) + 3Cu (s) + $3H_2O$ (l)

Berdasarkan persamaan kimia itu,/ *Based on the chemical equation,*

(i) nyatakan maksud tindak balas redoks dan terangkan jawapan anda dari segi oksigen dan hidrogen.
state the meaning of redox reaction and explain your answer in terms of oxygen and hydrogen.

[3 markah / 3 marks]

(ii) Jika 0.75 mol kuprum(II) oksida, CuO digunakan di dalam tindak balas, hitungkan isipadu gas nitrogen, N_2 yang terbebas pada keadaan bilik.
[Jisim atom relatif : Cu=64, O=16; 1 mol gas menempati 24 dm^3 pada keadaan bilik]
If 0.75 mol copper(II) oxide, CuO is used in this reaction, calculate the volume of nitrogen gas, N_2 release at room condition.
[Relative atomic mass : Cu=64, O=16; 1 mol gas occupied 24 dm^3 at room condition]

[2 markah / 2 marks]

(b) Rajah 11 menunjukkan pemerhatian bagi dua set eksperimen apabila paku besi bersentuhan dengan logam X dan logam Y dan terdedah kepada oksigen dan air selama tiga hari.
Diagram 11 shows the observation for two sets of experiment when iron nails in contact with metal X and metal Y and exposed to oxygen and water for three days.

Set	Pemerhatian/ *Observation*	
I		
	Sebelum dililit logam X *Before coiled with metal X*	Selepas dililit logam X *After coiled with metal X*
II		
	Sebelum dililit logam Y *Before coiled with metal Y*	Selepas dililit logam Y *After coiled with metal Y*

Rajah 11 / Diagram 11

Berdasarkan Rajah 11, cadangkan logam X dan logam Y. Terangkan perbezaan pemerhatian dalam Set I dan Set II.
Based on Diagram 11, suggest metal X and metal Y. Explain the differences in the observation in Set I and Set II.

[5 markah / 5 marks]

(c) Jadual 11 menunjukkan sebahagian daripada Siri Keupayaan Elektrod Piawai.
Table 11 shows a part of Standard Electrode Potential Series.

Persamaan sel setengah *Half-cell equation*	E° / V (298 K)
$Zn^{2+} + 2e \rightleftharpoons Zn$	-0.76
$Ni^{2+} + 2e \rightleftharpoons Ni$	-0.25
$Mg^{2+} + 2e \rightleftharpoons Mg$	-2.38
$Cu^{2+} + 2e \rightleftharpoons Cu$	+0.34
$Ag+ + e \rightleftharpoons Ag$	+0.80

Jadual 11 / Table 11

Dengan merujuk kepada Jadual 11, anda dikehendaki menentukan dua logam dan larutan garam yang sesuai untuk menjalankan satu eksperimen bagi mendapatkan nilai voltan yang tertinggi dalam sel kimia. Huraian anda perlulah mengandungi :
By referring to Table 11, you are required to determine two metals and suitable salt solution to describe an experiment to obtain the highest voltage value in a chemical cell. Your description must contain:

- Pengiraan bagi nilai E° sel/ *Calculation of the E° cell value*
- Prosedur/ *Procedures*
- Gambarajah berlabel/ *Labelled diagram*

[10 markah / 10 marks]

[2023-Putrajaya-09] (a) Rajah 9.1 menunjukkan susunan radas eksperimen untuk mengkaji satu tindak balas redoks. Satu gegelung wayar kuprum direndam ke dalam sebuah bikar yang mengandungi larutan argentum nitrat. Pemerhatian bagi sela masa berbeza ditunjukkan dalam rajah.
Diagram 9.1 shows apparatus set up for the experiment to investigate a redox reaction. One copper wire coil is immersed into a beaker containing silver nitrate solution. The observation for different time frame is shown in the diagram.

10 minit *10 minutes*	30 minit *30 minutes*	2 jam *2 hours*

Rajah/ Diagram 9.1

Jadual 9.1 menunjukkan sebahagian daripada nilai keupayaan elektrod piawai sel setengah.
Table 9.1 shows a part of the standard electrode potential of half-cells.

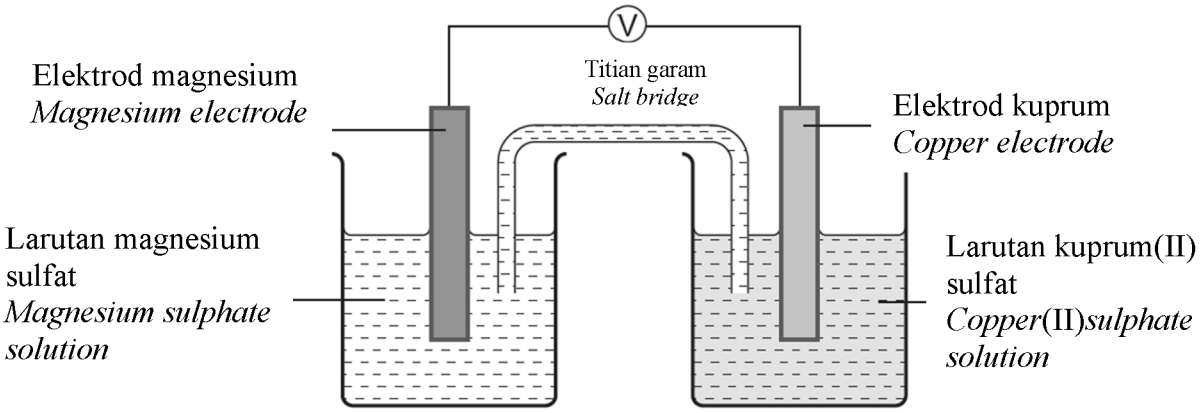
Tindak balas sel setengah *Half-cell equations*	E°/ V (298K)
$Cu^{2+} + 2e^- \leftrightharpoons Cu$	+ 0.34
$Ag^+ + e^- \leftrightharpoons Ag$	+ 0.80

Jadual/ Table 9.1

Berikan definisi tindak balas redoks. Merujuk kepada nilai keupayaan elektrod piawai dalam Jadual 9.1, tentukan agen pengoksidaan bagi tindak balas itu. Terangkan jawapan anda.
Give the definition of redox reaction. Referring to the standard electrode potential in Table 9.1, identify the oxidizing agent for the reaction. Explain your answer.

[5 markah/ marks]

(b) Rajah 9.2 menunjukkan menunjukkan susunan radas bagi satu sel kimia.
Diagram 9.2 shows an apparatus set-up for a chemical cell.



Rajah/ Diagram 9.2

Jadual 9.2 menunjukkan sebahagian daripada nilai keupayaan elektrod piawai sel setengah.
Table 9.2 shows a part of the standard electrode potential of half-cells.

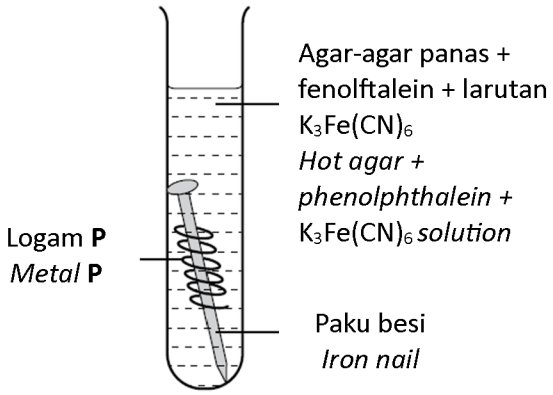
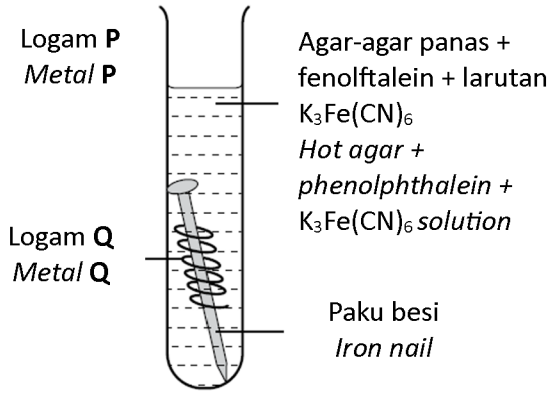
Tindak balas sel setengah *Half-cell equations*	E°/ V (298K)
$S_2O_8^{2-} + 2e^- \leftrightharpoons 2SO_4^{2-}$	+ 2.01
$O_2 + 2H_2O + 4e^- \leftrightharpoons 4OH^-$	+ 0.40
$2H^+ + 2e^- \leftrightharpoons H_2$	0.00
$Cu^{2+} + 2e^- \leftrightharpoons Cu$	+ 0.34
$Mg^{2+} + 2e^- \leftrightharpoons Mg$	– 2.38

Jadual/ Table 9.2

Kenal pasti terminal negatif bagi sel kimia tersebut. Jelaskan jawapan anda. Kirakan bacaan voltan, E°sel bagi sel kimia itu. Kemudian, tuliskan notasi sel bagi sel kimia tersebut.
Identify the negative terminal of the chemical cell.
Explain your answer. Calculate the voltage reading, E°cell for the chemical cell. Then, write the cell notation of the chemical cell.

[5 markah/ marks]

(c) Dua set eksperimen lain dijalankan untuk mengkaji kesan logam lain terhadap pengaratan besi. Paku besi dililit dengan logam berbeza. Kedua-dua paku besi yang dililit dengan logam itu dimasukkan ke dalam larutan agar-agar panas yang mengandungi larutan kalium heksasianoferat(III) dan fenolftalein. Keputusan eksperimen ditunjukkan dalam Jadual 9.3.
Two sets of other experiments are carried out to study the effect of the other metals on rusting of iron. The iron nail is been coiled with different metals. Both coiled iron nails are dipped into hot jelly solution containing potassium hexacyanoferrate (III) solution and phenolphthalein. The results of the experiment are shown in Table 9.3.

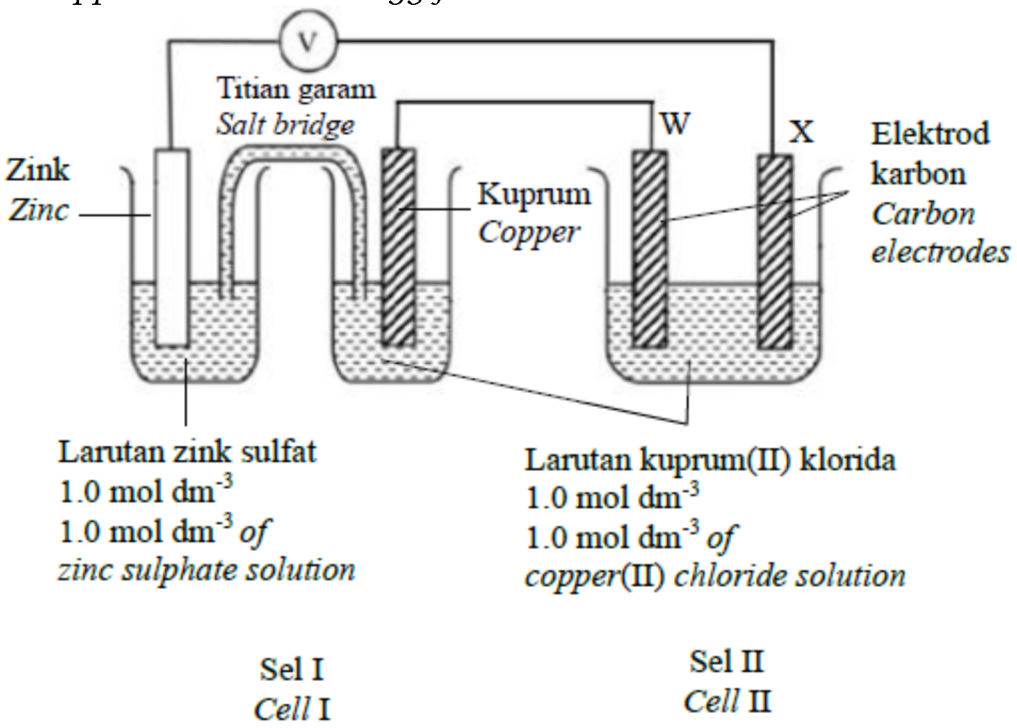
Set *Set*	Eksperimen *Experiment*	Pemerhatian *Observations*
I		Tompok merah jambu terbentuk *Pink spots formed*
II		Warna biru tua terbentuk *Dark blue colour formed*

Jadual/ Table 9.3

Berdasarkan Jadual 9.3, cadangkan logam P dan logam Q. Terangkan mengapa terdapat perbezaan dalam pemerhatian. Dalam jawapan anda sertakan setengah persamaan bagi tindak balas pengoksidaan dan nyatakan logam yang dioksidakan.
Based on Table 9.3, suggest metal P and metal Q. Explain why there is difference in the observations. In your answer, includes the half equations for oxidation reaction and state the metals that are oxidised.

[10 markah/ marks]

[2023-MRSM-09] Rajah 7 menunjukkan susunan radas bagi gabungan Sel I dan Sel II. Sel I membekalkan tenaga elektrik kepada Sel II
Diagram 7 shows the apparatus set-up for the combination of Cell I and Cell II. Cell I supplies electrical energy for Cell II.



Rajah 7/ Diagram 7

(a) Nyatakan fungsi titian garam dan cadangkan satu larutan yang sesuai untuk menghasilkannya.
State the function of salt bridge and suggest a suitable solution to produce it.
[2 markah]

(b) Jadual 3.1 menunjukkan sebahagian daripada nilai keupayaan elektrod piawai sel setengah.
Table 3.1 shows a part of the standard electrode potential of half- cells.

Persamaan sel setengah *Half-cell equations*	E°/ V (298 K)
$Mg^{2+} + 2e^- \rightleftharpoons Mg$	-2.38
$Zn^{2+} + 2e^- \rightleftharpoons Zn$	-0.76
$2H^+ + 2e^- \rightleftharpoons H_2$	0.00
$Cu^{2+} + 2e^- \rightleftharpoons Cu$	+0.34
$O_2 + 2H_2O + 4e^- \rightleftharpoons 4OH^-$	+0.40
$Cl_2 + 2e^- \rightleftharpoons 2Cl^-$	+1.36
$S_2O_8^{2-} + 2e^- \rightleftharpoons 2SO_4^{2-}$	+2.01

Jadual 3.1/ Table 3.1

Berdasarkan Sel I dalam Rajah 7, kenal pasti elektrod yang bertindak sebagai katod, tuliskan notasi sel dan hitung nilai E° sel. Jika logam zink dan larutan zink sulfat digantikan dengan logam magnesium dan larutan magnesium sulfat, nilai E°sel meningkat. Terangkan jawapan anda.
Based on Cell I in Diagram 7, identify the electrode act as a cathode, write the cell notation and calculate the value of E° cell. If zinc metal and zinc sulphate solution is replaced with magnesium metal and magnesium sulphate solution, the value of E° cell increases. Explain your answer.

[5 markah]

(c) Terangkan tindak balas yang berlaku pada elektrod W dan X.
Penerangan anda perlu mengandungi:
Explain the reaction that occurs at electrodes W and X.
Include the following in your explanation:

- Ion yang dipilih untuk dinyahcas/ *Ion that is selectively discharged*
- Sebab ion-ion dipilih untuk dinyahcas
- *The reason why the ions are selectively discharged*
- Setengah persamaan/ *Half equations*
- Pemerhatian/ *Observations*
- Hasil tindak balas yang terbentuk/ *Product formed*

[10 markah]

(d) Jadual 3.2 menunjukkan senarai radas dan bahan yang digunakan dalam suatu eksperimen.
Table 3.2 shows the list of apparatus and materials used in an experiment.

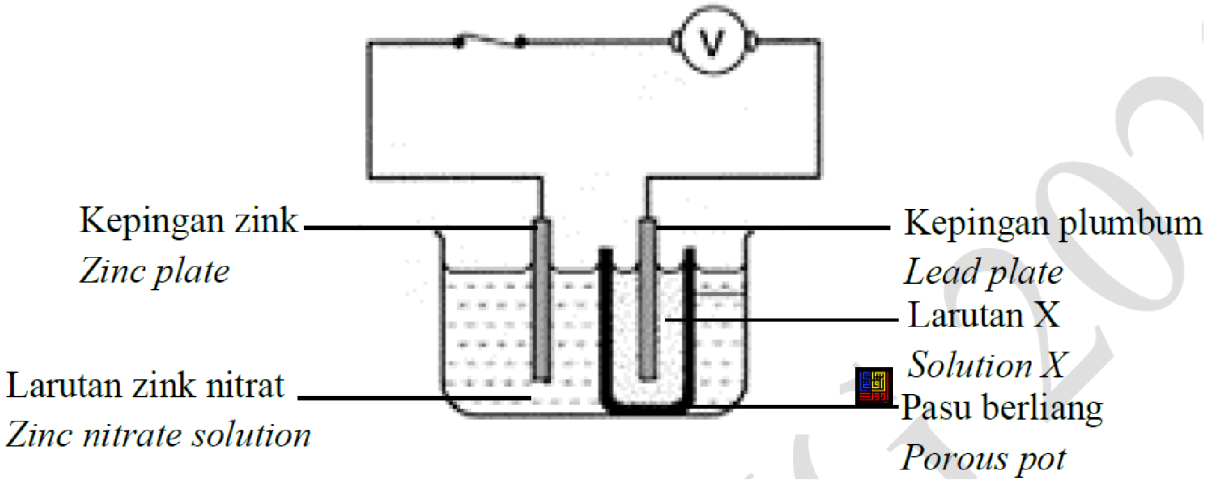
Radas dan bahan/ *Apparatus and materials*	
• Tiub-U *U-tube* • Galvanometer *Galvanometer* • Elektrod karbon *Carbon electrode* • Wayar penyambung *Connecting wire*	• Asid sulfurik cair *Dilute sulphuric acid* • Larutan kalium iodida *Potassium iodide solution* • Larutan kalium manganat(VII) berasid *Acidified potassium manganate(VII) solution*

Jadual 3.2/ Table 3.2

Dengan menggunakan radas dan bahan yang diberikan, lukis satu gambarajah berlabel untuk menunjukkan susunan radas bagi mengkaji pemindahan elektron pada suatu jarak. Lukis anak panah untuk menunjukkan arah pengaliran elektron.
Based on the apparatus and materials, draw a labelled diagram to show the apparatus set-up to investigate the transfer of electrons at a distance. Draw the arrow to show the direction of electron flow.

[3 markah]

[2023-JUJ-Set01-09] (a) Rajah 9.1 menunjukkan susunan radas bagi satu eksperimen untuk mengkaji tindak balas dalam suatu sel kimia.
Diagram 9.1 shows the apparatus set-up for an experiment to study reactions in a chemical cell.



Rajah 9.1 / Diagram 9.1

Nilai keupayaan elektrod piawai sel setengah, E° bagi beberapa sel setengah ditunjukkan dalam Jadual 9:
The half-cell standard electrode potential values, E° for several half-cells are shown in Table 9:

Tindak balas sel setengah *Half-cell equations*	E°, V
$Zn^{2+} + 2e^- \rightleftharpoons Zn$	- 0.76
$Pb^{2+} + 2e^- \rightleftharpoons Pb$	- 0.13

Jadual 9/ Table 9

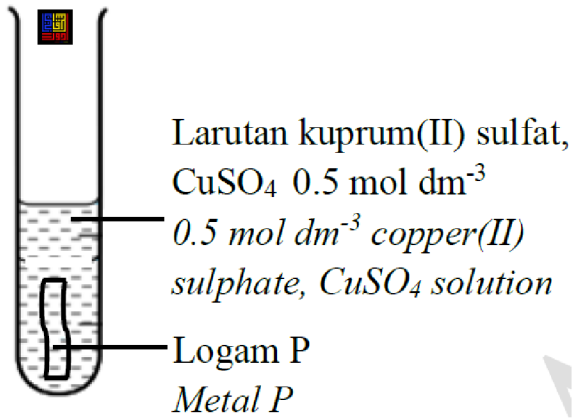
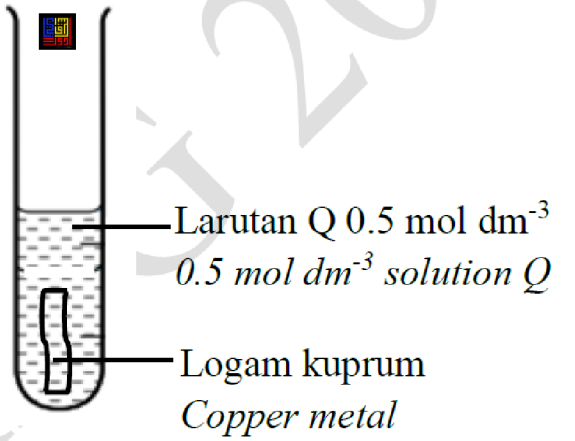
Berdasarkan maklumat yang diberi, nyatakan fungsi pasu berliang. Cadangkan nama larutan X, hitung nilai voltan, E°sel dan tuliskan notasi sel tersebut.
Based on the information given, state the function of porous pot. Suggest the name of solution X, calculate the voltage value, E° cell and write the cell notation.

[5 markah /5 marks]

(b) Syifa ingin mengubah warna larutan ferum(III) sulfat, $Fe_2(SO_4)_3$ 1.0 mol dm^{-3} daripada perang kepada hijau. Cadangkan satu bahan kimia yang sesuai digunakan oleh Syifa dan tuliskan setengah persamaan bagi tindak balas penurunan.
Syifa wants to change the colour of 1.0 mol dm^{-3} iron(III) sulphate solution, $Fe_2(SO_4)_3$ from brown to green. Suggest a suitable chemical substance used by Syifa and write the half-equation for the reduction reaction.

[2 markah /2 marks]

(c) Rajah 9.2 menunjukkan dua tindak balas penyesaran logam daripada larutan garamnya.
Diagram 9.2 shows two displacement reactions of metals from their salt solutions.

Set I	Set II
	
• Enapan perang terbentuk *Brown deposit formed*	• Enapan kelabu terbentuk *Grey deposit formed*

Rajah 9.2/ Diagram 9.2

(i) Berdasarkan Rajah 9.2, cadangkan nama logam P dan larutan Q.
Bandingkan kedua-dua set eksperimen dari segi:
Based on Diagram 9.2, suggest the name of metal P and solution Q.
Compare the two sets of experiments in terms of:

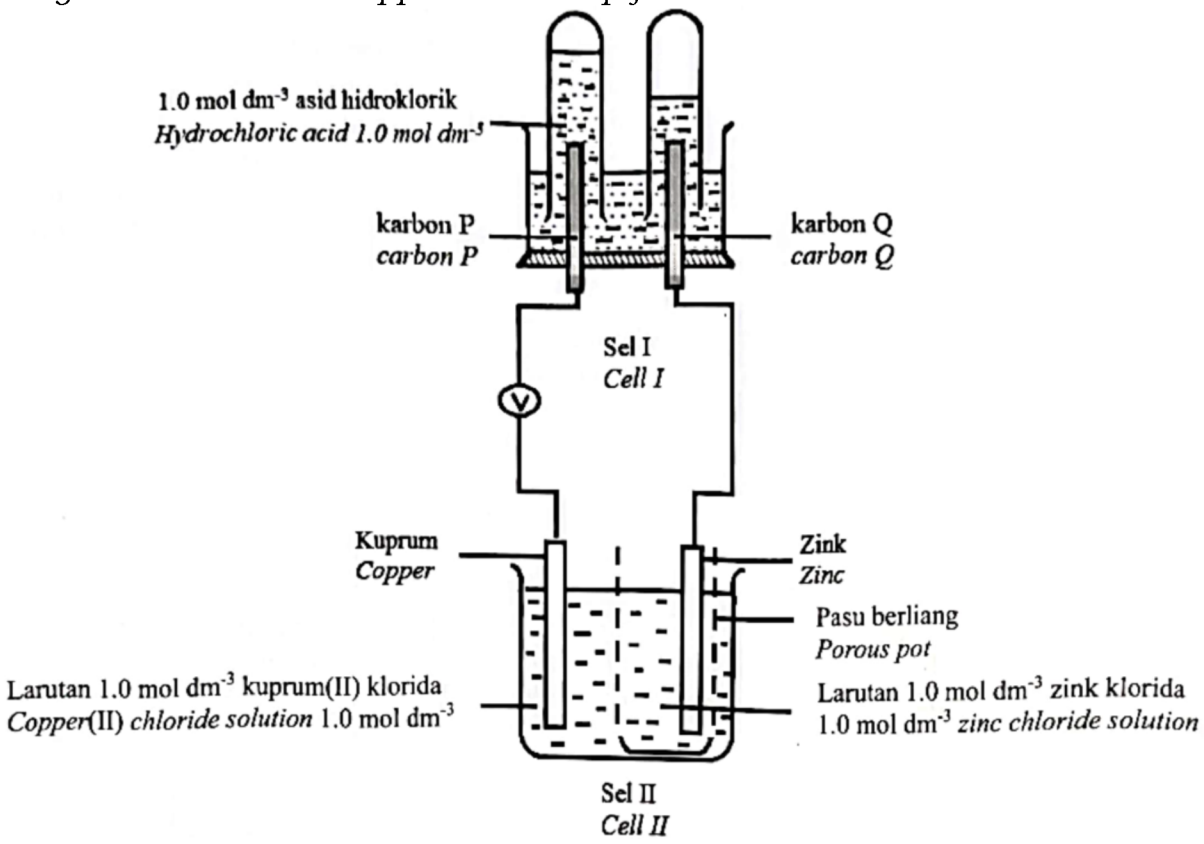
• perubahan warna larutan/ *change in colour of the solutions*
• agen pengoksidaan/ *oxidising agents*
• persamaan ion keseluruhan/ *overall ionic equation*

[10 markah /10 marks]

(ii) Berdasarkan Set II, hitung isipadu larutan Q yang digunakan dalam cm^3 sekiranya 0.08 g kuprum digunakan untuk tindak balas lengkap berlaku.
[Jisim atom relatif: Cu = 64]
Based on Set II, calculate the volume of solution Q used in cm^3 if 0.08 g of copper is used for complete reaction to occur.
[Relative atomic mass: Cu = 64]

[3 markah /3 marks]

[2023 Johor Bahru-10] 10. Rajah 10 menunjukkan susunan radas Sel I dan Set II.
Diagram 10 shows the apparatus set-up for Cell I and Cell II.



Rajah 10/ *Diagram 10*

Jadual 10 menunjukkan nilai keupayaan elektrod piawai bagi beberapa tindak balas sel setengah.
Table 10 shows the standard electrode potential values for some half-cell reactions.

Tindak balas sel setengah Half-cell reaction	E° / V (298 K.)
Zn^{2+} (ak) + 2e ⇌ Zn (p) Zn^{2+} (aq) + 2e ⇌ Zn (s)	-0.76
$2H^{+}$ (ak) + 2e ⇌ H_2(g) $2H^{+}$ (aq) + 2e ⇌ H_2(g)	0.00
Cu^{2+} (ak) + 2e ⇌ Cu (p) Cu^{2+} (aq) + 2e ⇌ Cu (s)	+0.34
O_2 (g) + $2H_2O$ (ce) + 4e ⇌ OH^{-} (ak) O_2 (g) + $2H_2O$ (1) + 4e ⇌ OH^{-} (aq)	+0.40
Cl_2 (g) + 2e ⇌ 2C1^{-} (ak) Cl_2 (g) + 2e ⇌ 2Cl^{-} (aq)	+1.36

Jadual 10/ Table 10

Berdasarkan maklumat di dalam Rajah 10 dan Jadual 10,
based on the informations in Diagram 10 and Table 10,

(a) dalam Sel I, /*in Cell 1,*

(i) nyalakan perubahan tenaga yang berlaku.
Kenal pasti elektrod yang bertindak sebagai anod dan berikan sebab bagi jawapan anda.
state the changes of energy that occur.
Identify the electrode that acts as the anode and give reason for your answer.
[3 markah] [3 marks]

(ii) tuliskan setengah persamaan di anod dan katod.
Terangkan perbezaan pemerhatian di anod dan katod.
write the half equations at anode and cathode.
Explain the differences in the observations at anode and cathode.
[10 markah] [10 marks]

(b) dalam Sel II,/ *in Cell II,*

(i) nyatakan fungsi pasu berliang.
state the function of the porous pot.

(ii) tuliskan notasi sel dan hitungkan voltan sel, E° sel bagi sel kimia ini.
write the cell notation and calculate the cell voltage, E°cell for this chemical cell.

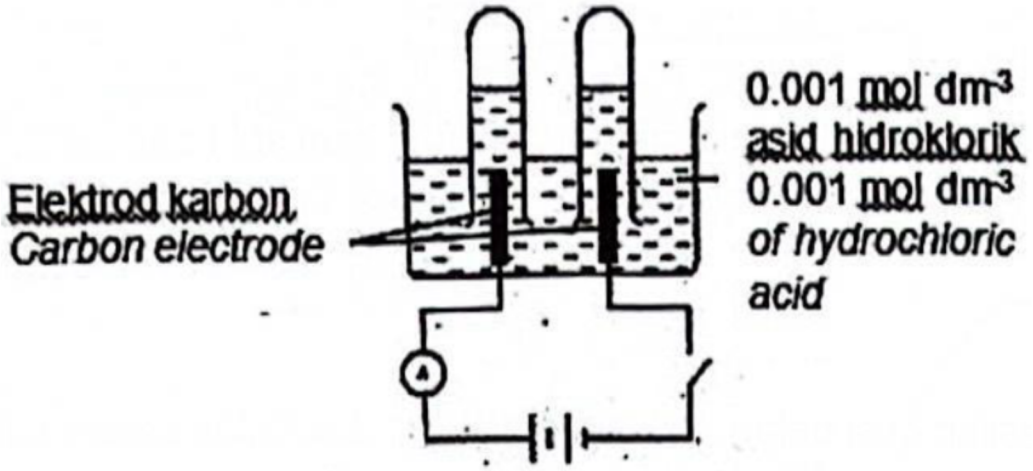
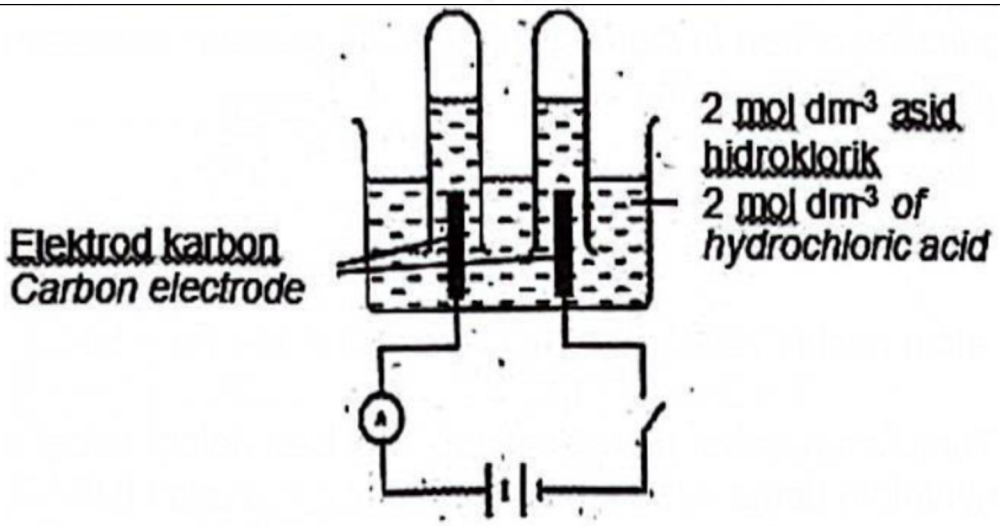
(iii) ramalkan nilai voltan sel jika kepingan zink digantikan dengan pita magnesium. Terangkan jawapan anda. Tuliskan persamaan ion keseluruhan bagi sel ini.
predict the value of the cell voltage if the zinc plate is replaced with a magnesium ribbon. Explain your answer. Write the overall ionic equation for this cell.
[7 markah] [7 marks]

[2023-TerengganuMPP3-10] (a) Berikut adalah satu persamaan tindak balas redoks.
The following is an equation represents a redox reaction.

$$2AgNO_3 + Zn \rightarrow Zn(NO_3)_2 + 2Ag$$

Nyatakan nama bahan yang bertindak sebagai agen pengoksidaan dan agen penurunan.
Terangkan jawapan anda dari segi perubahan nombor pengoksidaan.
State the name of the substance that act as an oxidising agent and a reducing agent. Explain your answer in terms of change in oxidation number.
[4 marks]

(b) Rajah 10 menunjukkan susunan radas untuk menyiasat proses elektrolisis dalam set I dan set II dengan menggunakan elektrod karbon.
Diagram 10 shows the apparatus set up to investigate the electrolysis process in cell I and cell II by using carbon electrode for both cells.

Sel Cell	Rajah Diagram
I	
II	

Rajah 10/ Diagram 10

Jadual 10 menunjukkan nilai E° bagi sel setengah elektrod piawai.
Table 10 shows E° value for half standard potential electrode.

$2H^+ + 2e \rightleftharpoons H_2$	E°= 0.00 V
$O_2 + 2H_2O + 4e \rightleftharpoons 4OH^-$	E° +0.40 V
$Cl_2 + 2e \rightleftharpoons 2Cl^-$	E°= +1.36 V

Jadual/ Table 10

(i) Berdasarkan sel I, nyatakan nama hasil yang terbentuk di katod dan anod.
Based on cell I diagram, state the name of the product formed at the cathode and anode.

[2 marks]

(ii) Hasil yang dikumpul pada anod dalam set I dan set II adalah berbeza. Terangkan jawapan anda berdasarkan pemilihan nyahcas ion.
The product collected at anode in cell I and cell II are different.
Explain your answer in terms of selective discharge of ion.

[6 marks]

(iii) Tulis setengah persamaan di anod bagi sel I dan sel II.
Write the half equations at the anode for cell I and cell II.

[2 marks]

(c) Penghasilan besi dalam industri melalui tindak balas antara bijih besi dan arang kok seperti persamaan kimia di bawah.
The production of iron in industry through the reaction between iron ore and coke is shown in chemical equation below.

$$2Fe_2O_3 + 3C \rightarrow 4Fe + 3CO_2$$

[Jisim atom relatif / relative atomic mass: O = 16 ; Fe = 56]

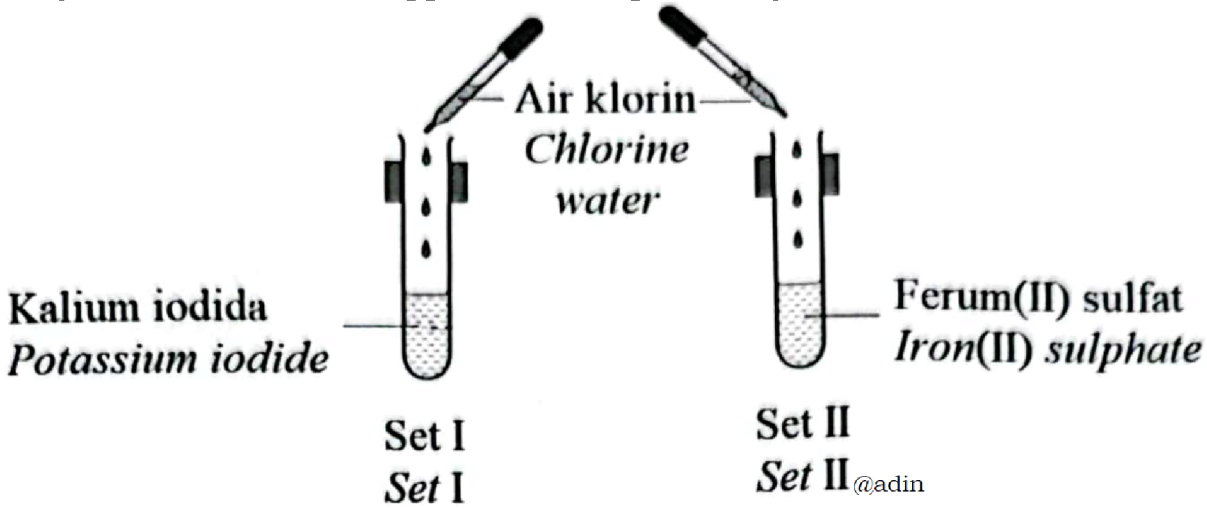
(i) Tentukan nombor pengoksidaan bagi besi dalam sebatian Fe_2O_3 dan nyatakan nama sebatian itu mengikut penamaan IUPAC.
Determine the oxidation number of iron in compound Fe_2O_3 and state the name of the compound according to the IUPAC nomenclature.

[2 marks]

(ii) Kilang tersebut mampu memproses 320 kg bijih besi sehari dengan menggunakan karbon yang berlebihan. Hitung jisim besi yang dihasilkan dalam sehari.
The factory is able to process 320 kg ore a day by using excess carbon.
Calculate the mass of the iron produced in a day.

[4 marks]

[2023-SBP-10] Rajah 10.1 menunjukkan susunan radas untuk mengkaji tindak balas redoks.
Diagram 10.1 shows the apparatus set-up to study the redox reaction.

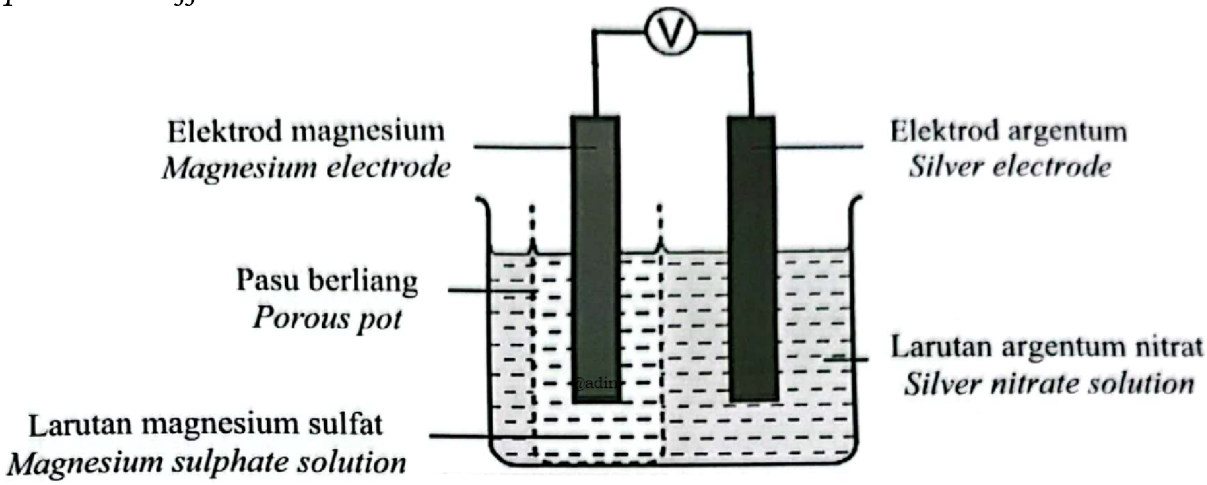


Rajah / Diagram 10.1

(a) Tuliskan setengah persamaan bagi tindak balas pengoksidaan dan penurunan yang berlaku di Set I dan Set II.
Nyatakan pemerhatian dalam tabung uji bagi Set I dan Set II, kemudian tentukan perubahan nombor pengoksidaan klorin bagi kedua-dua set.
Write the half-equation for the oxidation and reduction reactions occur in Set I and Set II. State the observation in the test tubes for Set I and Set II, then determine the change in oxidation number of chlorine for both sets.

[6 markah/ marks]

(b) Rajah 10.2 menunjukkan susunan radas bagi satu eksperimen untuk mengkaji beza keupayaan antara dua elektrod dalam tindak balas redoks.
Diagram 10.2 shows the apparatus set-up for an experiment to study the potential difference between two electrodes in a redox reaction.



Rajah/ Diagram 10.2

Jadual 10 menunjukkan sebahagian daripada nilai keupayaan elektrod piawai sel setengah.
Table 10 shows a part of the standard electrode potential of half-cells.

Tindak balas sel setengah *Half-cell equations*	E°/ V (298K)
$S_2O_8 + 2e \rightleftharpoons 2SO_4^{2-}$	+2.01
$NO_3^- + 2H^+ + 2e \rightleftharpoons NO_2^- + H_2O$	+0.42
$O_2 + 2H_2O + 4e \rightleftharpoons 4OH^-$	+0.40
$2H^+ + 2e \rightleftharpoons H_2$	0.00
$Ag^+ + e \rightleftharpoons Ag$	+0.80
$Mg^{2+} + 2e \rightleftharpoons Mg$	-2.38

Jadual/ Table 10.1

Berdasarkan Rajah 10.2 dan Jadual 10.1,
Based on Diagram 10.2 and Table 10.1,

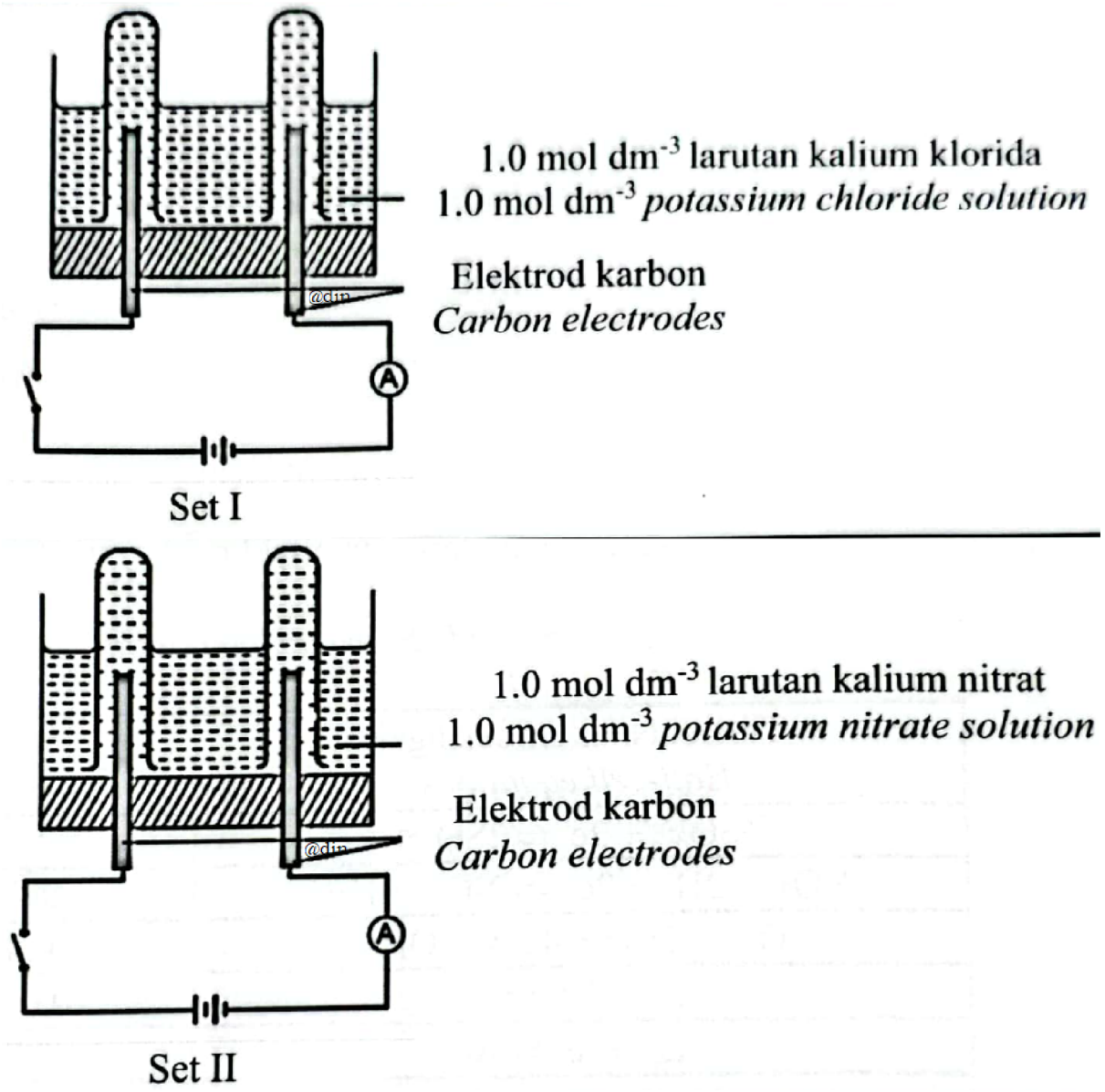
(i) Kenalpasti elektrod yang bertindak sebagai anod. Berikan alasan anda.
Identify the electrode which act as anode. Give your reason.

[2 markah/ marks]

(ii) Tuliskan notasi sel untuk tindak balas itu.
Write the cell notation for the reaction.

[2 markah/ marks]

(c)Dalam satu eksperimen yang lain, seorang murid menjalankan eksperimen di dalam makmal untuk mengkaji faktor yang mempengaruhi pemilihan ion-ion untuk dinyahcaskan pada elektrod berbeza. Rajah 10.3 menunjukkan susunan radas bagi kedua-dua set eksperimen itu.
In another experiment, a student conducts an experiment in the laboratory to investigate the factors that affecting the discharge of inns at different electrodes. Diagram 10.3 shows the apparatus set up for both of the experiments.



Rajah/ Diagram 10.3

Jadual 10.2 menunjukkan sebahagian daripada nilai keupayaan elektrod piawai sel setengah.
Table 10.2 shows a part of the standard electrode potential of half-cells.

Tindak balas sel setengah Half-cell equations	E°/ V (298K)
$Cl_2 + 2e \rightleftharpoons 2Cl^-$	+1.36
$NO_3^- + 2H^+ + 2e \rightleftharpoons NO_2^- + H_2O$	+0.42
$O_2 + 2H_2O + 4e \rightleftharpoons 4OH^-$	+ 0.40
$2H^+ + 2e \rightleftharpoons H_2$	0.00
$K^+ + e \rightleftharpoons K$	-2.92

Jadual/ Table 10.2

Berdasarkan Rajah 10.3 dan Jadual 10.2
Based on Diagram 10.3 and Table 10.2,

banding dan bezakan Set I dan Set II dari segi:
compare and contrast between Set I and Set II based on:

• ion-ion tertarik ke anod dan katod
ions attracted to anode and cathode

• pemilihan ion untuk dioksidakan
choice of ion to be oxidized

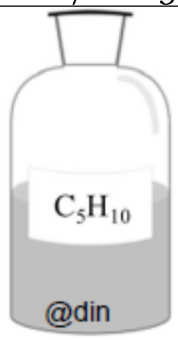
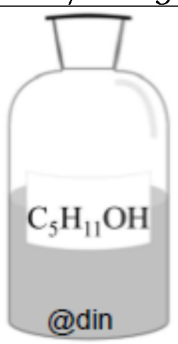
• sebab mengapa ion itu dipilih untuk dioksidakan
Reason why the ions were chosen to be oxidized

• pemerhatian di anod dan katod
observations at anode and cathode

[10 markah/ marks]

Bab 2 Sebatian Karbon

[2023-MRSM-05] Rajah 3 menunjukkan dua sebatian karbon di dalam botol reagen A dan B.
Diagram 3 shows two carbon compounds in reagent bottle A and B.

Botol reagen A/ *Reagent bottle A*	Botol reagen B/ *Reagent bottle B*
	

Rajah 3/ Diagram 3

(a) (i) Nyatakan maksud hidrokarbon./*State the definition of hydrocarbon.*

.....

..... [1M]

(ii) Nyatakan kumpulan berfungsi bagi sebatian dalam botol reagen A.
State the functional group of compound in reagent bottle A.

..... [1M]

(b) Sebatian dalam botol reagen B boleh dihasilkan daripada sebatian dalam botol reagen A melalui suatu tindak balas.
Compound in reagent bottle B can be produced from compound in reagent bottle A through a reaction.

(i) Apakah nama tindak balas ini?/ *What is the name of this reaction?*

..... [1M]

(ii) Tuliskan persamaan kimia bagi tindakbalas tersebut.
Write a chemical equation for the reaction.

..... [1M]

(c) Puan Rahmah memerlukan bahan api yang tidak menyebabkan permukaan periuk barunya menjadi hitam. Berdasarkan Rajah 3, cadangkan sebatian yang sesuai digunakan sebagai bahan api untuk mengelakkan permukaan periuk menjadi hitam. Terangkan jawapan anda.
[Jisim atom relatif: H = 1, C = 12, O = 16]

Puan Rahmah needs a fuel which do not cause the surface of her new pot become black. Based on Diagram 3, suggest the suitable compound to be use as fuel to prevent the surface of pot become black. Explain your answer.
[Relative atomic mass: H = 1, C = 12, O = 16]

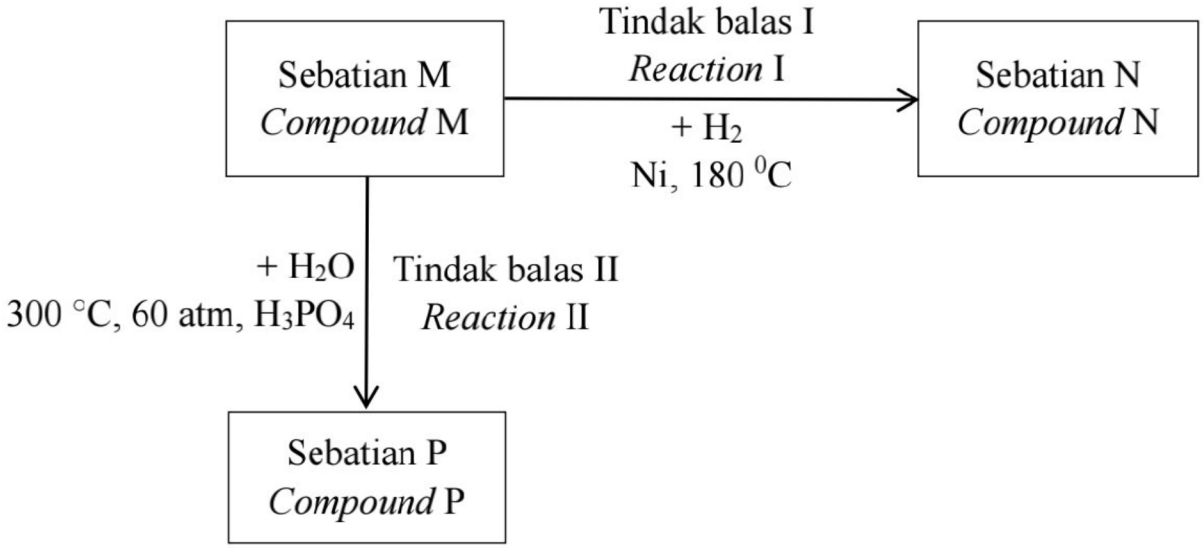
.....

.....

.....

..... [4M]

[2023-Melaka-07] Rajah 5 menunjukkan satu siri tindak balas kimia bagi sebatian M. Sebatian M ialah hidrokarbon tak tepu yang mempunyai empat atom karbon.
Diagram 5 shows a chemical reaction for compound M, Compound M is an unsaturated hydrocarbon with four carbon atoms.



Rajah 5 / Diagram 5

(a) Apakah yang dimaksudkan dengan hidrokarbon?
What is meant by hydrocarbon?

..... [1M]

(b) Berdasarkan Rajah 5,
Based on Diagram 5,

(i) Isomer ialah molekul yang mempunyai formula molekul yang sama tetapi formula struktur yang berbeza. Lukiskan satu isomer bagi sebatian M.
Isomers are molecules that has the same molecular formula but different structural formula. Draw one isomer for compound M.

[1M]

(ii) Kenal pasti Tindak balas I, Tindak balas II dan sebatian P.
Identify Reaction I, Reaction II and compound P.

Tindak balas I : .....
Reaction I

Tindak balas II : .....
Reaction II

Sebatian P : .....
Compound P [3M]

(c) Pembakaran sebatian M dan sebatian N menghasilkan kejelagaan yang berbeza. Jelaskan pernyataan ini dan sertakan bukti melalui pengiraan peratus jisim karbon per molekul bagi sebatian M dan sebatian N masing-masing.
[Jisim atom relatif: H=l, C=12, 0=16]
The combustion of compound M and compound N produce different amount of soot. Explain this statement by calculating the percentage of carbon by mass per molecule in each compound M and compound N respectively.
[Relative atomic mass : H=l, C=12, 0=16]

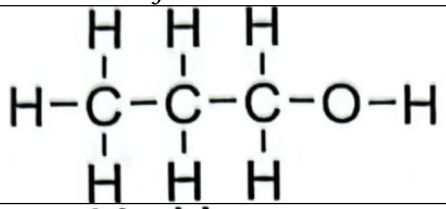
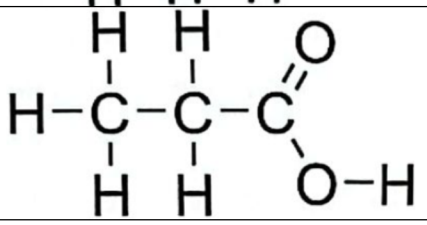
[3M]

(d) Kedua-dua sebatian P dan sebatian M boleh digunakan sebagai bahan api. Penggunaan sebatian yang manakah yang lebih mesra alam sekitar. Terangkan jawapan anda.
Both compounds P and M can be used as fuel Which of the compounds used, is more environmentally friendly. Explain your answer.

.....

..... [2M]

[2023-Kedah-08] Jadual 8 di bawah menunjukkan formula struktur sebatian P dan sebatian Q dan kegunaannya
Table 8 below shows structural formula for compound P and compound Q and their uses.

Sebatian *Compound*	Formula struktur *Stuctural formula*	Kegunaan *Uses*
P		Sebagai bahan pelarut cat. *As a solvent for paint.*
Q		Sebagai bahan mentah bersama bahan kimia lain untuk menghasilkan cat. *As a raw materials with other chemicals to produce paint.*

Jadual 8 / Table 8

(a) (i) Nyatakan kumpulan berfungsi bagi sebatian P.
State the functional group for compound P.

..... [1M]

(ii) Lukis formula struktur isomer bagi sebatian P selain struktur di atas.
Draw the structural formula of the isomer for compound P other than the structure above.

[1M]

(b) 0.5 mol bahan P terbakar dalam oksigen berlebihan menghasilkan karbon dioksida dan air.
0.5 mol of substance P burns in excess oxygen produce carbon dioxide and water.

(i) Lengkapkan persamaan di bawah
Complete the equation below

C_3H_7OH + ... O_2 → $3CO_2$ + ... H_2O

[1M]

(ii) Hitung isi padu gas karbon dioksida yang dibebaskan dalam eksperimen ini
[1 mol gas menempati isi padu 24 dm^3 mol^{-1} pada suhu bilik]
Calculate the volume of carbon dioxide that released in this experiment.
[1 mole of gas occupies a volume of 24 dm^3 mol^{-1} at room temperature]

[2M]

(c) Banding dan beza sifat fizik bahan P dan Q.
Compare and contrast physical properties of substances P and Q.

.....

.....

.....

.....

..... [2M]

(d) Rajah 8 di bawah menunjukkan penggunaan bahan P dan Q dalam kehidupan harian.
Diagram 8 below shows uses of substance P and Q in daily life.

Rajah 8 / Diagram 8

Pada pendapat anda, antara bahan P dan Q, yang mana satu lebih sesuai di gunakan sebagai bahan pelarut dalam pembuatan cat?
Wajarkan jawapan anda
In your opinion, between substance P and Q, which one is more suitable to be use as solvent in making paints?
Justify your answer.

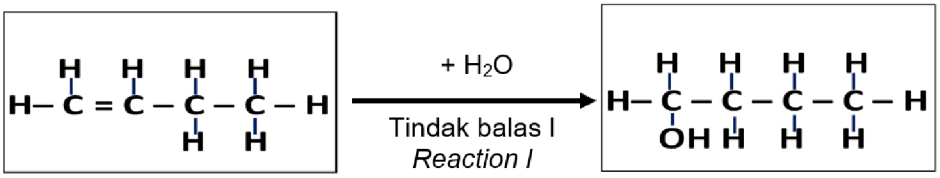
.....

.....

.....

..... [3M]

[2023-JohorSkudai-06] Rajah 6 menunjukkan penukaran bagi beberapa sebatian organik.
Diagram 6 shows the conversions of several organic compounds.



Sebatian A
Compound A

Rajah 6/ *Diagram 6*

Berdasarkan rajah,/ *Based on diagram,*

(a) Sebatian A mempunyai tiga isomer. Lukis satu isomer bagi sebatian A selain struktur di atas. Namakan isomer tersebut.
Compound A has three isomers. Draw one of the isomer other than above structural. Name the isomer.

[M]

(b) (i) Namakan tindak balas I./ *Name the reaction I.*

..... [1M]

(ii) Apakah keadaan yang diperlukan untuk tindak balas I berlaku?
What conditions are needed in reaction II?

..... [1M]

(iii) Tuliskan persamaan kimia bagi pembakaran sebatian B di dalam udara.
Write the chemical equation for combustion of compound B in the air

..... [2M]

(c) Huraikan satu ujian kimia untuk membezakan antara sebatian A dan sebatian B.
Describe a chemical test to differentiate between compound A and compound B?

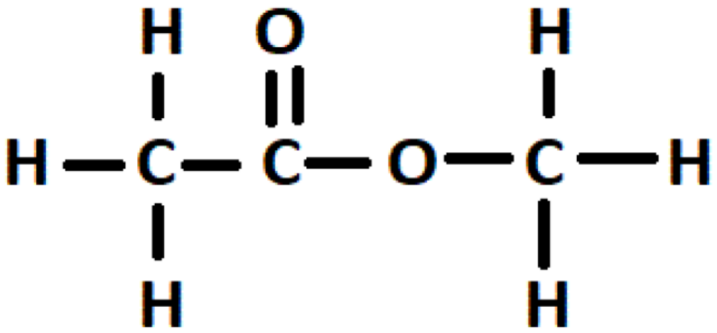
.....

.....

.....

..... [3M]

[2023-Pahang-07] Rajah 7.1 menunjukkan formula strukrur bagi satu sebatian karbon Z.
Diagram 7.1 shows the structural formula for a carbon compound Z.



Rajah 7.1 / Diagram 7.1

(a) (i) Nyatakan maksud sebatian karbon.
State the meaning of carbon compound.

.....

..... [1M]

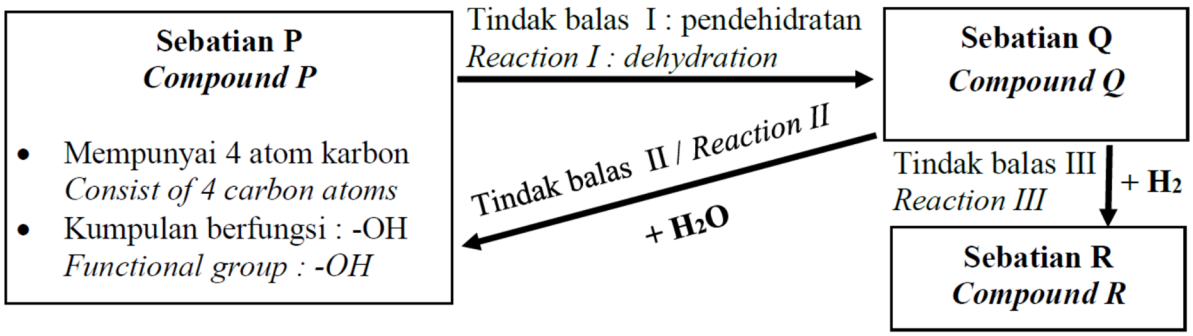
(ii) Nyatakan kumpulan berfungsi bagi sebatian karbon Z.
State the functional group of carbon compound Z.

..... [1M]

(iii) Sebatian Z boleh dihasilkan melalui tindak balas antara asid karboksilik X dan alkohol Y. Tuliskan persamaan kimia bagi tindak balas ini.
Compound Z can be produced by the reaction between carboxylic acid X and alcohol Y. Write the chemical equation for the reaction.

..... [2M]

(b) Rajah 7.2 menunjukkan satu carta alir bagi tindak balas kimia yang berlaku di antara ahli-ahli siri homolog dan ciri-ciri bagi sebatian P.
Diagram 7.2 shows a flow chart for the chemical reactions that occur between members of the homologous series and the characteristics of compound P.



Rajah 7.2 / Diagram 7.2

Berdasarkan Rajah 7.2,/ *Based on Diagram 7.2,*

(i) namakan siri homolog bagi sebatian P.
name the homologous series of compound P.

..... [1M]

(ii) nyatakan formula am bagi sebatian Q.
state the general formula of compound Q.

..... [1M]

(iii) tuliskan formula molekul bagi sebatian R.
write the molecular formula of compound R.

..... [1M]

(iv) huraikan satu ujian kimia untuk membezakan antara sebatian Q dan sebatian R.
describe a chemical test to differentiate between compound Q and compound R.

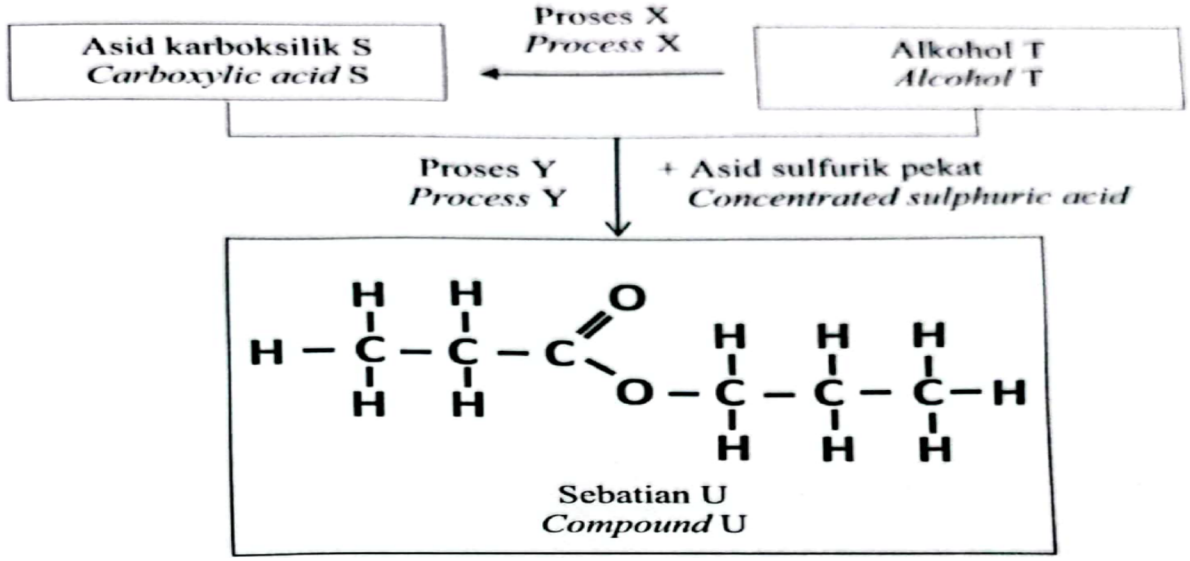
.....

.....

.....

..... [3M]

[2023-SBP-05] Rajah 5 menunjukkan tindak balas kimia antara sebatian karbon S dan T.
Diagram 5 shows a chemical reaction between carbon compounds S and T.



(a) Nyatakan kumpulan berfungsi bagi alkohol T.
State the functional group for alcohol T.

..... [1M]

(b) Namakan reagen yang digunakan dalam Proses X.
Name the reagent used in Process X.

..... [1M]

(c) Sebatian S bertindak balas dengan sebatian T untuk menghasilkan sebatian U melalui proses Y.
Compound S reacts with compound T to produce compound U through process Y.

(i) Tuliskan persamaan kimia bagi tindak balas itu.
Write the chemical equation for the reaction.

..... [2M]

(ii) Hitungkan jisim sebatian U yang terhasil apabila 0.02 mol sebatian S bertindak balas dengan sebatian T.
Calculate the mass of compound U produced when 0.02 mol of compound S reacted with compound T.
[Jisim atom relative/ Relative atomic mass: H = 1, C = 12, O= 16]

[2M]

(d) Pewangi merupakan campuran ester dan sebatian T. Jadual 5 menunjukkan tiga jenis pewangi yang mengandungi peratusan sebatian T berbeza yang digunakan sebagai pelarut.
Fragrance is a mixture of ester and compound T. Table 5 shows three types of fragrances containing different percentage of compound T that is used as solvent.

Jenis pewangi *Type of fragrance*	Peratus kandungan sebatian T (%) *Percentage content of compound T (%)*
Eau de Perfume (EDP)	75
Eau de Toilette (EDT)	88
Eau de Cologne (EDC)	95

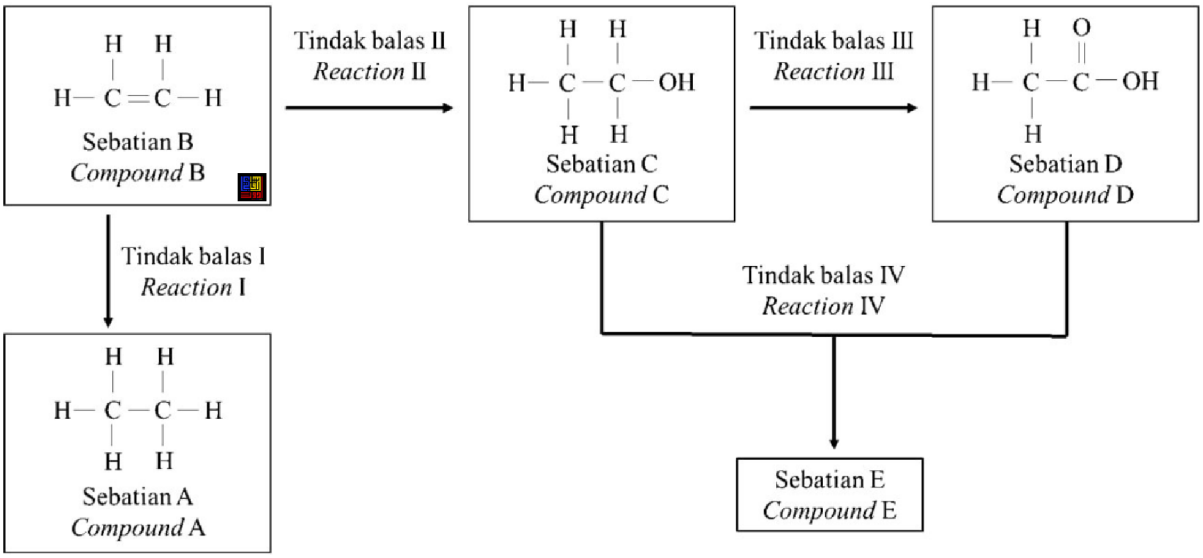
Jadual/ Table 5

Berdasarkan Jadual 5, pewangi manakah yang boleh bertahan paling lama? Berikan satu sebab.
Based on Table 5, which fragrance can last the longest?
Give one reason.

.....

..... [2M]

[2023-JUJ-Set02-08] Rajah 8 menunjukkan carta alir bagi penukaran tindak balas bagi hidrokarbon B.
Diagram 8 shows the flow chart for conversion reaction involving hydrocarbon B.



Rajah 8 / Diagram 8

(a) Nyatakan maksud hidrokarbon./ *State the meaning of hydrocarbon.*

..... [1M]

(b) Tuliskan persamaan kimia bagi tindak balas II.
Write a chemical equation for reaction II.

..... [1M]

(c) Namakan tindak balas III.
Name the reaction III.

..... [1M]

(d) Lukiskan formula struktur dan namakan bagi sebatian E.
Draw and name structural formula for compound E.

[2 markah / 2 marks]

(e) Sebatian A dan sebatian B ialah hidrokarbon. Bandingkan kedua-dua sebatian dari segi siri homolog dan formula am.
Compound A and compound B are hydrocarbons. Compare both compounds in terms of homologous series and general formula.

.....

.....
[2 markah/ marks]

(f) Seorang pelajar memindahkan sebatian C dan sebatian D ke dalam dua botol reagen yang berasingan. Namun begitu, beliau terlupa untuk melabelkan kedua-dua botol reagen tersebut. Sebagai seorang pelajar kimia, huraikan satu ujian kimia untuk mengenalpasti sebatian C dan D.
A student transferred compound C and compound D into two separate reagent bottles. However, he forgot to label both of the reagent bottles. As a chemistry student, describe a chemical test to identify compound C and D.

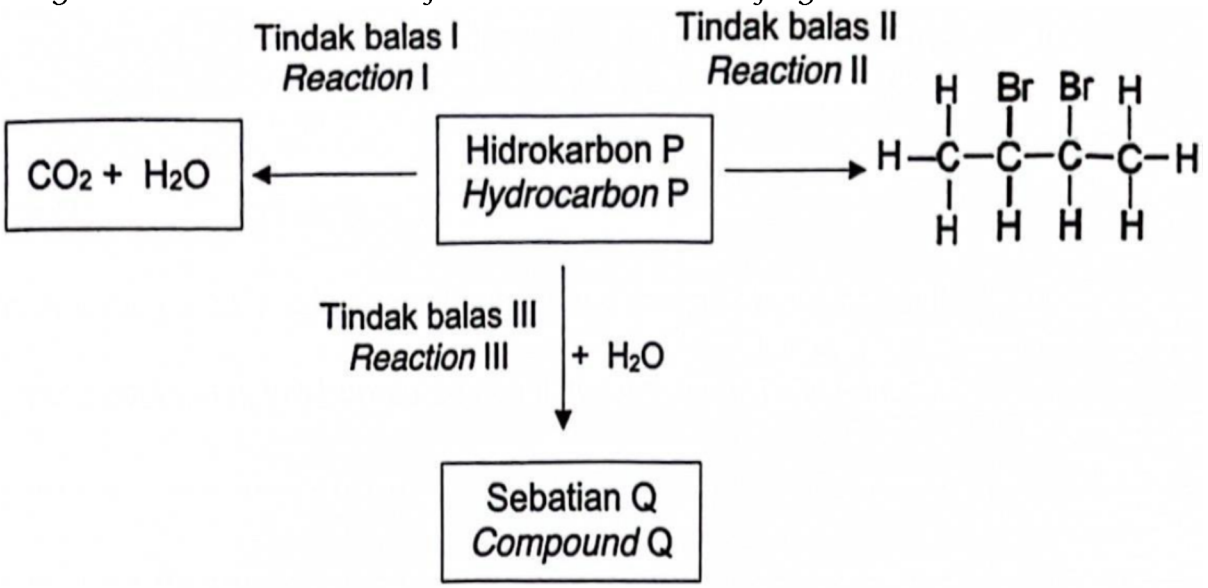
.....

.....

.....

.....
[3 markah/ marks]

[2023-TerengganuMPP3-08] Rajah 8 menunjukkan beberapa siri tindak balas kimia bagi hidrokarbon P.
Diagram 8 shows a series of chemical reactions of hydrocarbon P.



Rajah/ Diagram 8

(a) Nyatakan maksud hidrokarbon./ *State the meaning of hydrocarbon.*

..... [1M]

(b) (i) Nyatakan siri homolog bagi hidrokarbon P.
State the homologous series of hydrocarbon P

..... [1M]

(ii) Lukis formula struktur bagi hidrokarbon P.
Draw the structural formula of hydrocarbon P.

[1M]

(c) Dalam tindak balas I, hidrokarbon P terbakar lengkap dalam oksigen berlebihan. Tulis persamaan kimia bagi tindak balas itu.
In reaction I, hydrocarbon P burns completely in excess oxygen.
Write chemical equation for the reaction.

..... [2M]

(d) Tindak balas II boleh digunakan untuk menentusahkan hidrokarbon P.
Reaction II can be used to verify hydrocarbon P.

(i) Nyatakan nama bagi tindak balas II./ *State the name of reaction II.*

..... [1M]

(ii) Huraikan secara ringkas bagaimana tindak balas II boleh dijalankan di dalam makmal.
Describe briefly how reaction II can be carried out in the laboratory.

.....

..... [2M]

(e) Dalam tindak balas III, sebatian Q terbentuk apabila hidrokarbon P bertindak balas dengan air.
In reaction III, compound Q is produced when hydrocarbon P is reacted with water.

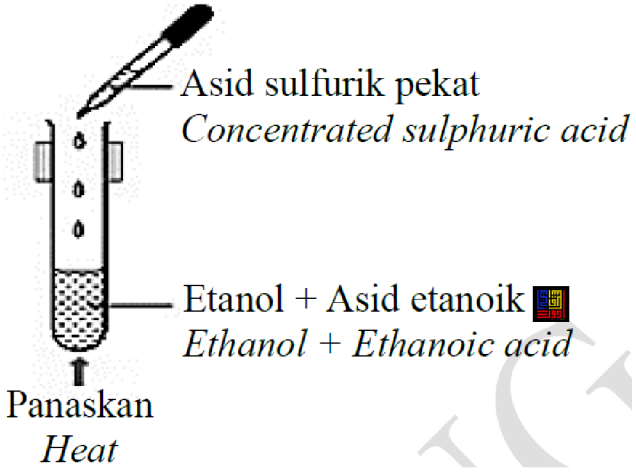
(i) Tulis formula molekul bagi sebatian Q.
Write molecular formula for compound Q.

..... [1M]

(ii) Sebatian Q boleh bertindak balas dengan asid etanoik menghasilkan sebatian R yang berbau seperti buah epal. Nyatakan nama sebatian R itu.
Compound Q can reacts with ethanoic acid to produce compound R which has smell of an apple. State the name of compound R.

..... [1M]

[2023-JUJ-Set01-03] Rajah 3.1 menunjukkan tindak balas asid etanoik dan etanol.
Diagram 3.1 shows the reaction of ethanoic acid and ethanol.



Rajah 3.1/Diagram 3.1

(a) (i) Nyatakan nama tindak balas ini./ *State the name of this reaction.*

..... [1M]

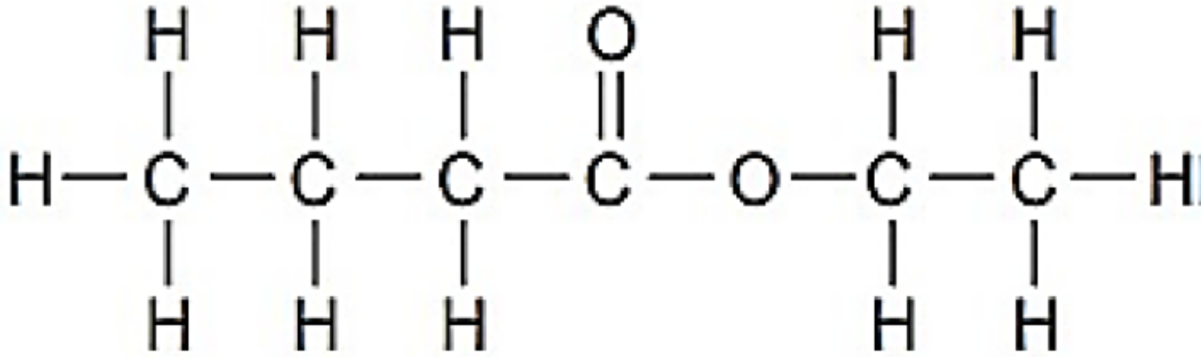
(ii) Nyatakan fungsi asid sulfurik pekat.
State the function of concentrated sulphuric acid.

..... [1M]

(iii)Tuliskan persamaan kimia bagi tindak balas ini.
Write the chemical equation for this reaction.

..... [2M]

(b) Rajah 3.2 menunjukkan formula struktur bagi perisa makanan yang dijumpai dalam buah nanas.
Diagram 3.2 shows a structural formula of food flavouring which found in pineapple.



Rajah 3.2/ Diagram 3.2

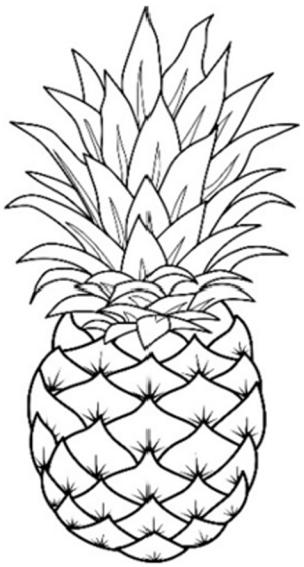
Berdasarkan Rajah 3.2, nyatakan kumpulan berfungsi dan nama bahan ini.
Based on Diagram 3.2, state the functional group and name of this substance.

Kumpulan berfungsi : .....
Functional group

Nama : .....
Name

[2M]

[2023-Putrajaya-08] Rajah 8 menunjukkan satu risalah yang dihasilkan oleh seorang murid sebagai salah satu bukti Pentaksiran Bilik Darjah (PBD) di dalam kelas.
Diagram 8 shows one pamphlet produced by a student as the proof of Classroom Assessment (PBD) in the class.



- Kumpulan ester
  Group of esters
- Nama IUPAC:
  Etil butanoat
  IUPAC *name*:
  Ethyl butanoate
- Terhasil daripada etanol dan sebatian organik M
  Formed from ethanol and organic compound M
- Berbau manis
  Has sweet smell

Rajah/ Diagram 8

(a) Berdasarkan Rajah 8,/*Based on Diagram 8,*

(i) apakah kumpulan berfungsi bagi etanol?
what is the functional group of etanol?

..... [1M]

(ii) nyatakan nama bagi sebatian organik M.
state the name of organic compound M.

..... [1M]

(iii) lukiskan formula struktur bagi ester tersebut.
draw the structural formula for the ester.

[2M]

(iv) nyatakan satu pemerhatian bagi ester yang terbentuk selain daripada menghasilkan bau manis.
state one observation for the ester formed other than produce sweet smell.

..... [1M]

(v) huraikan secara ringkas bagaimana untuk menyediakan ester tersebut di dalam makmal.
describe briefly how to prepare the ester in the laboratory.

.....

.....

.....

.....

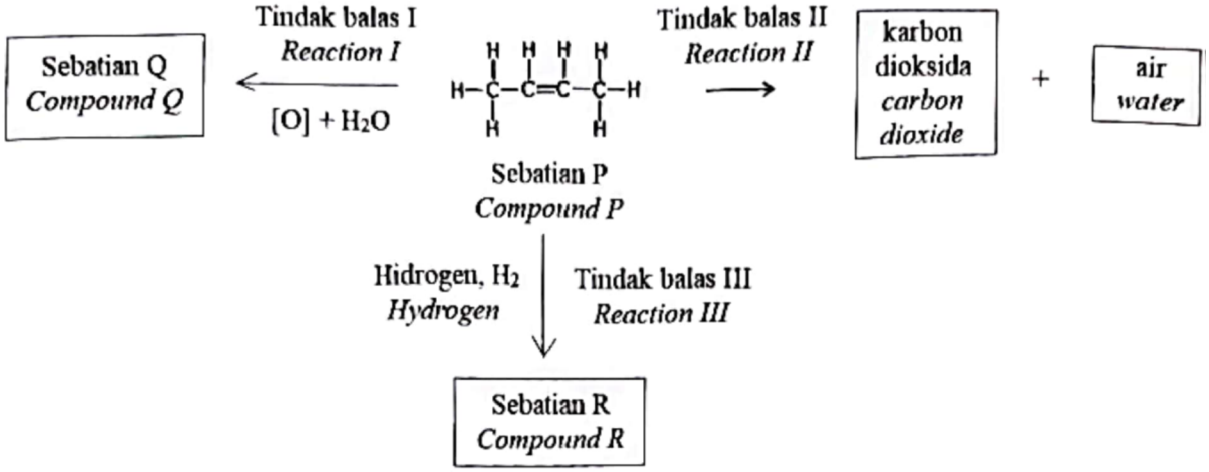
.....

..... [3M]

(b) Tuliskan persamaan kimia seimbang apabila etanol terbakar lengkap dalam oksigen berlebihan.
Write a balanced chemical equation when ethanol is burnt completely in excess oxygen.

..... [2M]

[2023 Johor Bahru-08] Rajah 8 menunjukkan carta alir bagi tindak balas melibatkan sebatian P.
Diagram 8 shows the flow chart for the reactions involving compound P.



Rajah 8/ Diagram 8
Berdasarkan Rajah 8,/ *Based on Diagram 8,*

(a) (i) nyatakan nama bagi sebatian P./ *state the name of the compound P.*

..... [1M]

(ii) Namakan satu reagen yang boleh digunakan dalam Tindak balas I.
Name one reagent that can be used in the Reaction I.

..... [1M]

(b) Dalam Tindak balas II, 14 g sebatian P terbakar lengkap dalam udara menghasilkan gas karbon dioksida dan air. Persamaan kimia tindak balas adalah seperti berikut:
In Reaction II, 14 g of compound P is burnt completely in air to produce carbon dioxide and water. The chemical equation for the reaction is as below:

$$C_4H_8 + 6O_2 \rightarrow 4CO_2 + 4H_2O$$

Hitung isi padu gas karbon dioksida yang terbebas dalam tindak balas ini pada suhu bilik.
Calculate the volume of carbon dioxide gas released in this reaction at room temperature.
[Jisim atom relatif: H = 1, C = 12, O = 16]
[Isi padu molar bagi gas pada suhu bilik = 24 dm^3 mol^{-1}]
[Relative atomic mass : H = 1, C = 12,0 = 16]
[Molar volume of gas at room temperature = 24 dm^3 mol^{-1}]

[3M]

(c) Sebatian P mengalami Tindak balas III untuk menghasilkan sebatian R. Banding dan bezakan sebatian P dan sebatian R.
Compound P undergoes Reaction III to form compound R.
Compare and contrast compounds P and R.

Persamaan/ *Similarity:*

.....

..... [1M]
Perbezaan/ *Difference :*

.....

..... [1M]

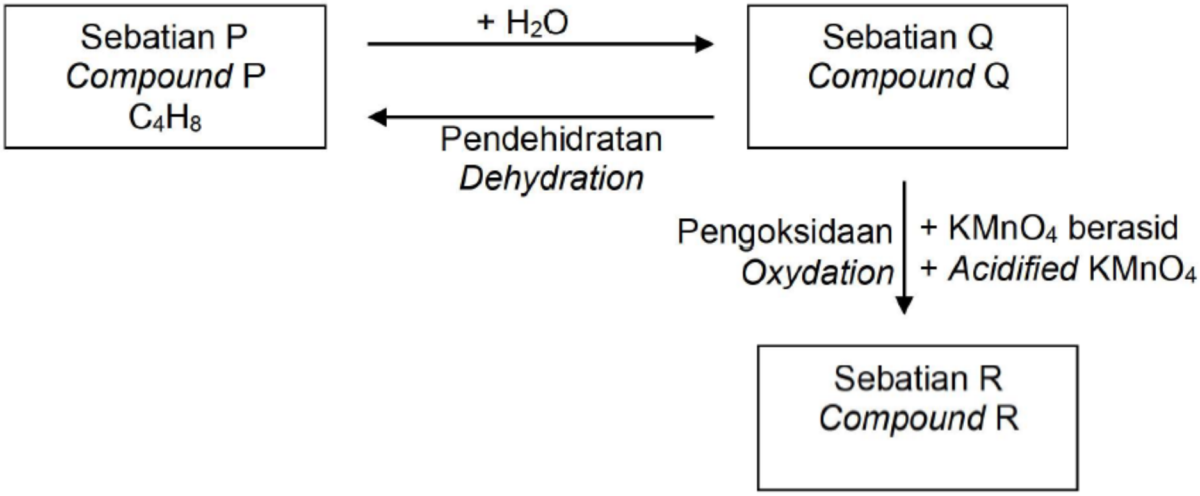
(d) Huraikan secara ringkas bagaimana sebatian P dan sebatian R dapat dikenal pasti dalam makmal.
Describe briefly how compounds P and R can be identified in the laboratory.

.....

.....

..... [3M]

[2023-Kelantan-08] Rajah 8 menunjukkan carta alir bagi tindak balas melibatkan sebatian karbon.
Diagram 8 shows a flow chart for reactions involving carbon compounds.



Rajah 8 / Diagram 8

(a) (i) Nyatakan siri homolog bagi sebatian P
State the homologous series of compounds P

..... [1M]

(ii) Sebatian P mempunyai beberapa isomer.
Lukiskan formula struktur dua isomer bagi sebatian P.
Compound P has several isomers.
Draw the structural formulas of the two isomers of compound P.

[2M]

(b) (i) Sebatian Q ditukarkan kepada sebatian P melalui tindak balas pendehidratan. Lukiskan gambarajah berlabel radas yang digunakan dalam tindak balas tersebut.
Compound Q is converted to compound P through a dehydration reaction. Draw a labelled diagram of the apparatus used in the reaction.

[2M]

(ii) Tuliskan persamaan kimia bagi tindak balas pendehidratan yang ditunjukkan dalam Rajah 8.
Write the chemical equation for the dehydration reaction shown in Diagram 8.

..... [2M]

(c) Sebatian Q dan sebatian R merupakan cecair yang tak berwarna dan sukar untuk dibezakan. Huraikan bagaimana anda dapat bezakan antara sebatian Q dan sebatian R berdasarkan sifat kimia kedua-dua bahan tersebut.
Compound Q and compound R are colorless liquids and are difficult to distinguish. Describe how you can differentiate between compound Q and compound R based on the chemical properties of the two substances.

.....

.....

..... [3M]

Esei/ essay

[2023-JohorPPDTangkak-11] Jadual 8 menunjukkan sifat sebatian karbon X, sebatian karbon Y dan sebatian karbon Z yang mempunyai dua atom karbon permolekul.
Table 8 shows the properties of three carbon compounds X, Y and Z that consist of two carbon atoms per molecule.

Sebatian karbon *Carbon compound*	Sifat *Properties*
X	□ Larut dalam air *Dissolve in water* □ Bertindak balas dengan bes menghasilkan garam karboksilat dan air *Reacts with base to produce carboxylate salt and water*
Y	□ Tidak larut dalam air *Does not dissolve in water.* □ Menyahwarna warna perang air bromin *Decolourises the brown colour of bromine water*
Z	□ Larut dalam air *Dissolve in water* □ Mudah terbakar dengan nyalaan biru dan tidak menghasilkan jelaga *Easily burned with blue flame and does not produce soot*

Jadual 8/ Table 8

(a) Apakah yang dimaksudkan dengan sebatian karbon dan nyatakan jenis sebatian karbon yang berasal daripada benda hidup. Lukis struktur formula bagi sebatian karbon X dan Y.
What is meant by carbon compound and state the type of carbon compound that originated from living things. Draw the structural formula for carbon compound X and Y.

[4 markah/marks]

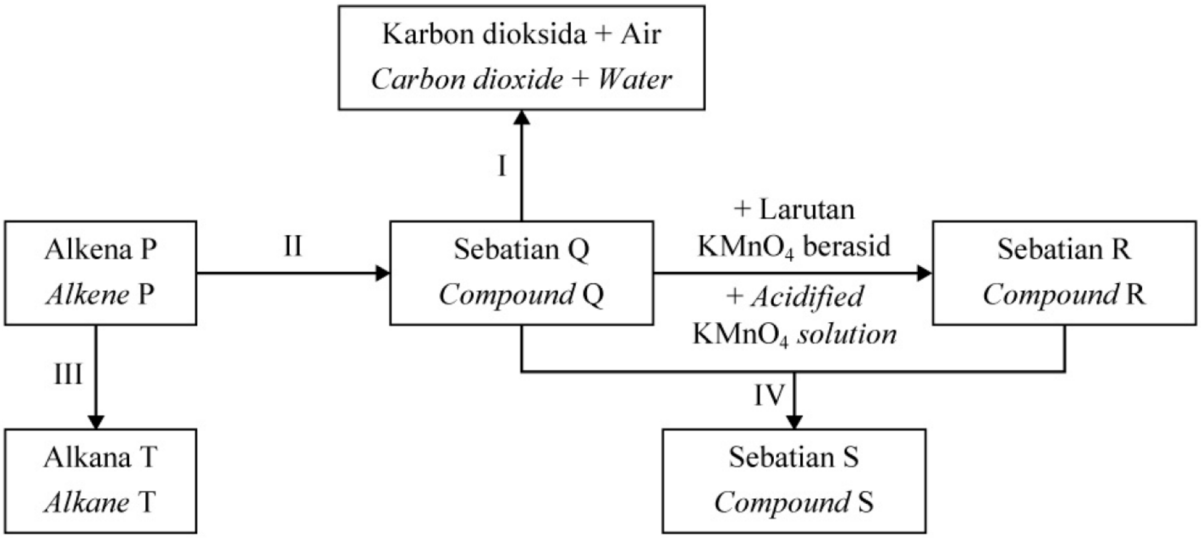
(b) Berdasarkan maklumat dalam Jadual 8, nyatakan siri homolog bagi X, Y dan Z. Sebatian karbon Z boleh ditukar kepada sebatian karbon X melalui satu proses. Huraikan secara ringkas langkah proses tersebut di dalam makmal. Huraian disertakan dengan nama hasil tindak balas.
Based on information in Table 8, state the homologous series of X, Y and Z. Carbon compound Z can be converted to carbon compound X through a process. Describe briefly the steps of the process in the laboratory. The description includes the name of the product of the reaction.

[10 markah/marks]

(c) Sebatian karbon boleh terbakar lengkap dalam udara menghasilkan air dan karbon dioksida. Tulis persamaan kimia bagi pembakaran lengkap untuk sebatian karbon Y dan sebatian karbon Z. Hitung isipadu gas karbon dioksida yang terhasil apabila 0.02 mol sebatian karbon Z terbakar lengkap.
Carbon compounds can be completely burnt in the air to produce water and carbon dioxide. Write a chemical equation for the complete combustion for carbon compounds Y and Z. Calculate the volume of carbon dioxide gas produced when 0.02 mol of carbon compound Z is burnt completely.
[Isipadu molar gas pada keadaan bilik: 24 dm^3 mol^{-1}]
[Molar volume of gas at room conditions: 24 dm^3 mol^{-1}]

[6 markah/marks]

[2023-Selangor-Set01-11] Rajah 11 menunjukkan penukaran sebatian organik daripada satu siri homolog kepada yang lain.
Diagram 11 shows the changes of organic compounds from one homologous series to another.



Rajah 11/ Diagram 11

(a) Jisim molekul relative alkena P ialah 42. Tentukan formula molekul bagi alkena P dan namakan alkena tersebut.
[Jisim atom relatif: H = 1. C = 12]
The relative molecular mass of alkene P is 42. Determine the molecular formula of alkene P and name the alkene.
[Relative atomic mass: H = 1, C = 12]

[2 markah] [2 marks]

(b) Sebatian Q boleh dihasilkan daripada alkena P melalui tindak balas II.
Compound Q can be produced from alkene P through the reaction 11.

(i) Nyatakan keadaan dan reagen yang digunakan bagi penukaran alkena P kepada sebatian Q dan tulis persamaan kimia bagi tindak balas itu.
State the conditions and reagent used for the changes of alkene P to compound Q and write the chemical equation for the reaction.

[5 markah][5 marks]

(ii) Sebatian Q terbakar dengan lengkap pada suhu bilik untuk membebaskan 7 200 cm^3 gas karbon dioksida. Hitung bilangan mol sebatian Q yang terbakar.
[1 mol gas menempati 24 dm^3 pada keadaan bilik]
Compound Q burns completely at room temperature to release 7 200 cm^3 carbon dioxide gas. Calculate the number of moles of compound Q burned.
[1 mol of gas occupies 24 dm^3 at room conditions]

[4 markah] [4 marks]

(c) (i) Namakan tindak balas III.
Name the reaction III.

[1 markah] [1 mark]

(ii) Huraikan satu ujian kimia yang dapat dijalankan untuk membezakan alkena P dan alkana T.
Describe a chemical test that can be carried out to differentiate alkene P and alkane T.

[2 markah] [2 marks]

(d) Sebatian Q bertindak balas dengan sebatian R membentuk sebatian S yang berbau manis.
Compound Q reacts with compound R to form compound S with sweet smell.

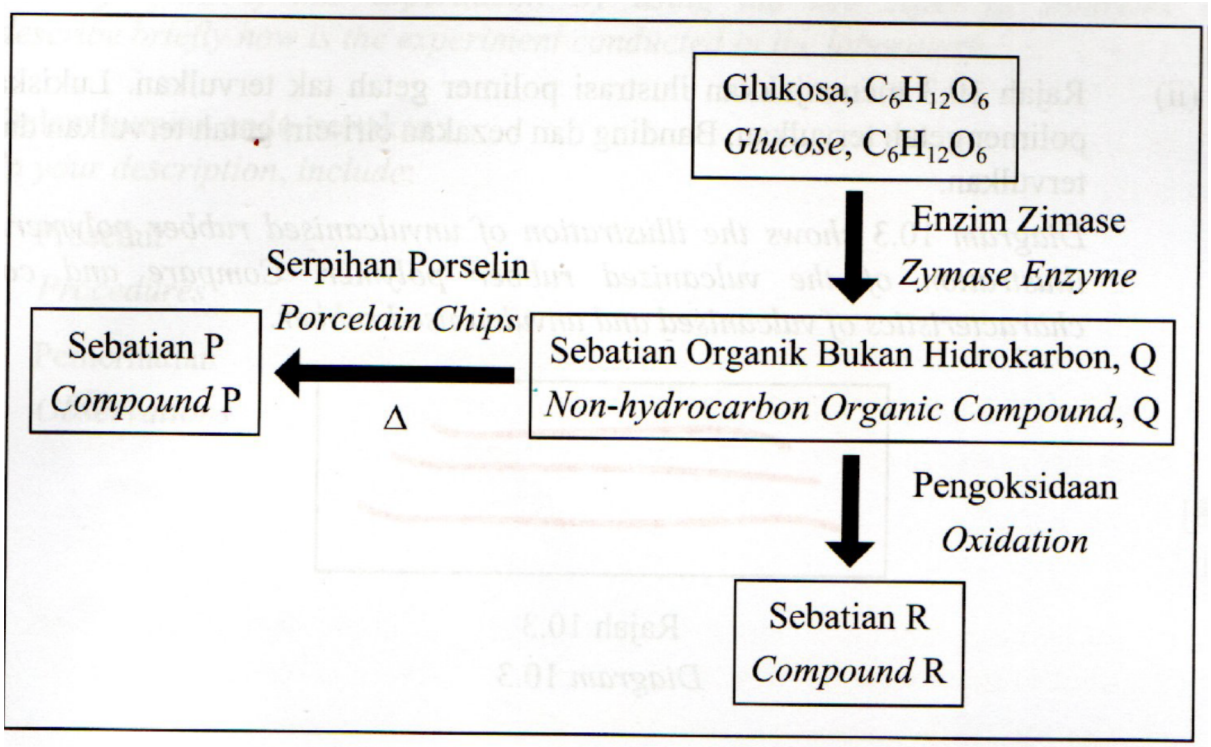
(i) Namakan sebatian R dan huraikan secara ringkas langkah penyediaan sebatian S.
Name compound R and describe briefly the steps ofpreparation of compound S.

[5 markah] [5 marks]

(ii) Lukis formula struktur sebatian S.
Draw the structural formula of compound S.

[1 markah] [1 mark]

[2023-Selangor-Set02-11] (a) Rajah 11.1 menunjukkan penyediaan sebatian organik bukan hidrokarbon, Q dan dua jenis tindak balas bagi penukaran sebatian Q kepada dua sebatian organik yang berlainan.
Diagram 11.1 shows the preparation of non-hydrocarbon organic compound, Q and two types of reactions for the changes of compound Q to two different organic compounds.



Berdasarkan Rajah 11.1,/ *Based on Diagram 11.1,*

(i) nyatakan maksud sebatian bukan hidrokarbon. Namakan sebatian P, Q dan R. Lukiskan formula struktur bagi sebatian Q. Tuliskan persamaan kimia seimbang bagi pembentukan sebatian R daripada sebatian Q.
state the meaning of non-hydrocarbon compound. Name compounds P, Q and R. Draw the structural formula of compound Q. Write balanced chemical equation for the formation of compound R from compound Q.

[7 markah] [7 marks]

(ii) sebatian Q mempunyai sifat fizik yang membolehkannya sesuai digunakan dalam penghasilan bahan untuk kegunaan dalam kehidupan seharian. Nyatakan dua barangan yang dihasilkan daripada sebatian Q.
the physical properties of compound Q are suitable for the production of materials for everyday use. State two products which are made from compound Q.

[2 markah] [2 marks]

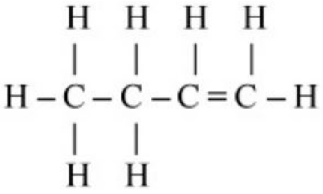
(b) Rajah 11.2 menunjukkan satu poster amaran yang ditampal di sebuah restoran. Pada pendapat anda, adakah amaran itu wajar? Berikan sebab untuk menyokong pendapat anda.
Diagram 11.2 shows one warning poster which is pasted in a restaurant. In your opinion, is this warning reasonable? Give reasons to support your opinion.

Rajah 11.2 / Diagram 11.2

(c) Saintis meramalkan kebanyakan rizab petroleum dalam bumi akan habis dalam masa 100 tahun jika digunakan pada kadar sekarang. Oleh itu, langkah proaktif dan berkesan amat diperlukan untuk menghasilkan sumber alternatif bagi menggantikan petroleum. Sumber tenaga alternatif boleh dihasilkan melalui proses kimia yang bersumberkan biojisim. Cadangkan satu bahan buangan yang boleh diperoleh di persekitaran kita yang dapat diproses sehingga menghasilkan bioetanol. Huraikan secara ringkas langkah penyediaan bioetanol di makmal.
Based on our current rate of usage, scientist predict most of the petroleum reserves on earth will be exhausted within 100 years. Therefore, there is a need for proactive and effective steps to produce alternative resources to replace petroleum. Alternative energy sources can be derived from many chemical processes derived from biomass. Suggest one waste substance found in our surroundings that can be processed to produce bioethanol. Describe briefly the steps of preparation of the bioethanol in laboratory.

[6 markah] [6 marks]

[2023-Perlis-10] Rajah 9.1 menunjukkan formula struktur bagi butena.
Diagram 9.1 shows a structural formula of butene.



Rajah 9.1/ Diagram 9.1

(a) (i) Nyatakan nama siri homolog bagi butena.
Name the homologous series for butene.

[1 markah][1 mark]

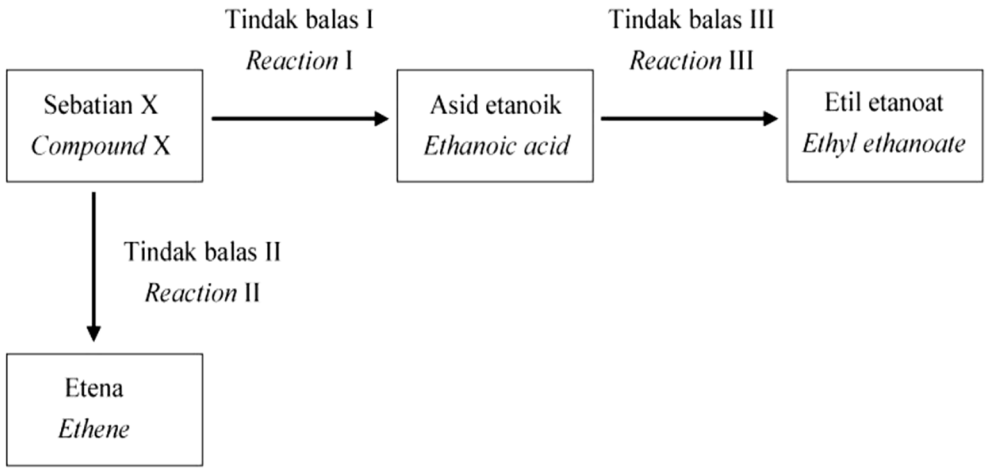
(ii) Apakah yang dimaksudkan dengan isomer?
What is meant by isomers?

[1 markah][1 mark]

(iii) Lukis formula struktur satu lagi isomer bagi butena dan namakan isomernya mengikut penamaan IUPAC.
Draw the structural formula of another isomer of butene and name the isomer according to the IUPAC nomenclature.

[2 markah][2 marks]

(b) Rajah 9.2 menunjukkan penukaran bagi beberapa sebatian organik.
Diagram 9.2 shows the conversions of several organic compounds.



Rajah 9.2 / Diagram 9.2

(i) Nyatakan nama, siri homolog, formula molekul dan kumpulan berfungsi bagi sebatian X.
State the name, homologous series, molecular formula and functional group of compound X.

[4 markah][4 marks]

(ii) Nyatakan nama bagi Tindak balas I, Tindak balas II dan Tindak balas III.
State the name of Reaction I, Reaction II and Reaction III.

[3 markah][3 marks]

(iii) Tulis persamaan kimia bagi Tindak balas I dan Tindak balas II.
Write chemical equations for Reaction I and Reaction II.

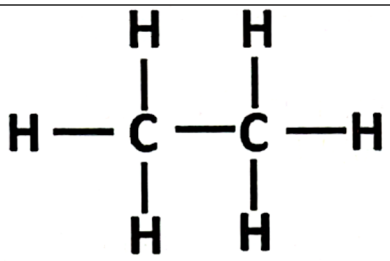
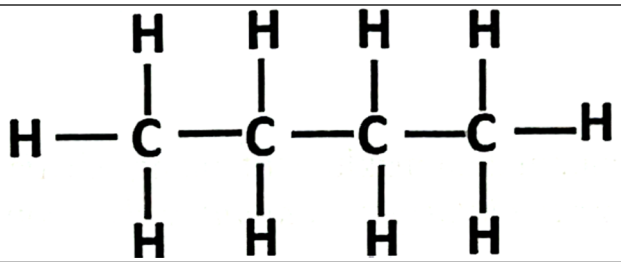
[4 markah][4 marks]

(c) Etena terbakar lengkap dalam oksigen menghasilkan gas karbon dioksida dan air. Tulis persamaan kimia yang seimbang dan hitungkan isipadu gas karbon dioksida yang terhasil apabila 1.12 g etena terbakar lengkap.

[Jisim atom relatif : C = 12, H = 1 dan 1 mol bagi sebarang gas menempati 24 dm^3 mol^{-1} pada keadaan bilik]
Ethene burns completely in oxygen producing carbon dioxide gas and water. Write a balanced chemical equation and calculate the volume of carbon dioxide gas produced when 1.12 g of ethene burns completely.
[Relative atomic masses : C = 12, H = 1 and 1 mole of any gas occupies 24 dm^3 mol^{-1} at room conditions]

[5 markah][5 marks]

[2023-NegeriSembilan-10] (a) Rajah 9 menunjukkan formula struktur bagi hidrokarbon P dan Q.
Diagram 9 shows the structural formulae of hydrocarbon P and Q.

	
Hidrokarbon P / *Hydrocarbon P*	Hidrokarbon Q/ Hydrocarbon Q

Rajah 9/ Diagram 9

(i) Tuliskan formula molekul hidrokarbon P dan Q. Nyatakan siri homolog dan formula am bagi kedua-dua hidrokarbon.
Write the molecular formulae for hydrocarbon P and Q. State the homologous series and general formula for both hydrocarbons.

[4 markah / 4 marks]

(ii) Hidrokarbon Q mempunyai satu isomer yang lain. Lukis formula struktur dan namakan isomer tersebut.
Hydrocarbon Q has another isomer. Draw the structural formula and name the isomer.

[2 markah / 2 marks]

(iii) Gas P dialirkan ke dalam air klorin dan diletakkan dalam satu almari bertutup. Selepas 2 jam, wama air klorin didapati tidak berubah. Jelaskan pemerhatian tersebut.
Gas P is channelled into chlorine water and put into a closed cupboard. After 2 hours, it was found that the colour of chlorine water remains unchanged. Explain the observation.

[2 markah / 2 marks]

(iv) 2.9 g gas Q terbakar lengkap dalam gas oksigen menghasilkan karbon dioksida dan air. Tuliskan persamaan kimia yang seimbang dan hitungkan isi padu maksimum gas karbon dioksida yang terbebas pada keadaan bilik.
[Jisim atom relatif: H = 1, C = 12; 1 mol gas menempati 24 dm_3 pada keadaan bilik]

2.9 g gas Q burns completely in oxygen gas to produce carbon dioxide and water. Write a balanced chemical equation and calculate the maximum volume of carbon dioxide gas released at room conditions.
[Relative atomic mass: H = 1, C = 12; 1 mol of gas occupies 24 dm_3 at room conditions]

[6 markah / 6 marks]

(b) Jadual 5 menunjukkan maklumat tentang sebatian karbon W dan X.
Table 5 shows the information about carbon compound W and X.

Sebatian karbon W *Carbon compound W*	Sebatian karbon X *Carbon compound X*
• Mempunyai 2 atom karbon *Has 2 carbon atoms* • Mengandungi Kumpulan hidroksil, -OH *Contains hydroxyl, -OH group*	• Mempunyai 3 atom karbon *Has 3 carbon atoms* • Mengandungi Kumpulan karboksil, -COOH *Contains carboxyl, -COOH group*

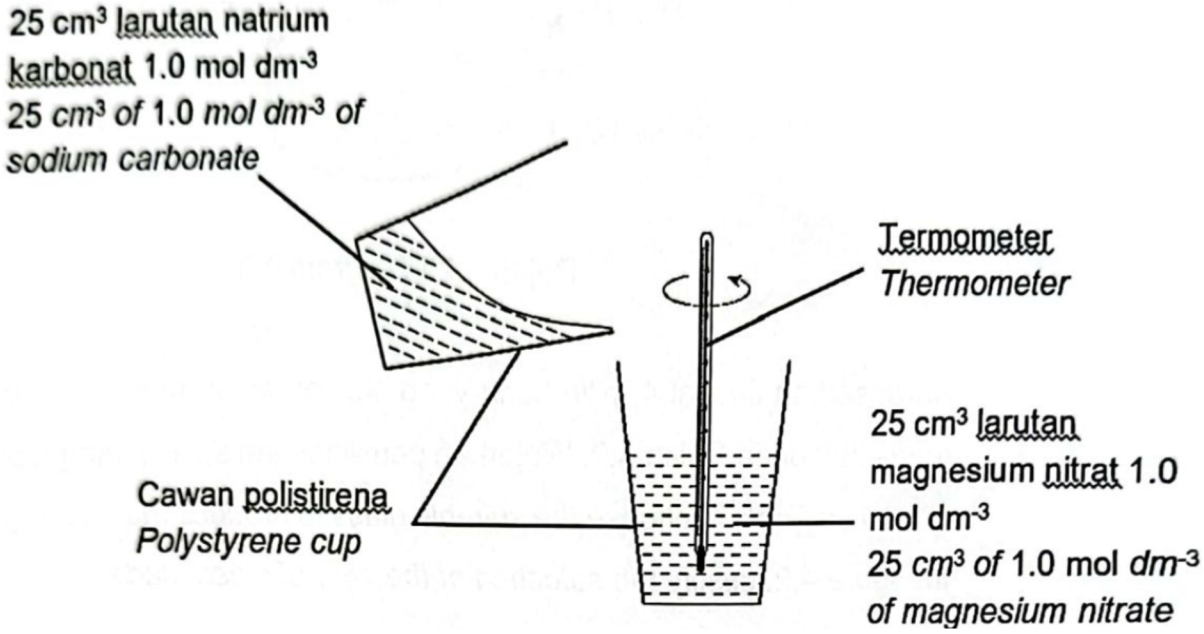
Jadual 5 / *Table 5*

Namakan sebatian karbon W dan X. Huraikan satu ujian kimia untuk membezakan sebatian karbon W dan X.
Name carbon compounds and X. Describe a chemical test to differentiate carbon compound W and X.

[6 markah / 6 marks]

Bab 3 Termokimia

[2023-Kedah-05] Rajah 5 menunjukkan susunan radas untuk menentukan haba pemendakan bagi magnesiurn karbonat, $MgCO_3$.
Diagram 5 shows the apparatus set-up to determine the heat of precipitation for magnesium carbonate, $MgCO_3$.



Rajah 5 / Diagram 5

Keputusan yang diperoleh daripada eksperimen itu direkod dalam Jadual 5,
Result obtained from the experiment is recorded in Table 5.

Penerangan *Description*	Suhu (°C) *Temperature (°C)*
Suhu awal larutan natrium karbonat 1.0 mol dm^{-3} *Initial temperature of 1.0 mol dm^{-3} of sodium carbonate solution*	29.0
Suhu awal larutan magnesium nitrat 1.0 mol dm^{-3} *Initial temperature of 1.0 mol dm^{-3} of magnesium nitrate solution*	28.0
Suhu terendah campuran *Lowest temperature of the mixture*	25.0

Jadual 5 / Table 5

Berdasarkan eksperimen ini,/ *Based on this experiment,*

(a) (i) Nyatakan maksud haba pemendakan.
State the meaning of heat of precipitation.

.....

..... [1M]

(ii) Nyatakan jenis tindak balas tersebut./ *State the type of the reaction.*

..... [1M]

(iii) Tuliskan persamaan ion bagi tindak balas pemendakan yang berlaku.
Write the ionic equation for tho procipitato roactlon occurs.

..... [1M]

(b) Hitung perubahan haba pemendakan dalam tindak balas itu,
[Muatan haba tentu bagi larutan, c = 4.2 J g^{-1} $°C^{-1}$;
Ketumpatan larutan = 1 g cm^{-3})
Calculate the heat of precipitation in the reaction
[Specific heat capacity of solution, c = 4.2 J g^{-1} $°C^{-1}$;
Density of solution = 1 g cm^{-3}]

[3M]

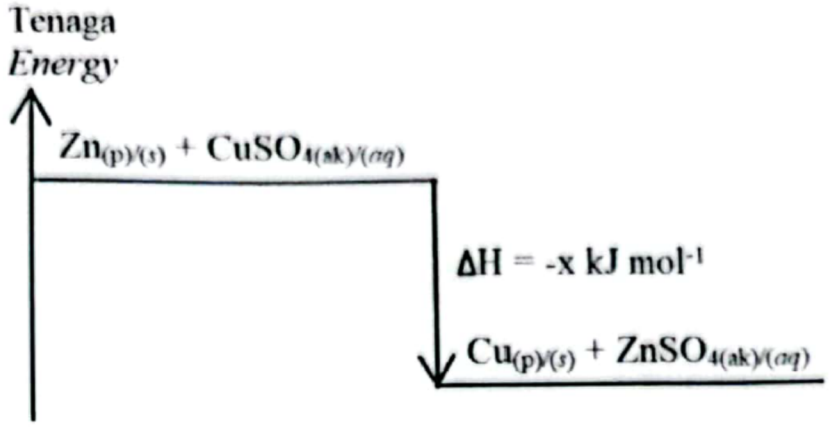
(c) Eksperimen diulang bagi menggantikan 25 cm^3 larutan natrium karbonat 1.0 mol dm^{-3} dengan 25 cm^3 larutan kalium karbonat 1.0 mol dm^{-3}. Ramalkan haba pemendakan yang akan diperoleh. Jelaskan jawapan anda.
The experiment is repeated by replacing 25 cm^3 1.0 mol dm^{-3} of sodium carbonate solution with 25 cm^3 of 1.0 mol dm^{-3} of potassium carbonate solution. Predict the heat of precipitation obtained. Explain your answer.

.....

.....

..... [2M]

[2023-SBP-04] Seorang murid menjalankan satu eksperimen bagi menentukan nilai x bagi tindak balas antara 50 cm^3 larutan kuprum(II) sulfat 0.2 mol dm^3 dengan serbuk zink. Rajah 4 menunjukkan gambar rajah aras tenaga bagi tindak balas itu
A student carried out an experiment to determine the value of x for the reaction 50 cm^3 of 0.2 mol dm^3 copper(II) sulphate solution with zinc powder. Diagram 4 shows the energy level diagram for the reaction.



Rajah/ Diagram 4

(a) Apakah yang diwakili oleh simbol ΔH?
What is represented by the symbol of ΔH?

..... [1M]

(b) Berdasarkan Rajah 4, nyatakan jenis tindak balas yang berlaku.
Based on Diagram 4, state the type of reaction occur.

..... [1M]

(c) Jadual 4 menunjukkan keputusan bagi eksperimen yang dijalankan itu.
Table 4 shows the result of the experiment that was carried out.

Penerangan *Descriptions*	Suhu (°C) *Temperature (°C)*
Suhu awal larutan kuprum(II) sulfat *Initial temperature of copper(II) sulphate solution*	28.0
Suhu tertinggi campuran *The highest temperature of the mixture*	38.0

Jadual/ Table 4

(i) Hitungkan perubahan haba bagi tindak balas itu.
Calculate the heat change for the reaction.
[Muatan haba tentu larutan, c = 4.2 J g^{-1} $°C^{-1}$;
Ketumpatan larutan = 1 g cm^{-3}]
[Specific heat capacity of solution, c = 4.2 J g^{-1} $°C^{-1}$;
Density of solution = 1 g cm^{-3}]

[1M]

(ii) Hitungkan nilai x./ *Determine the value of x.*

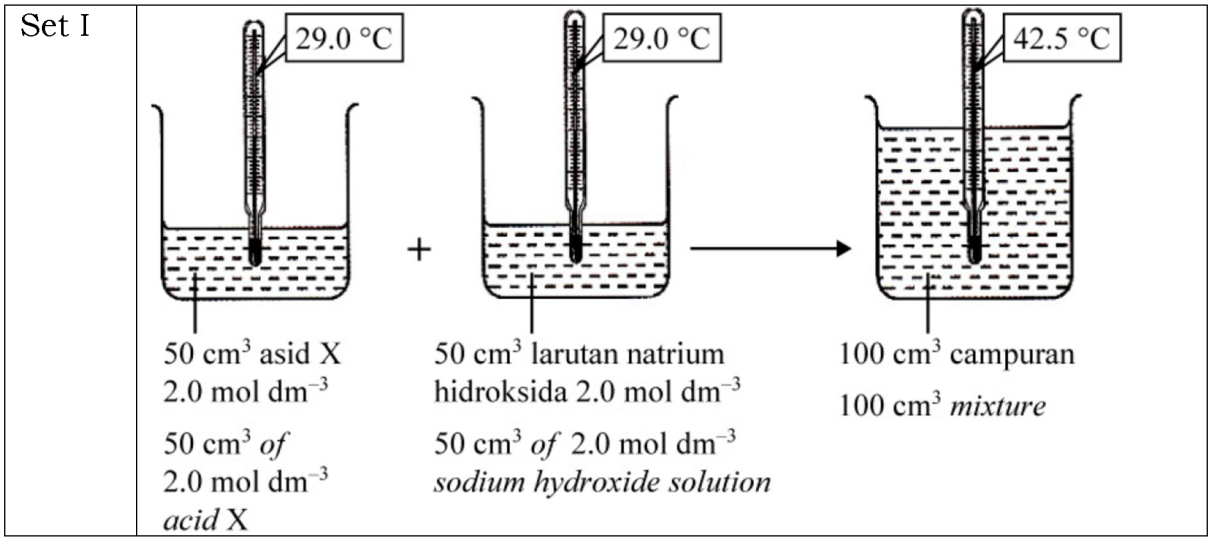
[2M]

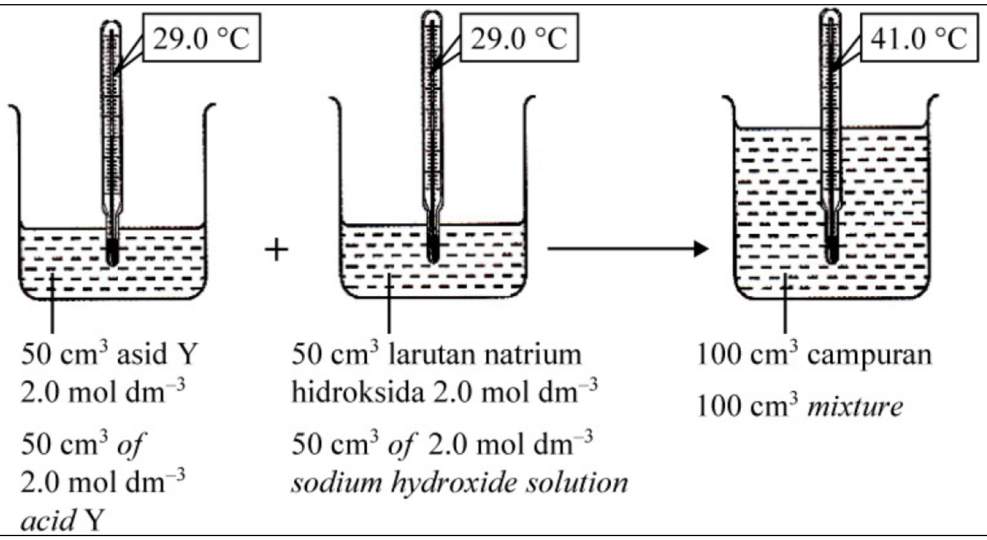
(iii) Ramalkan nilai x jika isi padu larutan kuprum(II) sulfat bertambah kepada 100 cm^3 manakala bahan dan kuantiti yang lain dikekalkan. Berikan sebab.
Predict the value of x if the volume of copper(II) sulphate solution increases to 100 cm^3 while other materials and quantity are remained. Give reason.

.....

..... [2M]

[2023-Selangor-Set01-06] Rajah 6 menunjukkan susunan radas dan suhu yang direkodkan untuk menentukan haba peneutralan menggunakan dua jenis asid, asid X dan asid Y dengan larutan natrium hidroksida.
Diagram 6 shows the apparatus set-up and the temperature recorded to determine the heat of neutralisation using two types of acid, acid X and acid Y with sodium hydroxide solution.



Set II	

Rajah 6/ *Diagram 6*

(a) Apakah maksud haba peneutralan?
What is the meaning of heat of neutralisation?

.....

..... [1M]

(b) Tulis persamaan ion bagi tindak balas yang berlaku dalam eksperimen ini.
Write the ionic equation for the reaction in this experiment.

..... [1M]

(c) Hitung haba peneutralan bagi tindak balas dalam Set I.
[Diberi muatan haba tentu bagi larutan ialah c = 4.2 J g^{-1} $°C^{-1}$, ketumpatan larutan = 1 g cm^{-3}]
Calculate the heal of neutralisation of reaction in Set 1.
[Given the specific heat capacity of solution is c = 4.2 J g^{-1} $°C^{-1}$, density of solution = 1 g cm^{-3}]

[3M]

(d) Bandingkan perubahan suhu antara Set I dan Set II. Terangkan jawapan anda.
Compare the changes of temperature between Set 1 and Set II. Explain your answer.

.....

.....

.....

..... [3M]

(e) Daniel ingin meningkatkan suhu bagi tindak balas dalam Set I sebanyak dua kali ganda. Apakah yang beliau boleh lakukan?
Daniel wants to double the temperature of reaction in Set 1. What can he do?

..... [1M]

[2023-MRSM-07] Persamaan termokimia di bawah mewakili dua tindak balas peneutralan.
Thermochemical equations below represent two neutralization reactions.

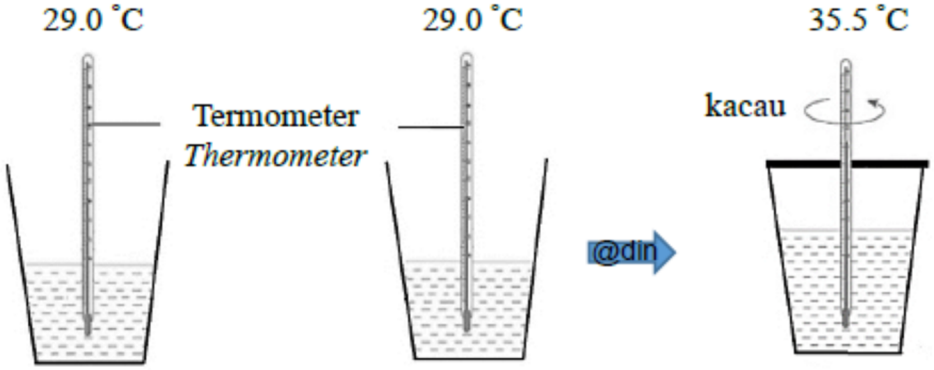
Set I : $KOH + HCl \rightarrow KCl + H_2O$; $\Delta H = -Y$ kJ mol^{-1}

Set II : $KOH + CH_3COOH \rightarrow CH_3COOK + H_2O$; $\Delta H = -50.0$ kJ mol^{-1}

(a) Berdasarkan set I dan set II, nyatakan jenis tindak balas.
Based on set I and set II, state the type of reaction.

..... [1M]

(b) Rajah 5 menunjukkan susunan radas untuk menentukan haba peneutralan bagi Set I.
Diagram 5 shows an apparatus set-up to study the heat of neutralisation for Set I.



Rajah 5/ Diagram 5

(i) Hitung haba peneutralan bagi tindak balas ini.
[Diberi muatan haba tentu larutan, C = 4.2 J g^{-1} $°C^{-1}$,
ketumpatan larutan ialah 1.0 g cm^{-3}]
Calculate the heat of neutralisation of the reaction.
[Given specific heat capacity of solution, C = 4.2 J g^{-1} $°C^{-1}$,
density of solution is 1.0 g cm^{-3}]

[4M]

(ii) Lukis gambar rajah aras tenaga bagi tindak balas ini.
Draw the energy level diagram for this reaction

[2 markah]

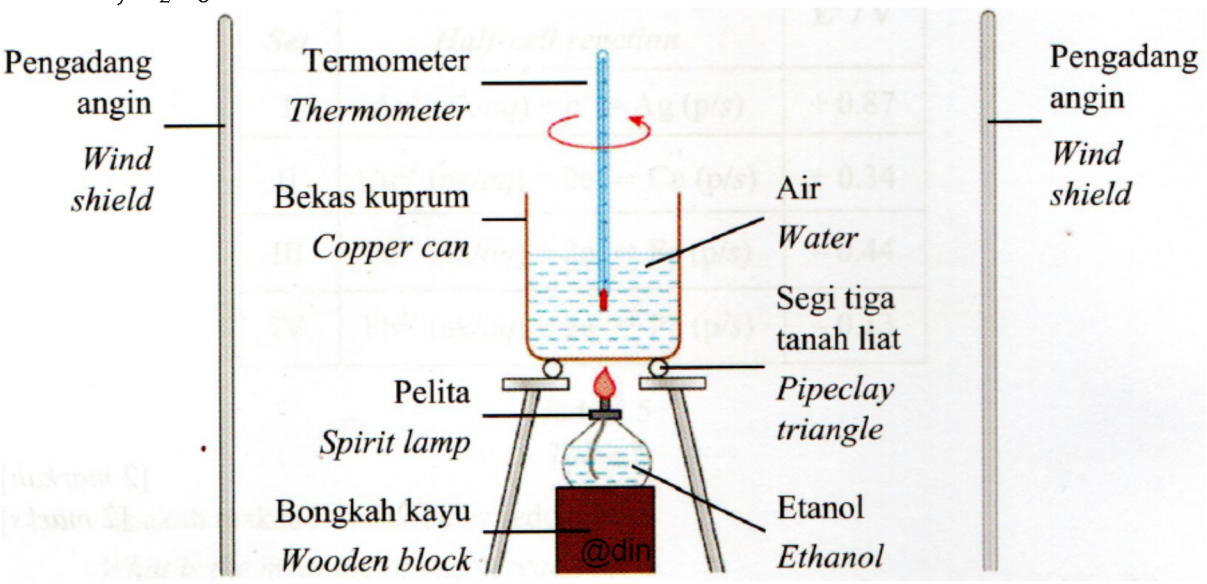
(iii) Bandingkan nilai haba peneutralan bagi Set I dan Set II.
Jelaskan mengapa.
Compare the value of heat of neutralisation for Set I and Set II. Explain why.

.....

.....

..... [3M]

[2023-Selangor-Set02-06] Rajah 6 menunjukkan susunan radas untuk menentukan haba pembakaran etanol, C_2H_5OH.
Diagram 6 shows the apparatus set-up to determine the heat of combustion of ethanol, C_2H_5OH.



(a) Mengapakah bekas kuprum digunakan dalam eksperimen ini?
Why is a copper can used in this experiment?

..... [1M]

(b) Pernyataan berikut adalah mengenai haba pembakaran etanol, C_2H_5OH.
The following statement is about the heat of combustion of ethanol, C_2H_5OH.

> **1 376 kJ haba dibebaskan apabila satu mol etanol, C_2H_5OH dibakar dengan lengkap dalam oksigen, O_2 berlebihan.**
> ***1 376 kJ heat is released when one mole of ethanol, C_2H_5OH is completely burnt in excess oxygen, O_2.***

(i) Tulis persamaan termokimia bagi pemyataan di atas.
Write the thermochemical equation for the statement above.

..... [2M]

(ii) Hitungkan jisim etanol, C_2H_5OH yang diperlukan untuk membakar dengan lengkap dalam oksigen, O_2 berlebihan supaya dapat menaikkan suhu 1 170 cm^3 air, H_2O sebanyak 56 °C. Andaikan tiada haba yang hilang ke persekitaran.
[Muatan haba tentu air, c = 4.2 J g^{-1} $°C^{-1}$; Ketumpatan air = 1 g cm^{-3}; Jisim molar etanol = 46 g mol^{-1}]
Calculate the mass of ethanol, C_2H_5OH needed to burn completely in excess oxygen, O_2 in order to raise the temperature of 1 170 cm^3 of water, H_2O by 56°C. Assume that no heat is lost to the surroundings.
[Specific heat capacity of solution, c = 4.2 J g^{-1} $°C^{-1}$; Density of solution = 1 g cm3; Molar mass of ethanol = 46 g mol^{-1}]

[3M]

(c) Bahan api ialah sebatian yang terbakar dalam udara untuk menghasilkan tenaga haba. Setiap bahan api mempunyai haba pembakaran yang-berlainan.
Fuels are substances that burn in the air to produce heat energy. Each fuel has different heat of combustion.

(i) Apakah yang dimaksudkan dengan nilai bahan api?
What is the meaning of the fuel value?

..... [1M]

(ii) Nilai bahan api metana ialah 27 kJ g^{-1} manakala nilai bahan api oktana ialah 48.2 kJ g^{-1}. Bahan api manakah yang akan anda pilih untuk memasak? Wajarkan jawapan anda.
Fuel value of methane is 27 kJ g^{-1} whereas fuel value of octane is 48.2 kJ g^{-1}. Which fuel would you choose to cook? Justify your answer.

.....

.....

..... [2M]

[2023-JUJ-Set01-08] Rajah 8 menunjukkan persamaan termokimia bagi tindak balas haba peneutralan.
Diagram 8 shows the thermochemical equation for the heat of neutralisation.

$HCl(ak) + NaOH(ak) \rightarrow NaCl(ak) + H_2O(ce)$; $\Delta H = -57$ kJ mol^{-1}
$HCl(aq) + NaOH(aq) \rightarrow NaCl(aq) + H_2O(l)$; $\Delta H = -57$ kJ mol^{-1}

Rajah 8/ *Diagram* 8

(a) Apakah yang dimaksudkan dengan haba peneutralan?
What is meant by heat of neutralisation?

.....

..... [1M]

(b) Nyatakan jenis tindak balas bagi proses peneutralan.
State the type of reaction for the neutralisation process.

..... [1M]

(c) Nazmi menjalankan eksperimen menentukan haba peneutralan di dalam makmal. Dia menggunakan 50 cm^3 asid hidroklorik, HCl 2.0 mol dm^{-3} dan 50 cm^3 larutan natrium hidroksida, NaOH 2.0 mol dm^{-3}. Hitungkan haba yang dibebaskan.
Nazmi conducted an experiment to determine the heat of neutralisation in the laboratory. He uses 50 cm^3 of hydrochloric acid, HCl 2.0 mol dm^{-3} and 50 cm^3 of sodium hydroxide solution, NaOH 2.0 mol dm^{-3}. Calculate the heat released.

[2M]

(d) Jika eksperimen diulangi dengan menggunakan 50 cm^3 larutan asid sulfurik 2.0 mol dm^{-3} bagi menggantikan larutan asid hidroklorik, ramalkan nilai haba yang dibebaskan dalam eksperimen ini. Terangkan jawapan anda.
If the experiment is repeated by using 50 cm^3 of sulphuric acid solution 2.0 mol dm^{-3} to replace the hydrochloric acid solution, predict the value of the heat released in this experiment. Explain your answer.

.....

.....

.....

..... [3M]

(e) Nazmi dibekalkan dengan dua jenis asid, iaitu asid P dan asid Q, larutan natrium hidroksida, dua cawan polistirena dan dua termometer. Berdasarkan pengetahuan anda dalam termokimia, bagaimana anda dapat membantu Nazmi mengenalpasti yang manakah di antara asid P dan asid Q merupakan asid kuat dan asid lemah di dalam makmal?
Nazmi is supplied with two types of acid, which are acid P and acid Q, sodium hydroxide solution, two polystyrene cups and two thermometers. Based on your knowledge in thermochemistry, how can you help Nazmi identify which of acid P and acid Q is a strong acid and weak acid in the laboratory?

.....

.....

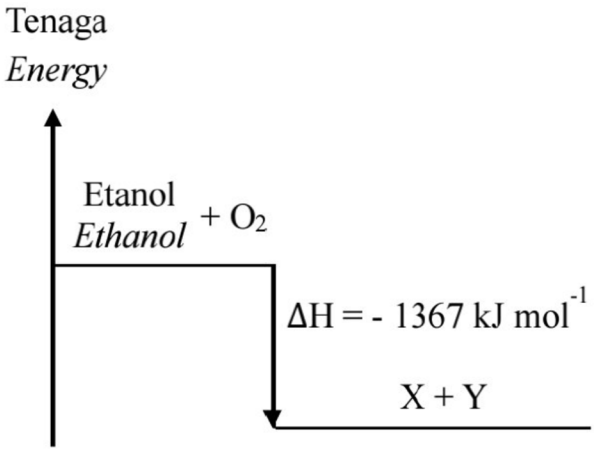
.....

.....

.....

..... [3M]

[2023-Melaka-06] Rajah 4 menunjukkan gambar rajah aras tenaga apabila etanol bertindak balas dengan oksigen berlebihan.
Diagram 4 shows the energy level diagram when ethanol reacts with excess oxygen.



(a) Tuliskan formula kimia bagi etanol.
Write the chemical formula for ethanol.

..... [1M]

Berdasarkan Rajah 4,/ *Based on Diagram 4,*

(b) nyatakan jenis tindak balas dari segi perubahan tenaga.
state the type of reaction in terms of heat change.

..... [1M]

(c) (i) kenal pasti X dan Y./ *Identify X and Y.*

X : .....

Y : ..... [2M]

(ii) tuliskan persamaan kimia bagi tindak balas itu.
write a chemical equation for the reaction.

..... [2M]

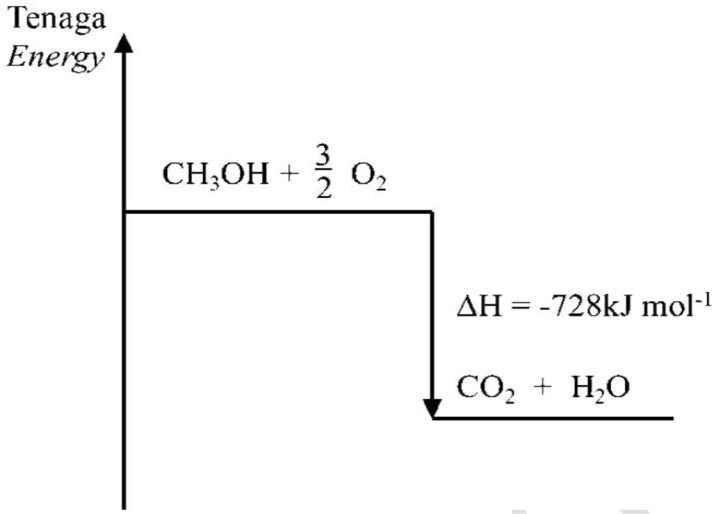
(d) bandingkan jumlah kandungan tenaga bahan tindak balas dengan jumlah kandungan tenaga hasil tindak balas.
Compare the total energy content of the reactants with the total energy content of the products.

..... [1M]

(e) 4.6 g etanol telah bertindak balas lengkap dalam oksigen berlebihan. Hitungkan haba yang dibebaskan dalam eksperimen ini.
[Jisim atom relatif: H=l, C=12, 0=16]
4.6 g of ethanol reacted completely in excess oxygen.
Calculate the heat released in this experiment
[Relative atomic mass : H=l, C=12, 0=16]

[2M]

[2023-JUJ-Set02-07] Satu ekperimen telah dijalankan untuk mengkaji haba pembakaran metanol, CH_3OH.
Rajah 7 menunjukkan gambar rajah aras tenaga bagi pembakaran metanol tersebut.
An experiment was conducted to study the heat of combustion of methanol, CH_3OH.
Diagram 7 shows the energy level diagram for the combustion of methanol.



Rajah 7 / Diagram 7

(a) Nyatakan jenis tindak balas bagi pembakaran metanol, CH_3OH.
State the type of reaction for the combustion of methanol, CH_3OH.

..... [1M]

(b) Dalam ekperimen ini, tenaga haba yang terbebas daripada pembakaran lengkap 2.56 g metanol digunakan untuk memanaskan 500 cm^3 air.
[Jisim atom relatif: H = 1, C = 12, O = 16; Muatan haba tentu air, c = 4.2 J g^{-1} $°C^{-1}$; Ketumpatan air = 1.0 g cm^{-3}]
In this experiment, heat energy released from the complete combustion of 2.56 g of methanol is used to heat 500 cm^3 of water.
[Relative atomic mass: H = 1, C = 12, O = 16; Specific heat capacity of water, c = 4.2 J g^{-1} $°C^{-1}$; Density of water = 1.0 g cm^{-3}]

Hitungkan,/ *Calculate,*

(i) haba yang dibebaskan dalam eksperimen ini.
the heat released in this experiment.

[2M]

(ii) perubahan suhu dalam tindak balas ini.
the temperature change in this reaction.

[1M]

(c) Eksperimen ini diulang dengan menggantikan metanol dengan etanol. Haba pembakaran yang diperoleh adalah -1376 kJ mol^{-1}. Banding dan terangkan mengapa terdapat perbezaan haba pembakaran antara metanol dan etanol.
The experiment is repeated by replacing methanol with ethanol. The heat of combustion obtained is -1376 kJ mol^{-1}. Compare and explain why there is a difference in the heat of combustion between methanol and ethanol.

.....

.....

..... [3M]

(d) Jadual 7 menunjukkan nilai bahan api bagi beberapa jenis bahan api.
Table 7 shows the fuel values of a few type of fuels.

Bahan api *Fuel*	Nilai bahan api (kJ g^{-1}) *Fuel value (kJ g^{-1})*
Metana/ *Methane*	30
Kerosin/ *Kerosene*	37
Gas Asli/ *Natural gas*	50
Hidrogen/ *Hydrogen*	143

Jadual 7 / Table 7

(i) Apakah maksud nilai bahan api?/ *What is the meaning of fuel value?*

..... [1M]

(ii) Berdasarkan Jadual 7, pilih satu bahan api yang sesuai untuk memasak. Wajarkan jawapan anda.
Based on Table 7, choose one fuel that is suitable for cooking.
Justify your answer.

.....

.....

..... [2M]

[2023-NegeriSembilan-08] Jadual 4 menunjukkan haba pembakaran beberapa bahan api.
Table 4 shows the heat of combustion of some fuels.

Bahan api *Fuel*	Haba pembakaran (kJ mol^{-1}) *Heat of combustion (kJ mol^{-1})*
Metana/ *Methane*	-890
Propana/ *Propane*	-2230
Etanol/ *Ethanol*	-1376
Propanol/ *Propanol*	-2016

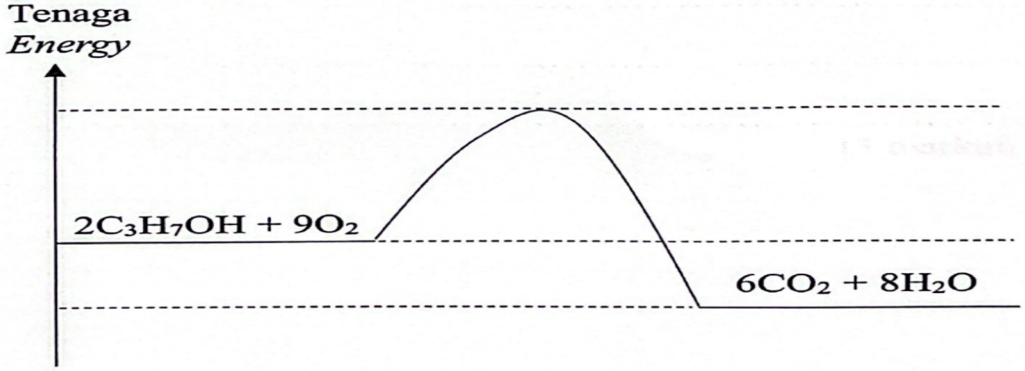
Jadual 4/ Table 4

(a) Pembakaran bahan api adalah tindak balas eksotermik. Apakah yang dimaksudkan dengan tindak balas eksotermik?
The combustion of fuel is an exothermic reaction. What is meant by exothermic reaction?

.....

..... [1M]

(b) Rajah 7 menunjukkan profil tenaga bagi pembakaran propanol.
Diagram 7 shows the energy profile for the combustion of propanol.



Tandakan ΔH bagi tindak balas tersebut dalam Rajah 7.
Mark ΔH for the reaction in Diagram 7.

(c) (i) Bandingkan haba pembakaran metana dan propana.
Compare the heat of combustion of methane and propane.

..... [1M]

(ii) Terangkan jawapan anda di 8(c)(i)./ *Explain your answer in 8(c)(i).*

.....

.....

..... [2M]

(d) Hitungkan nilai bahan api bagi etanol.
Calculate the fuel value of ethanol.
[Jisim atom relative/ Relative atomic mass: H=1,C=12, 0=16]

[2M]

(e) Semasa perlawanan bo la sepak, seorang pemain mendapati lututnya bengkak selepas berlanggar dengan pemain lawan. Untuk melegakan kesakitan, lututnya perlu diletakkan sesuatu yang sejuk. Dengan menggunakan pengetahuan kimia, pilih bahan-bahan yang betul untuk melegakan kesakitan pemain itu:
During a football game, a player found that his knee was swollen after being hit by the opponent. To relieve the pain, his knee should be put with something cold. By using chemistry knowledge, choose the correct materials to relieve the player's pain:

- Beg plastic/ *Plastic bag*
- Air/ *Water*
- Serbuk natrium hidroksida/ *Sodium hydroxide powder*
- Serbuk ammonium nitrat/ *Ammonium nitrate powder*

Huraikan bagaimana kesakitan pemain itu dapat dilegakan.
Describe how the player's pain can be relieved.

.....

.....

.....

.....

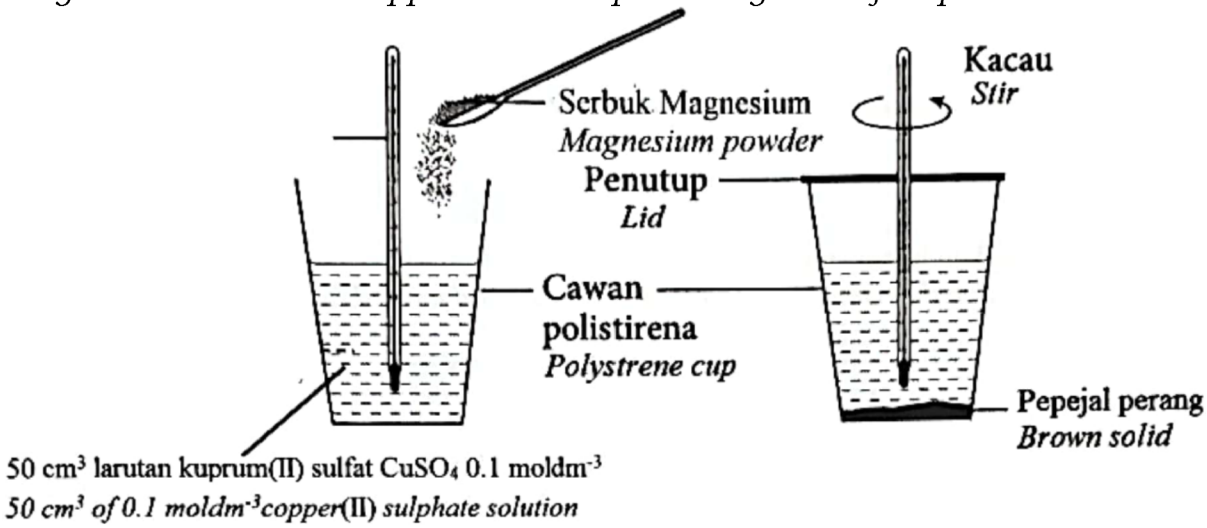
.....

.....

.....

..... [3M]

[2023 Johor Bahru-07] 7. Rajah 7.1 menunjukkan susunan radas untuk mengkaji haba penyesaran.
Diagram 7.1 shows the apparatus set-up to study heat of displacement.



Rajah 7.1 / Diagram 1.1

Berdasarkan Rajah 7.1,/ *Based on Diagram 7.1,*

(a) apakah maksud haba penyesaran?
what is the meaning of heat of displacement?

..... [1M]

(b) namakan pepejal perang yang terbentuk.
name the brown solid formed.

..... [1M]

(c) Jadual 7 menunjukkan maklumat bagi keputusan eksperimen yang telah direkodkan.
Table 7 shows the information for the recorded results of the experiment

Suhu awal larutan kuprum(II) sulfat
Initial temperature of copper(II) sulphate = 28°C

Suhu tertinggi larutan campuran
Highest temperature of the mixture solution = 50°C

Jadual 7/ Table 7

(i) Hitungkan bilangan mol pepejal perang yang terhasil.
Calculate the number of mole of the brown solidformed.

[1M]

(ii) Tentukan haba penyesaran bagi tindak balas ini.
Determine the heat of displacement for this reaction.
[Muatan haba tentu bagi larutan = 4.2 J g^{-1} $°C^{-1}$, Ketumpatan larutan = 1.0 g cm^{-3}]
[Specific heat capacity of solution = 4.2 J g^{-1} $°C^{-1}$, Density of solution = 1.0 g cm^{-3}]

[2M]

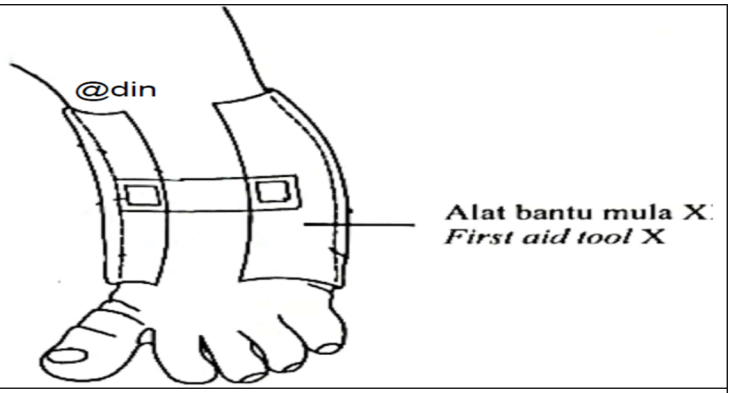
(d) Seorang pelajar telah menggantikan logam magnesium dengan logam X dan didapati haba penyesaran tindak balas tersebut berkurang.
Cadangkan logam X dan terangkan jawapan anda.
A student replaced the magnesium metal with metal X and found that the heat of displacement of the reaction decreases.
Suggest metal X and explain your answer.

.....

.....

.....

..... [3M]

(c) Rajah 7.2 menunjukkan suatu alat bantu mula X yang dibalut pada kaki yang terseliuh. *Diagram 7.2 shows a first aid tool X which is wrapped around sprained foot.*	
	Rajah 7.2/ Diagram 7.2

Pada pendapat anda, adakah bahan tindak balas dalam Rajah 7.1 boleh digunakan dalam alat bantu mula X bagi merawat kecederaan tersebut ? Wajarkan jawapan anda.
In your opinion, can the reactants in Diagram 7.1 used in first aid tool X to treat the injury? Justify your answer.

.....

.....

..... [2M]

Esei/ Essay

[2023-JohorSkudai-09] (a) Jadual 9 menunjukkan keputusan eksperimen bagi menentukan haba pemendakan bagi dua jenis tindak balas yang menggunakan larutan natrium karbonat, Na_2CO_3.
Table 9 shows the experimental results to determine the heat of precipitation for two types of reactions that use sodium carbonate solution, Na_2CO_3.

Set	Tindak balas *Reaction*	Suhu awal larutan *Initial Temperature of solution* (°C)	Perbezaan suhu selepas dicampurkan *Temperature difference after mixing* (°C)
I	100 cm^3 larutan natrium karbonat 0.1 mol dm^{-3} + 100 cm^3 larutan kuprum(II) sulfat 0.1 mol dm^{-3} menghasilkan **pepejal hijau Y** dan larutan natrium sulfat. *100 cm^3 of 0.1 mol dm^{-3} sodium carbonate solution + 100 cm^3 of 0.1 mol dm^{-3} copper(II) sulphate solution produces **green solid Y** and sodium sulfate solution.*	29.0	Berlaku kenaikan suhu sebanyak 4°C *There is a temperature increase of 4°C*
II	100 cm^3 larutan natrium karbonat 0.1 mol dm^{-3} + 100 cm^3 larutan magnesium nitrat 0.1 mol dm^{-3} menghasilkan magnesium karbonat dan **larutan tidak berwarna Z.** *100 cm^3 of 0.1 mol dm^{-3} sodium carbonate solution + 100 cm^3 of 0.1 mol dm^{-3} magnesium nitrate solution produces magnesium carbonate and a **colourless solution Z.***	29.0	Berlaku penurunan suhu sebanyak 3°C *There is a temperature decrease of 3°C*

(i) Apakah yang dimaksudkan dengan haba pemendakan dan warna kuprum(II) sulfat?
What is meant by heat of precipitation and colour of copper(II) sulfate?
[2 markah] [2 marks]

(ii) Cadangkan pepejal hijau Y dan larutan tidak berwarna Z.
Suggest a green solid Y and a colourless solution Z.
[2 markah] [2 marks]

(iii) Hitung haba pemendakan bagi set I dan set II.
Calculate the heat of precipitation for set I and set II.
[Muatan haba tentu larutan, c = 4.2 J g^{-1} $°C^{-1}$; ketumpatan larutan = 1 g cm^{-3}]
[Specific heat capacity of solution, c = 4.2 J g^{-1} $°C^{-1}$; density solution = 1 g cm^{-3}]
[6 markah][6 marks]

(b) Jadual 9.2 menunjukkan maklumat tentang dua jenis asid yang bertindak balas dengan larutan alkali bagi penentuan haba peneutralan di makmal.
Table 9.2 shows information about two types of acids that react with alkaline solutions to determine the heat of neutralization in the laboratory.

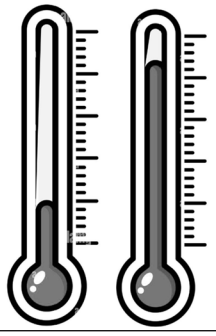
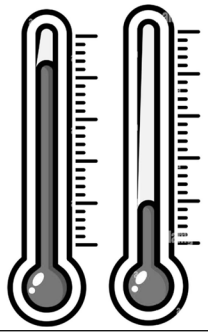
	Asid X *Acid X*	Asid Y *Acid Y*
Formula kimia *Chemical formula*	CH_3COOH	HCl
Haba peneutralan *Heat of neutralization*	ΔH = -57 kJ mol^{-1}	ΔH = -53 kJ mol^{-1}

Jadual 9.2
Table 9.2

(ii) Nyatakan 1 persamaan di antara asid X dan asid Y. Selepas itu terangkan perbezaan haba peneutralan kedua-dua asid tersebut.
State 1 similarty between acid X and acid Y. After that explain the difference in the heat of neutralization of the two acids.

[10 markah][10 marks]

[2023-Putrajaya-11] (a) Jadual 11.1 menunjukkan maklumat bagi eksperimen yang dijalankan untuk menyiasat jenis tindak balas berdasarkan perubahan bacaan termometer apabila bahan dilarutkan dalam air.
Table 11.1 shows the information's for experiment conducted to investigate the type of reactions based on changes in thermometer readings when substances dissolve in water.

Tindak balas ***Reaction***	**A**	**B**
Bahan ***Substance***	Pepejal natrium hidroksida *Solid sodium hydroxide*	Pepejal kalium klorida *Solid potassium chloride*
Perubahan bacaan thermometer ***Changes in thermometer readings***		

Jadual/ Table 11.1

Berdasarkan Jadual 11.1, bandingkan Tindak balas A dengan Tindak balas B dari segi :
Based on Table 11.1, compare Reaction A and Reaction B in terms of :

• Jenis tindak balas/ *Type of reaction*
• Tanda bagi ΔH/ *Sign for ΔH*

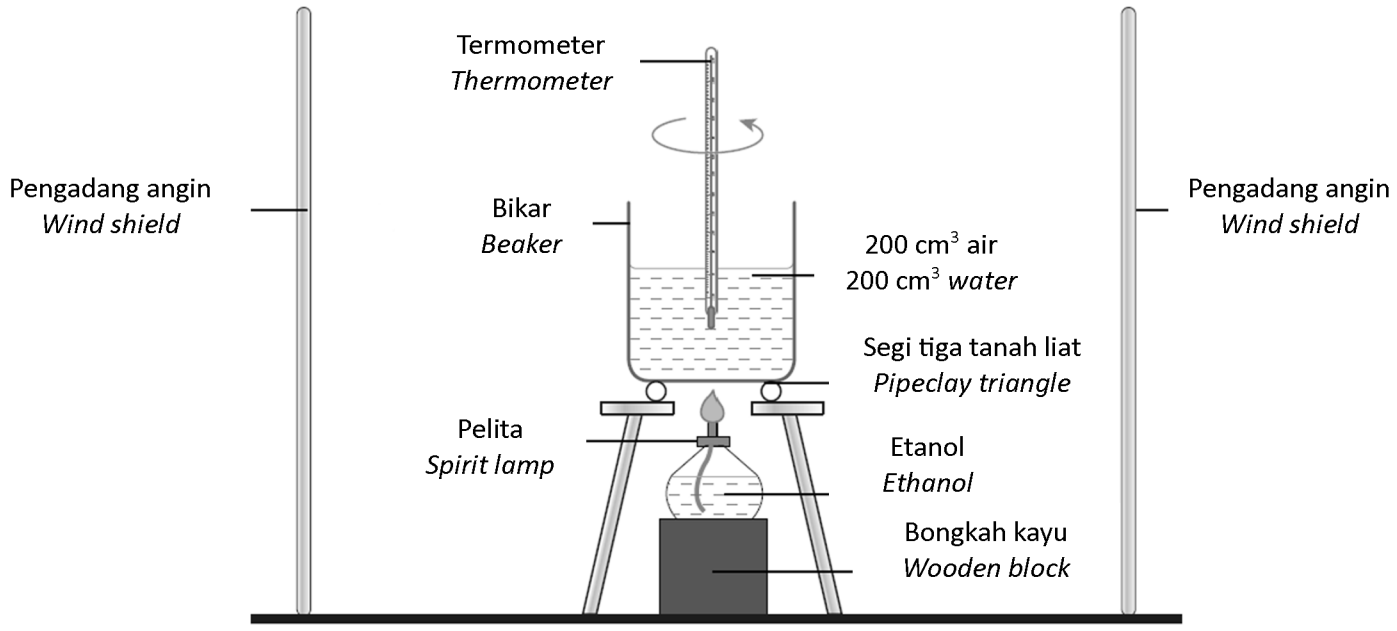
• Perubahan jumlah kandungan tenaga bahan tindak balas dan jumlah kandungan tenaga hasil tindak balas
Change in the total energy content of reactants and the total energy content of products

• Pembentukan dan pemecahan ikatan/ *Formation and breaking bond*

• Contoh lain bagi Tindak balas A dan B
Other example for Reaction A and B

[6 markah/ marks]

(b) Rajah 11.1 menunjukkan susunan radas eksperimen untuk menentukan haba pembakaran bagi etanol di dalam makmal.
Diagram 11.1 shows the apparatus set up for the experiment to determine the heat of combustion of ethanol in laboratory.



(i) Cadangkan satu pengubahsuaian yang boleh dilakukan ke atas susunan radas untuk mendapatkan perubahan suhu yang lebih tepat. Terangkan jawapan anda.
Suggest one modification that can be made to the apparatus set up to obtain more accurate temperature changes. Explain your answer.

[2 markah/ marks]

(ii) Hitung haba pembakaran bagi 1.38 g etanol jika suhu meningkat sebanyak 50 °C.
[Muatan haba tentu air, c = 4.2 J g^{-1} $°C^{-1}$; ketumpatan air = 1 g cm^{-3}; jisim molar etanol = 46 gmol-1]
Calculate the heat of combustion for 1.38 g of ethanol if the temperature increased by 50 °C.
[Specific heat capacity of solution, c = 4.2 J g^{-1} $°C^{-1}$; density of solution = 1 g cm^{-3}; molar mass of ethanol = 46 g mol^{-1}]

[4 markah/ marks]

(c) Jadual 11.2 menunjukkan nilai bahan api bagi beberapa jenis bahan api.
Table 11.2 shows the fuel value of a few types of fuels.

Bahan api ***Fuel***	**Nilai bahan api (kJ g^{-1})** ***Fuel value*** **(kJ g^{-1})**
Metana, CH_4 *Methane*, CH_4	27
Etanol, C_2H_5OH *Ethanol*, C_2H_5OH	30
Butana, C_4H_{10} *Butane*, C_4H_{10}	49

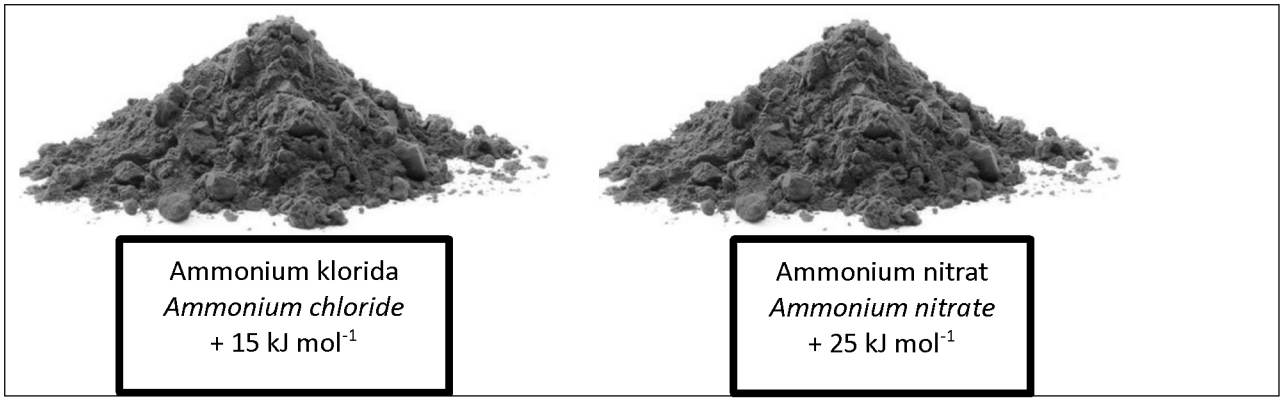
Jadual/ Table 11.2

Manakah bahan api yang terbaik untuk digunakan berdasarkan kesannya terhadap alam sekitar?
Terangkan jawapan anda dan buktikannya menggunakan pengiraan.
[Jisim atom relatif : H = 1, C = 12, O = 16]
Which fuel is the best to be used in terms of its effect on the environment? Explain your answer and prove by using calculations.
[Relative atomic mass : H = 1, C = 12, O = 16]

[5 markah/ marks]

(d) Rajah 11.2 menunjukkan satu pek sejuk yang digunakan dalam kalangan ahli sukan dan dua jenis bahan kimia dengan maklumat haba tindak balas nya.
Diagram 11.2 shows a cold pack used among the sportsman and two types of chemical substances with the information of its heat of reactions.

Pek sejuk
Cold pack

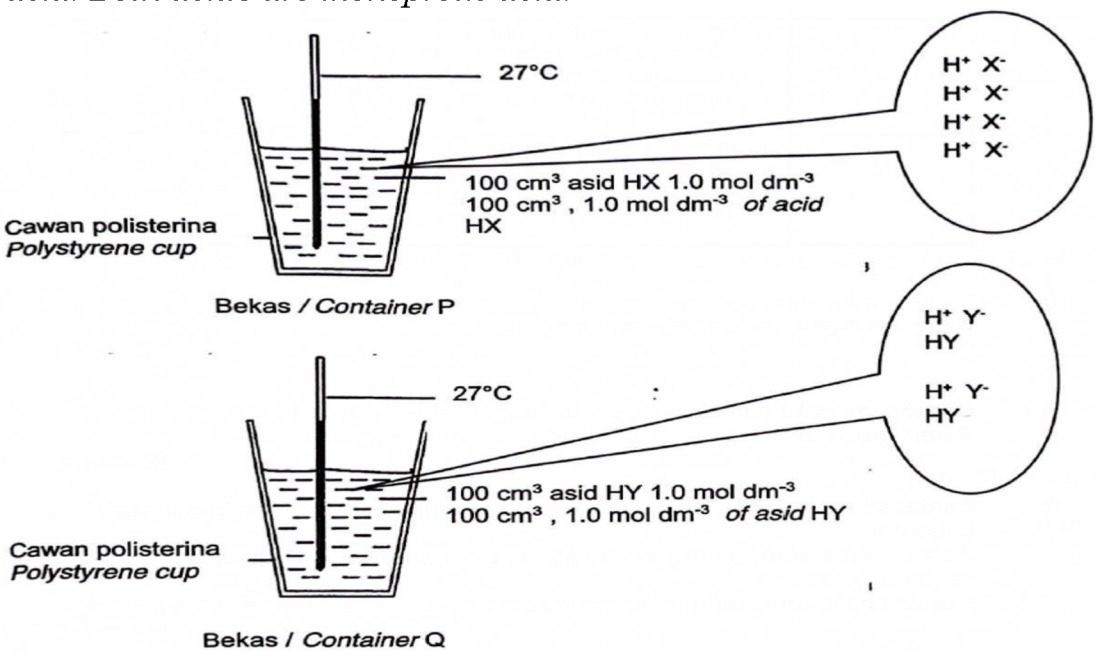


Rajah/ Diagram 11.2

Semasa hari sukan sekolah, seorang murid mengalami kesakitan otot selepas acara larian. Apakah jenis tindak balas bagi pek sejuk? Sebagai pelajar Kimia, bantu murid tersebut untuk memilih bahan kimia terbaik untuk digunakan di dalam pek sejuk tersebut. Berikan satu alasan.
During school sports day, a student experience muscle pain after the running event. What is the type of reaction of cold pack? As a chemistry student, help the student to choose the best chemical substance to be used in the cold pack. Give one reason.

[3 markah/ marks]

[2023-TerengganuMPP3-11] Rajah 11 menunjukkan bekas P dan bekas Q yang mengandungi asid HX dan asid HY. Kedua-dua asid adalah asid monoprotik.
Diagram 11 shows container P and container Q that containing HX acid and HY acid. Both acids are monoprotic acid.



Rajah 11/ Diagram 11

Jadual 11.1 menunjukkan dua tindak balas peneutralan melibatkan tindak balas antara larutan natrium hidroksida dengan asid HX dan tindak balas antara larutan natrium hidroksida dengan asid HY.
Haba peneutralan bagi setiap tindak balas ditunjukkan seperti dalam jadual.
Table 11.1 shows two neutralization reactions involving the reaction between sodium hydroxide solution with HX acid and sodium hydroxide solution with HY acid. Heat of neutralization for each reaction is shown as in the table.

Tindak balas *Reaction*	Bahan tindak balas *Reactants*	Haba peneutralan *Heat of Neutralisation* (kJ mol^{-1})
I	100 cm^3 larutan Natrium hidroksida 1.0 mol dm^{-3} + asid HX *100 cm^3 of sodium hydroxide 1.0 mol dm^{-3} + HX acid*	-57
II	100 cm^3 larutan Natrium hidroksida 1.0 mol dm^{-3} + asid HY *100 cm^3 of sodium hydroxide 1.0 mol dm^{-3} + HY acid*	-55

Jadual/ Table 11.1

(a) Nyatakan maksud haba peneutralan.
State the meaning heat of neutralisation.

[1 mark]

(b) Cadangkan satu contoh yang sesuai bagi asid HX dan asid HY.
Suggest one suitable example for HX acid and HY acid.

[2 marks]

(c) Berdasarkan tindak balas I, hitungkan suhu tertinggi campuran bagi tindak balas itu.
Based on reaction I, calculate the highest temperature of the mixture for the reaction.
[Muatan haba tentu larutan/ specific heat capacity of solution = 4.2 J g^{-1} $°C^{-1}$]

[4 marks]

(d) Bandingkan haba peneutralan antara tindak balas I dan tindak balas II. Terangkan jawapan anda.
Compare heat of neutralisation between reaction I and reaction II.
Explain your answer.

[5 marks]

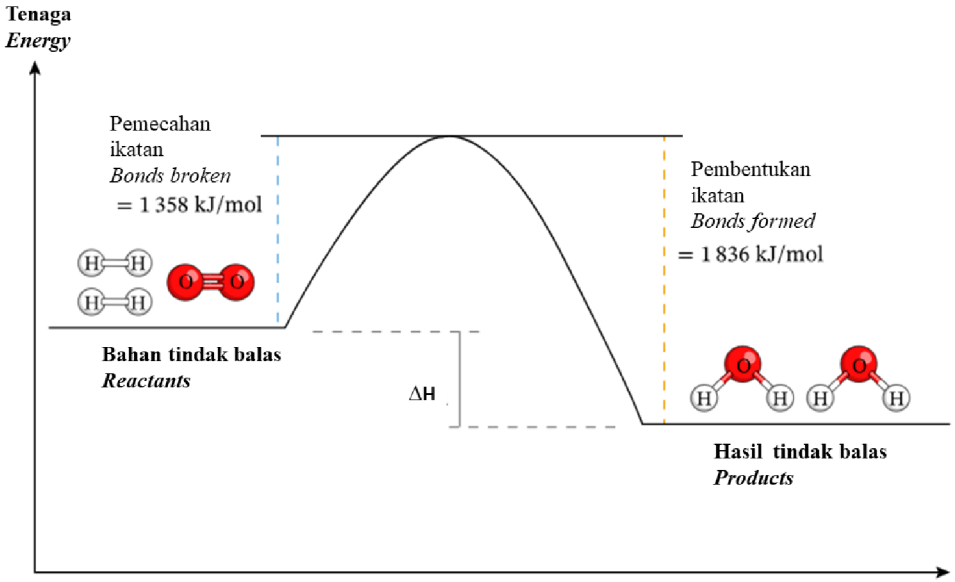
(e) Jadual 11.2 menunjukkan bahan api dan haba pembakaran bagi etanol, C_2H_5OH dan kerosin, $C_{12}H_{26}$
Table 11.2 shows type of fuel and heat of combustion of ethanol, C_2H_5OH and kerosene, $C_{12}H_{26}$.

Bahan api Fuel	Haba Pembakaran Heat of Combustion (kJ mol^{-1})
Etanol Ethanol	1380
Kerosin Kerosene	6290

Jadual/table 11.2

Berdasarkan Jadual 11.2, pilih satu bahan api yang terbaik dari aspek:
• Nilai bahan api
• Kesan terhadap alam sekitar Wajarkan kedua-dua pemilihan anda itu.
[Jisim molar: etanol = 46 g mol^{-1}, kerosin = 170 g mol^{-1}, JAR, C=12, H=1]
Based on Table 11.2, choose one fuel that is the best in terms of.
• *Fuel value*
• *Effects on environment Justify both of your choices.*
[Molar mass: ethanol = 46 g mol^{-1}, kerosene = 170 g mol^{-1}, RAM, C=12, H=1]
[8 marks]

[2023-Perlis-11] Rajah 10.1 menunjukkan profil aras tenaga bagi satu tindak balas.
Diagram 10.1 shows an energy level diagram for a reaction.



Rajah 10.1/ Diagram 10.1

(a) Nyatakan maksud tindak balas eksotermik.
State the meaning of exothermic reaction.
[1 markah][1 mark]

(b) Berdasarkan Rajah 10.1,/ *Based on the Diagram 10.1,*

(i) Nyatakan jenis tindak balas dan terangkan.
State type of reaction and explain.

[2 markah][2 marks]

(ii) Tuliskan persamaan kimia bagi tindak balas yang terlibat.
Write the chemical equation of the reaction involved.

[2 markah][2 marks]

(iii) Kira haba tindak balas, ΔH./ *Calculate heat of reaction, ΔH.*

[2 markah][2 marks]

(c) Jadual 5 menunjukkan haba peneutralan bagi larutan kalium hidroksida dan dua jenis asid iaitu asid X dan asid Y.
Table 5 shows the heat of neutralisation of potassium hydroxide and two types of acids which are acid X and acid Y.

Set	Eksperimen *Experiment*	Haba peneutralan *Heat of neutralisation* ($kJ\ mol^{-1}$)
I	50 cm^3 0.1 mol dm^{-3} kalium hidroksida dan 50 cm^3 0.1 mol dm^{-3} asid X 50 cm^3 0.1 mol dm^{-3} *potassium hydroxide and* 50 cm^3 0.1 mol dm^{-3} *acid* X	-57.2
II	50 cm^3 0.1 mol dm^{-3} kalium hidroksida dan 50 cm^3 0.1 mol dm^{-3} asid Y 50 cm^3 0.1 mol dm^{-3} *potassium hydroxide and* 50 cm^3 0.1 mol dm^{-3} *acid* Y	-55.8

Cadangkan asid X dan asid Y. Terangkan mengapa terdapat perbezaan haba peneutralan antara set I dan set II.
Suggest acid X and acid Y. Explain why there is a difference in heat of neutralisation between set I and set II.

[6 markah] [6 marks]

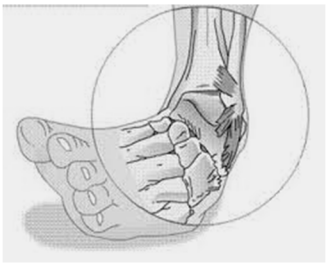
(d) (i) Rajah 10.2 menunjukkan satu pek pemanas sendiri nasi beriani yang dibawa oleh Ekhwan ketika mendaki bukit.
Diagram 10.2 shows a self-heating pack of biryani rice carried by Ekhwan during hill climbing.

Rajah 10.2
Diagram 10.2

Wajarkan penggunaan pek pemanas sendiri.
Justify uses of a self-heating pack.

[2 markah][2 marks]

(ii)

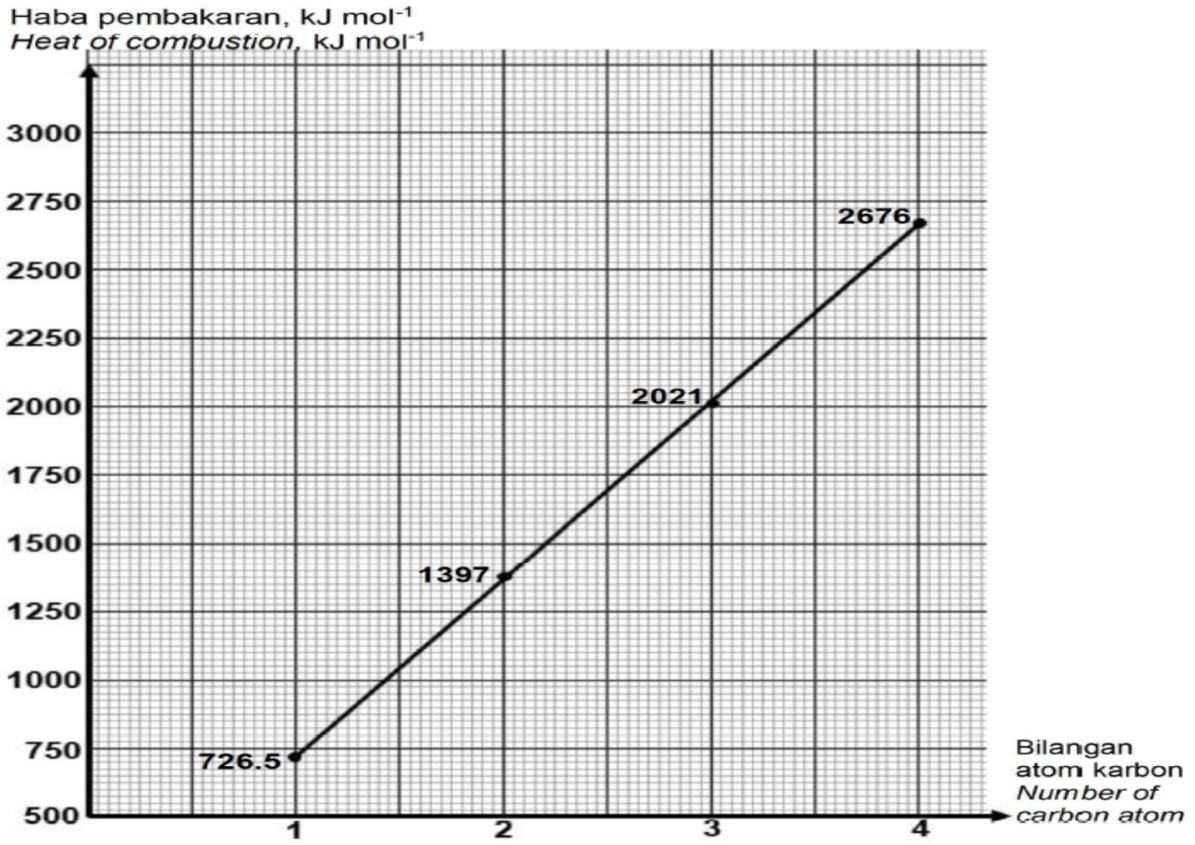


Rajah 10.3/ Diagram 10.3

Ekhwan terseliuh dan kakinya membengkak. Beliau memerlukan pek penyejuk. Sebagai seorang pelajar kimia, sediakan bahan-bahan yang bersesuaian di rumah dan kaedah untuk menyediakan pek penyejuk. Terangkan fungsi pek penyejuk.
Ekhwan sprained his leg and his leg was swollen. He needs a cooling pack. As a chemistry student, provide the appropriate materials in house and methods to prepare a cooling pack. Explain the function of the cooling pack.

[5 markah] [5 marks]

[2023-Kelantan-11] (a) Sesuatu alkohol mempunyai nilai haba pembakaran yang berbeza-beza. Rajah 11 menunjukkan satu graf haba pembakaran melawan bilangan atom karbon per molekul bagi alkohol.
An alcohol has a different heat of combustion value. Diagram 11 shows a graph of the heat of combustion against the number of carbon atoms per molecule for alcohol.



(i) Apakah maksud haba pembakaran?
What is meant by heat of combustion?

[1 markah] [1 mark]

(ii) Berdasarkan Rajah 11,/ *Based on Diagram 11*

• Tentukan haba pembakaran bagi etanol
Determine heat of combustion for ethanol

• Nyatakan hubungan antara bilangan atom karbon permolekul dalam sesuatu alkohol dengan haba pembakaran. Terangkan jawapan anda.
State the relationship between the number of carbon atoms per molecule in an alcohol and the heat of combustion. Explain your answer.

[4 markah] [4 marks]

(ii) Dengan menggunakan maklumat dari Rajah 11, tentukan perubahan suhu yang akan diperolehi jika 1.08 g propanol digunakan untuk memanaskan 200 cm^3 air. Sertakan juga persamaan kimia bagi pembakaran lengkap propanol.
[Jisim molar propanol = 60 g mol^{-1},
muatan haba tentu bagi air = 4.2 J g^{-1} $°C^{-1}$ dan ketumpatan air = 1.0 g cm^{-3}]
Using the information from Diagram 11, determine the temperature change that will be obtained if 1.08 g of propanol is used to heat 200 cm^3 of water. Also include the chemical equation for the complete combustion of propanol.
[Molar mass propanol = 60 g mol^{-1}, specific heat capacity of water = 4.2 J g^{-1} $°C^{-1}$ and density of water = 1.0 g cm^{-3}][5 markah] [5 marks]

(b) Nilai bahan api ialah jumlah tenaga haba terbebas apabila 1 g bahan api terbakar lengkap dalam oksigen. Jadual 8 menunjukkan nilai-nilai haba pembakaran dan jisim molar bagi dua jenis bahan api.
Fuel value is the amount of heat energy released when 1 g of fuel is burned completely in oxygen. Table 8 shows the value of heat of combustion and molar mass for two types of fuel.

Jenis bahan api *Type of fuel*	Jisim molar (g mol^{-1}) *Molar mass (g mol^{-1})*	Haba pembakaran (kJ mol^{-1}) *Heat of combustion (kJ mol^{-1})*
Butana *Butane*	58	2880
Butanol *Butanol*	74	2679

Jadual 8/ Table 8

Berdasarkan Jadual 2, tentukan bahan api terbaik yang boleh digunakan dan berikan satu sebab kepada jawapan anda.
Based on Table 2, Determine the best fuel to be used and give a reason for your answer.

[2 markah] [2 marks]

(c) Seorang pelajar mendapati lilin yang diperbuat dari sarang lebah boleh digunakan sebagai satu bahan api. Dengan menggunakan pengetahuan kimia anda, huraikan satu eksperimen bagi membantu pelajar tersebut menentukan nilai bahan api dari lilin tersebut.
A student found that candles made from beehives can be used as a fuel. Using your knowledge of chemistry, describe an experiment to help the student determine the fuel value of the candle.

[8 markah] [8 marks]

[2023-Pahang-11] (a) Jadual 11 menunjukkan dua tindak balas kimia yang menggunakan dua jenis asid berbeza, X dan Y untuk menentukan haba peneutralan.
Table 11 shows two chemical reaction using two different acids, X and Y to determine heat of neutralisation.

Tindak balas *Reaction*	Persamaan kimia *Chemical equation*	Haba peneutralan/ kJ mol^{-1} *Heat of neutralization/* kJ mol^{-1}
I	$X + NaOH \rightarrow NaX + H_2O$	- 57.0
II	$Y + NaOH \rightarrow NaY + H_2O$	- 52.0

Jadual 11 / Table 11

(i) Berdasarkan jadual 11, nyatakan maksud haba peneutralan.
Based on table 11, state the meaning heat of neutralisation.

[1 markah/ 1 mark]

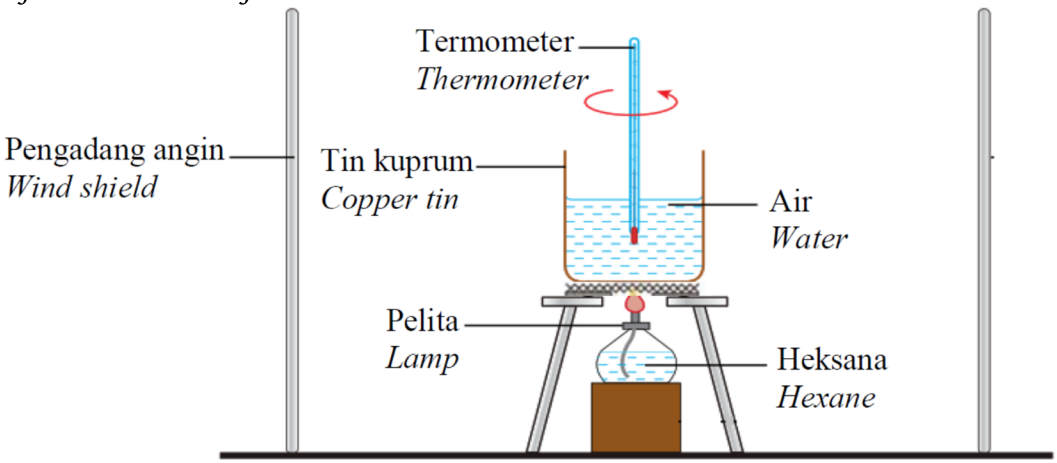
(ii) Cadangkan asid X dan Y. Terangkan perbezaan haba peneutralan bagi tindak balas II apabila dibandingkan dengan tindak balas I.
Suggest acid X and Y. Explain the difference in the heat of neutralisation for reaction II when compared to reaction I.

[4 markah/ 4 marks]

(iii) Lukis gambar rajah aras tenaga bagi tindak balas II dan deduksikan satu maklumat daripada gambar rajah aras tenaga tersebut.
Draw energy level diagram for reaction II and deduce one information from the energy level diagram.

[3 markah/ 3 marks]

(b) Rajah 11 menunjukkan susunan radas bagi eksperimen untuk menentukan haba pembakaran heksana.
Diagram 11 shows the apparatus *set-up for an experiment to determine the heat of combustion of hexane.*



3500 kJ haba dibebaskan apabila 1 mol heksana terbakar dalam oksigen berlebihan.
3500 kJ of heat was released when 1 mol of hexane is burnt in excess oxygen.

(i) Cadangkan satu pengubahsuaian yang boleh dilakukan ke atas susunan radas untuk mendapatkan perubahan suhu dengan lebih tepat. Berikan sebab jawapan anda.
Suggest one modification that can be made to the apparatus set- up to obtain more accurate temperature change. Give a reason for your answer.

[2 markah/ 2 marks]

(ii) Tuliskan persamaan kimia bagi pembakaran heksana tersebut dan hitungkan jisim heksana yang diperlukan untuk pembakaran bagi membebaskan haba sebanyak 630 000 J.
[Jisim atom relatif: C=12, H=1]
Write the chemical equation for combustion of hexane and calculate the mass of hexane required for combustion to release 630 000 J of heat.
[Relative atomic mass: C=12, H=1]

[4 markah/ 4 marks]

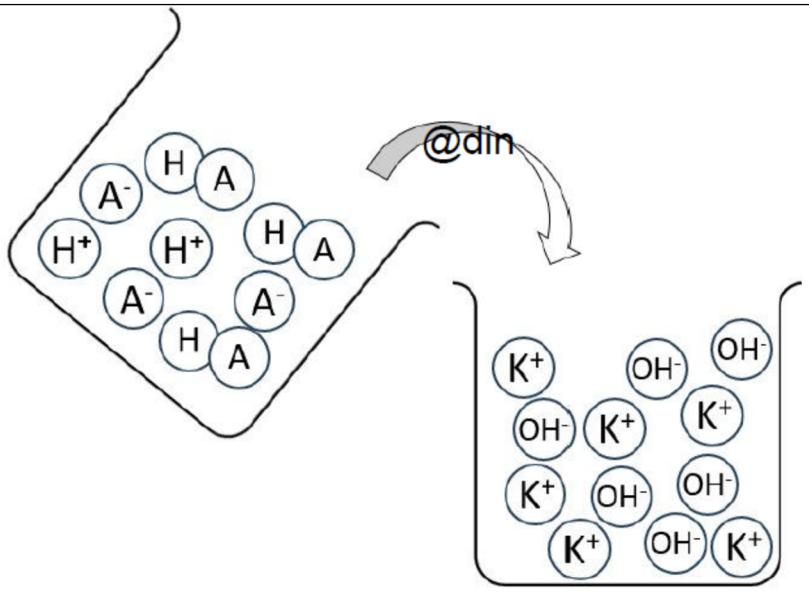
(c) Anda dibekalkan dengan bahan-bahan berikut:
You are supplied with the following substances:

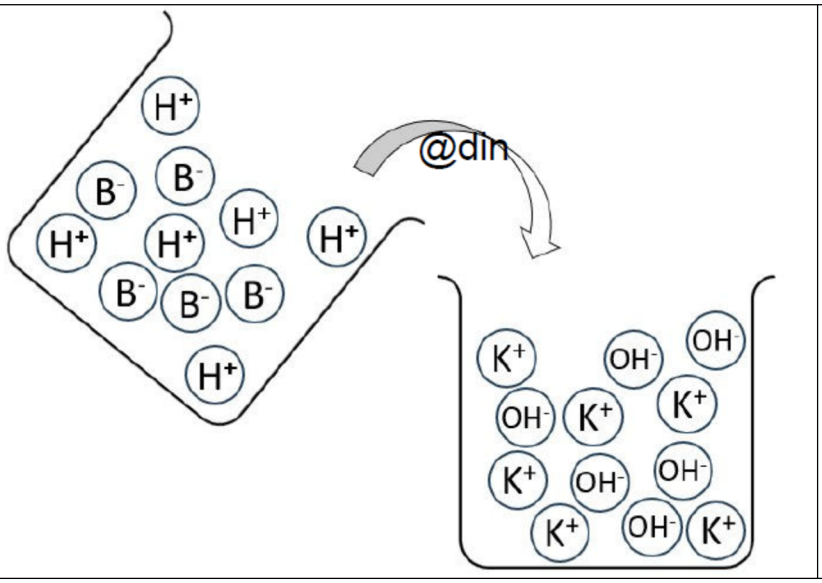
- Pelet kalium hidroksida/ *Potassium hydroxide pellets*
- Ammonium klorida/ *Ammoinum chloride*
- Kalsium klorida kontang/ *Anhydrous calcium chloride*
- Air suling/ *Distilled water*

Huraikan satu eksperimen untuk menentukan perubahan suhu apabila bahan dilarutkan dalam air suling. Kelaskan bahan bahan itu kepada bahan yang mengalami tindak balas eksotermik dan tindak balas endotermik.
Describe an experiment to determine the temperature change when the substances are dissolved in distilled water. Classify the substances into substances that undergo exothermic reactions and endothermic reactions.

[6 markah/ 6 marks]

[2023-JohorPPDTangkak-10] (a) Rajah 8.1 menunjukkan bahan tindak balas dan nilai haba peneutralan, ΔH bagi tindak balas larutan kalium hidroksida dengan asid HA dan asid HB. Kedua-dua asid HA dan asid HB adalah asid monoprotik.
Diagram 8.1 shows the reactants and the value of the heat of neutralization, ΔH for the reaction of potassium hydroxide solution with HA acid and HB acid. Both HA acid and HB acid are monoprotic acids.

Bahan tindak balas *Reactants*	Haba peneutralan, ΔH *Heat of neutralisation, ΔH*
	- x kJ mol^{-1}



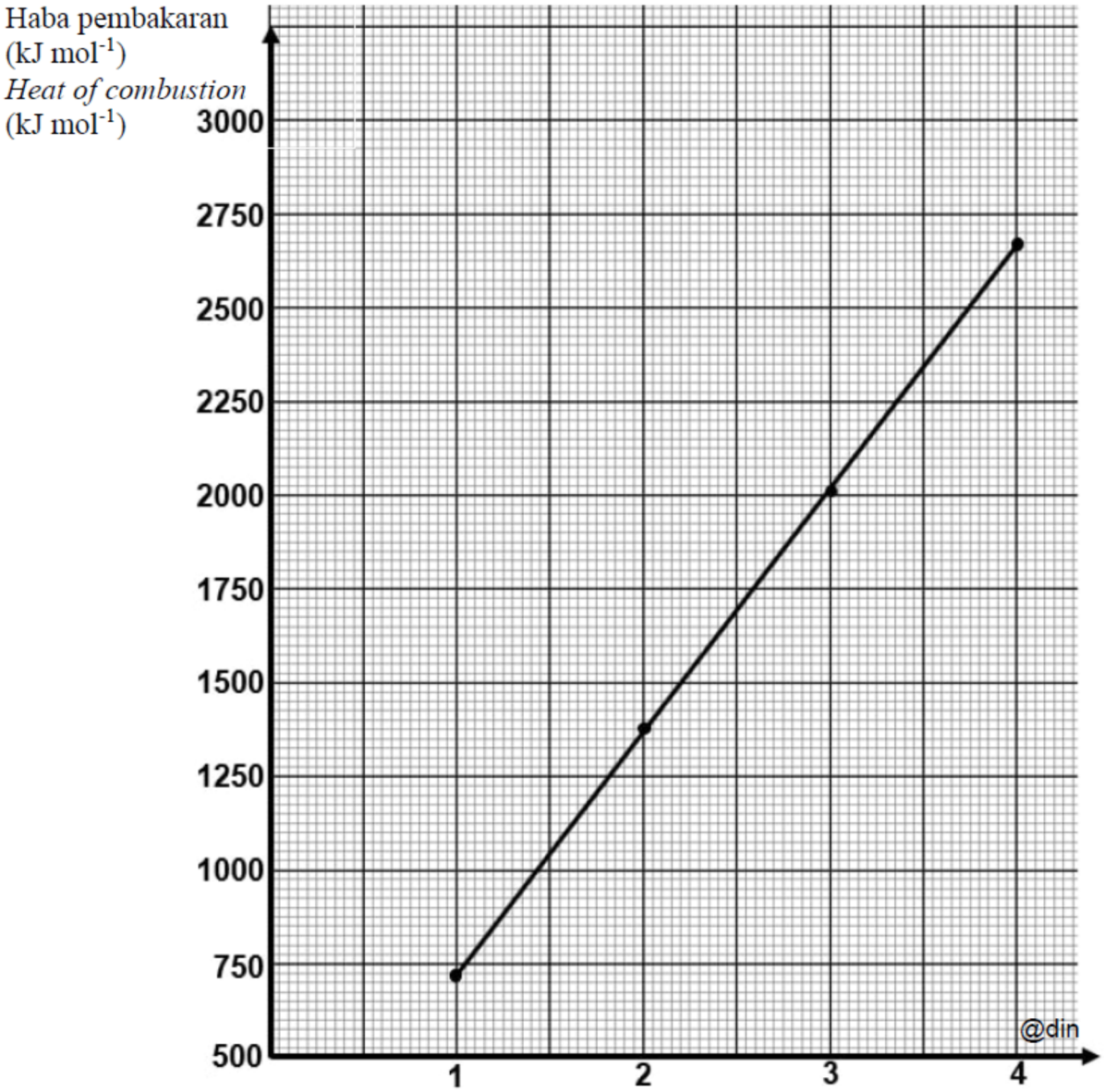
- y kJ mol^{-1}

Rajah 8.1/ Diagram 8.1

Nilai - x kJ mol^{-1} adalah lebih kecil dari - y kJ mol^{-1}. Cadangkan nama bagi asid HA dan asid HB dan tuliskan persamaan kimia bagi tindak balas salah satu asid yang dinamakan dengan larutan kalium hidroksida. Terangkan mengapa terdapat perbezaan dalam nilai haba peneutralan itu.
The value of - x kJ mol^{-1} is smaller than - y kJ mol^{-1}. Suggest the name of HA acid and HB acid and write the chemical equation for the reaction of one of the named acid with potassium hydroxide solution. Explain why there is a difference in the value of heat of neutralisation.

[7 markah/marks]

(b) Rajah 8.2 menunjukkan graf haba pembakaran alkohol melawan bilangan atom karbon per molekul alkohol.
Diagram 8.2 shows a graph of the heat of combustion of alcohol against number of carbon atom per molecule of alcohol.



Rajah 8.2/Diagram 8.2

(i) Nyatakan definisi bagi haba pembakaran. Berdasarkan Rajah 8.2, bandingkan nilai haba pembakaran bagi etanol dan propanol. Terangkan jawapan anda dari segi pembentukan ikatan dalam molekul karbon dioksida dan air yang terhasil. Apakah nilai haba pembakaran etanol, C_2H_5OH?
State the definition of heat of combustion. Based on Diagram 8.2, compare the heat of combustion of ethanol and propanol. Explain your answer in terms of the formation of bond in carbon dioxide and water molecule produced. What is the value of heat combustion of ethanol, C_2H_5OH?

[6 markah/marks]

(ii) Tulis persamaan kimia bagi pembakaran lengkap propanol. Jika 1.08 g propanol digunakan untuk memanaskan 200 cm^3 air, hitung bilangan mol propanol dan perubahan suhu semasa tindak balas.

[Diberi jisim molar propanol = 60 g mol^{-1}]
[Muatan baba tertentu bagi air, c = 4.2 J g^{-1} $°C^{-1}$,
Ketumpatan air = 1.0 g cm^{-3}]
Write a chemical equation for the complete combustion of propanol. If 1.08 g of propanol is used to heat 200 cm^3 of water, calculate the number of moles of propanol and the temperature change during the reaction.
[Given that molar mass of propanol = 60 g mol^{-1}]
[Specific heat capacity of water, c = 4.2 J g^{-1} $°C^{-1}$,
Density of water = 1.0 g cm^{-3}]

[5 markah/marks]

(c) Nilai bahan api ialah jumlah tenaga haba terbebas apabila 1 g bahan api terbakar lengkap dalam oksigen. Jadual 7 menunjukkan nilai-nilai haba pembakaran dan jisim molar bagi dua jenis bahan api.
Fuel value is the amount of heat energy released when 1 g of fuel is burned completely in oxygen. Table 7 shows the value of heat of combustion and molar mass for two types of fuel.

Jenis bahan api *Type of fuel*	Haba pembakaran (kJ mol^{-1}) *Heat of combustrion (kJ mol^{-1})*	Jisim molar (g mol^{-1}) *Molar mass (g mol^{-1})*
Butana *Butane*	2880	58
Butanol *Butanol*	2679	74

Jadual 7/ Table 7

Berdasarkan Jadual 7, tentukan bahan api terbaik yang boleh digunakan dan berikan satu sebab kepada jawapan anda.
Based on Table 7, Determine the best fuel to be used and give a reason for your answer.

[2 markah/marks]

Bab 4 Polimer

[2023-Pahang-01] Rajah 1 menunjukkan bahan-bahan yang diperbuat daripada polimer S.
Diagram 1 shows the substances produced from polymer S.

Rajah 1 / Diagram 1

(a) Apakah polimer?/ *What is polymer?*

.....

..... [1M]

(b) Namakan polimer S./ *Name polymer S.*

..... [1M]

(c) Apakah sumber utama bagi menghasilkan polimer S?
What is is the main source to produce polymer S?

..... [1M]

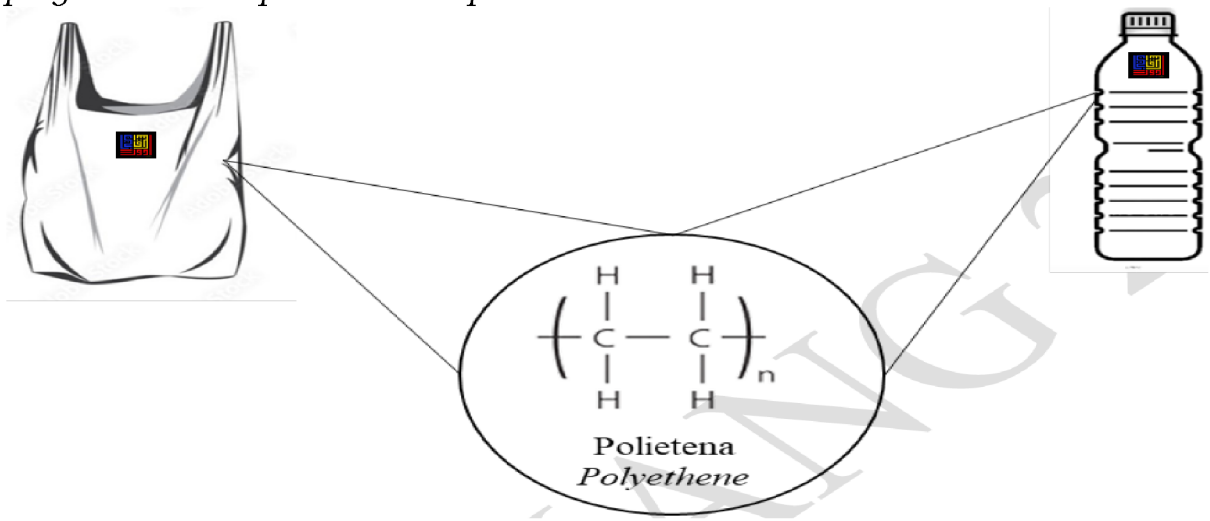
(d) Nyatakan jenis tindak balas pempolimeran bagi menghasilkan polimer S.
State the type of polymerisation reaction to produce polymer S.

..... [1M]

(e) Lukiskan formula struktur bagi monomer S.
Draw the structural formula for monomer S.

[1M]

[2023-JUJ-Set02-01] Botol minuman dan beg plastik dihasilkan menggunakan sejenis polimer. Rajah 1 menunjukkan polimer yang digunakan untuk menghasilkan kedua-dua produk.
Drink bottle and plastic bag are made up of polymer. Diagram 1 shows polymer used to produce both products.



Rajah 1 / Diagram 1

(a) Apakah yang dimaksudkan dengan polimer?
What is meant by polymer?

..... [1M]

(b) Nyatakan jenis polimer bagi polietena.
State the type of polymer for polyethene.

..... [1M]

(c) Polimer dihasilkan melalui tindak balas pempolimeran. Nyatakan jenis tindak balas pempolimeran yang menghasilkan polietena.
Polymer is produced through polymerisation process. State the type of polymerisation process used to produce polyethene.

..... [1M]

(d) Lukis dan namakan formula struktur bagi monomer yang membentuk polietena.
Draw and name the structural formula for monomer that formed polyethene.

[2M]

[2023-TerengganuMPP3-05] Jadual 5.1 menunjukkan dua polimer dan monomernya.
Table 5.1 shows two polymers and their monomers.

Polimer sintetik *Synthetic polymer*	Monomer *Monomer*
Polypropena Pol*ypropene*	Propena, C_3H_6 *Propene, C_3H_6*
Polivinil klorida *Polyvinyl chloride*	Monomer Y *Monomer Y*

Jadual/ *Table 5.1*

Berdasarkan Jadual 5.1,/ *Based on Diagram 5.1,*

(a) Apakah maksud polimer?/ *What is meant by polymer?*

..... [1M]

(b) Polipropena dan polivinil klorida dihasilkan melalui kaedah pempolimeran yang sama. Nyatakan kaedah pempolimeran tersebut.
Polypropene and polyvinyl chloride are produced by the same polymerisation method. State the method of polymerisation.

..... [1M]

(c) (i) Nyatakan nama monomer Y./ *State the name of monomer Y.*

..... [1M]

(ii) Tunjukkan bagaimana polivinil klorida dihasilkan daripada monomernya dalam tindak balas pempolimeran.
Show how polyvinyl chloride is produced from its monomer in polymerisation reaction.

[2M]

(d) Jadual 5.2 menunjukkan keputusan eksperimen bagi mengkaji kekenyalan getah.
Table 5.2 shows the results of experiment to Investigate the elasticity of rubber.

Jenis getah *Type of rubber*	Panjang asal keplngan getah (cm) *Initial length of rubber strip (cm)*	Panjang kepingan getah dengan pemberat 150 g (cm) *Length of rubber strip with 150 g weight (cm)*	Panjang kepingan getah selepas pemberat dialihkan (cm) *Length of rubber strip after the weight is removed (cm)*
X	13.00	13.15	13.00
Y	13.00	13.25	13.10

Jadual/Table 5.2

Bandingkan kekenyalan bagi kedua-dua getah itu. Terangkan jawapan anda.
Compare the elasticity of the two rubbers. Explain your answer.

.....

.....

..... [3M]

[2023-Melaka-02] Rajah 1 menunjukkan sejenis polimer sintetik.
Diagram 1 shows a type of synthetic polymer.

Rajah 1/ Diagram 1

(a) Apakah yang dimaksudkan dengan polimer?
What is meant by polymer?

.....

[1 markah][1 mark]

(b) Monomer bagi polimer dalam Rajah 1 ialah kloroetena. Lukiskan formula struktur bagi polimer tersebut.
The monomer of the polymer in Diagram 1 is chloroethene. Draw a structural formula of the polymer.

[1M]

(c) Apakah kebaikan menggunakan polimer ini?
What is the advantage of using this polymer?

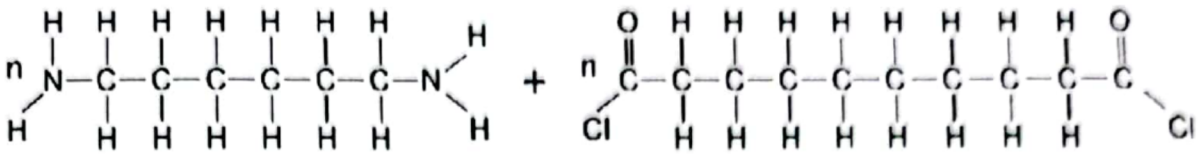
..... [1M]

(d) Polimer sintetik digunakan secara meluas dalam kehidupan seharian. Namun begitu, penggunaannya telah menyebabkan pencemaran alam sekitar. Terangkan bagaimana penggunaan PVC yang tidak terkawal boleh menyebabkan pencemaran alam sekitar.
Synthetic polymer is widely used in daily life. However, the usage lead to environmental pollution. Explain how the uncontrolled use of PVC can cause the pollution.

.....

..... [2M]

[2023-SBP-06] Rajah 6.1 menunjukkan formula struktur monomer-monomer yang terlibat dalam tindak balas pempolimeran kondensasi untuk menghasilkan nilon.
Diagram 6.1 shows the structural formula of the monomers involved in the condensation polymerisation reaction to produce nylon.



Rajah/ Diagram 6.1

(a) (i) Apakah maksud polimer?/ *What is the meaning of polymer?*

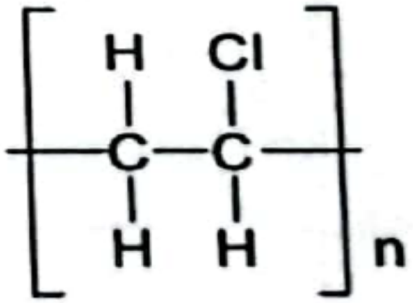
.....

..... [1M]

(ii) Nyatakan hasil sampingan daripada tindak balas pempolimeran nilon.
State the by-product of the polymerisation reaction of nylon.

..... [1M]

(b) Rajah 6.2 menunjukkan polimer yang terhasil daripada tindak balas pempolimeran penambahan.
Diagram 6.2 shows the polymer produced from addition polymerisation reaction.



Rajah 6.2 / Diagram 6.2

(i) Tuliskan persamaan pempolimeran bagi pembentukan polimer dalam Rajah 6.2.
Write the polymerisation equation for the formation of the polymer in Diagram 6.2.

[2M]

(ii) Banding dan bezakan tindak balas pempolimeran bagi penghasilan polimer dalam Rajah 6.2 dan nilon.
Compare and contrast the polymerization reaction for the production of the polymer in Diagram 6.2 and nylon.

.....

.....

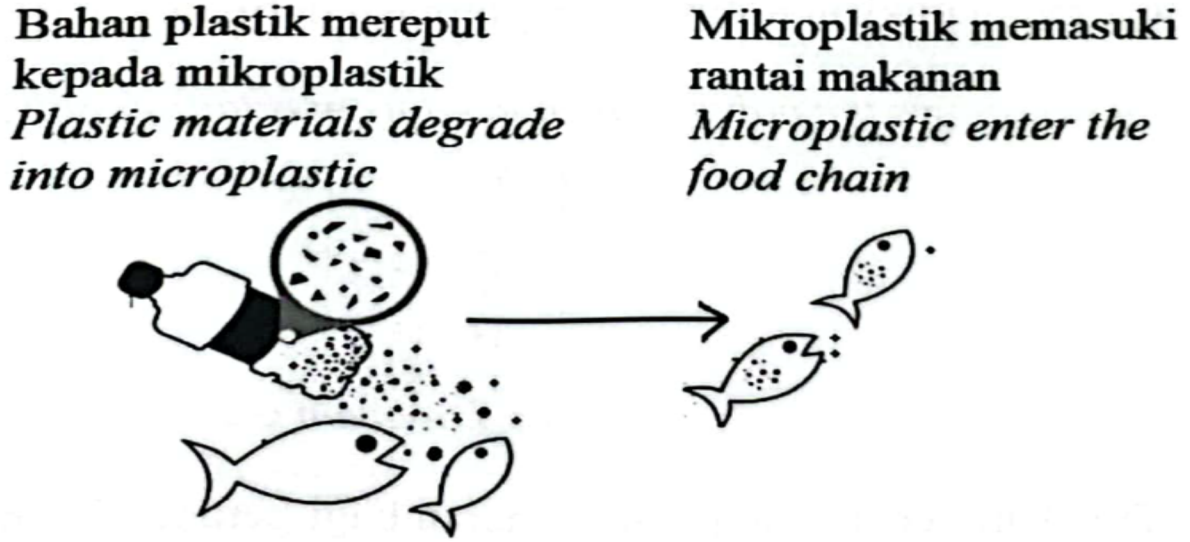
.....

.....

.....

..... [3M]

(c) Satu kajian mendapati pencemaran di lautan adalah akibat pembuangan sisa plastik daripada industri perikanan dan aktiviti lain di daratan. Rajah 6.3 menunjukkan kesan pembuangan sisa plastik terhadap kehidupan akuatik di lautan.
A study found that pollution in the ocean is caused by disposal of plastic waste from fishing industry and other activities in land. Diagram 6.3 shows the impact of the disposal of plastic waste to the aquatic life in the ocean.



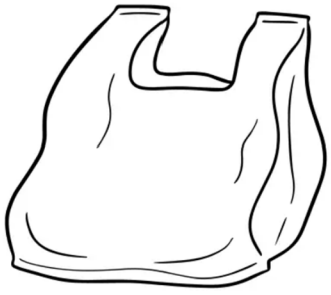
Cadangkan dua cara untuk memastikan isu ini tidak berlaku lagi pada masa hadapan.
Suggest two ways to make sure this issue will not happen again in the future.

.....

.....

..... [2M]

[2023-Putrajaya-07] Rajah 7.1 menunjukkan tiga jenis polimer dan kegunaannya dalam kehidupan harian.
Diagram 7.1 shows three types of polymers and their uses in daily life.

Polietena *Polyethene*	X	Polistirena *Polystyrene*
		

Rajah/ Diagram 7.1

(a) Berdasarkan Rajah 7.1,/ *Based on Diagram 7.1,*

(i) apakah yang dimaksudkan dengan polimer?
what is the meaning of polymers?

.....

..... [1M]

(ii) kenalpasti polimer X./ *identify polymer X.*

..... [1M]

(iii) tunjukkan bagaimana polimer polietena dihasilkan daripada monomernya dalam tindakbalas pempolimeran.
show how polymer polyethene is produced from its monomer in polymerisation reaction

[2M]

(iv) nyatakan satu ciri-ciri bagi polistirena yang membolehkannya sesuai dijadikan pembungkus makanan.
state one characteristic of polystyrene which make it suitable to be used as food packaging.

..... [1M]

(b) Rajah 7.2 menunjukkan dua laporan eksperimen kimia yang dijalankan oleh murid Tingkatan 5 Harmoni.
Diagram 7.2 shows two chemistry experiments reports conducted by the students of 5 Harmoni.

Laporan A/ *Report* A	**Laporan B/ *Report* B**
Prosedur:/ *Procedures*: 1. Ukur dan tuang 50 cm^3 lateks ke dalam sebuah bikar. *Measure and pour* 50 cm^3 *of latex into a beaker.* 2. Ukur dan tuang 5 cm^3 larutan **P** ke dalam bikar dan kacau. *Measure and pour* 5 cm^3 *solution* **P** *into the latex and stir.* 3. Rekodkan pemerhatian selepas 30 minit. *Record the observation after* 30 *minutes.* Pemerhatian/ *Observation*: Lateks menggumpal *Latex coagulates*	Prosedur:/ *Procedures*: 1. Ukur dan tuang 50 cm^3 lateks ke dalam sebuah bikar. *Measure and pour* 50 cm^3 *of latex into a beaker.* 2. Ukur dan tuang 5 cm^3 larutan **Q** ke dalam bikar dan kacau. *Measure and pour* 5 cm^3 *solution* **Q** *into the latex and stir.* 3. Rekodkan pemerhatian selepas 30 minit. *Record the observation after* 30 *minutes.* Pemerhatian/*Observation*: Lateks tidak menggumpal *Latex does not coagulates*

Rajah/ Diagram 7.2

Cadangkan larutan P dan larutan Q. Terangkan pemerhatian bagi setiap set eksperimen.
Suggest solution P and solution Q. Explain the observation for each set of experiment.

.....

.....

..... [3M]

(c) Rajah 7.3 menunjukkan timbunan tayar terbuang kesan daripada penggunaan barangan getah secara tidak lestari yang mengakibatkan pencemaran terhadap alam sekitar.
Diagram 7.3 shows the stacked of discarded tyres effect of the unsustainable use of rubber materials which lead to environmental pollution.

Rajah/ Diagram 7.3

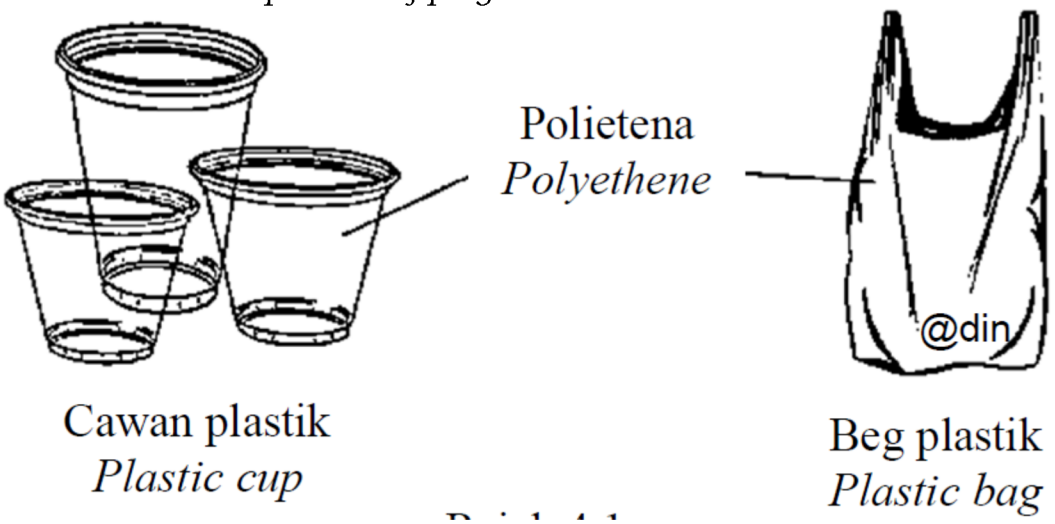
Cadangkan dua langkah yang boleh dilaksanakan untuk mengatasi masalah tersebut.
Suggest two ways that can be implemented to solve the problem.

.....

.....

..... [3M]

[2023-JohorPPDTangkak-06] Rajah 4.1 menunjukkan satu produk polimer.
Diagram 4.1 shows a product of polymer.



Rajah 4.1/ *Diagram 4.1*

(a) (i) Apakah maksud polimer?/ *What is the meaning of polymer?*

.....

..... [1M]

(ii) Nyatakan nama monomer bagi produk polimer dalam Rajah 4.1.
State the name of monomer of polymer product in Diagram 4.1.

..... [1M]

(b) Rajah 4.2 menunjukkan produk getah sintetik yang dihasilkan daripada produk sampingan petroleum.
Diagram 4.2 shows the product of synthetic rubber which is produced from petroleum by product.

Rajah 4.2 / Diagram 4.2

Nyatakan dua kaedah pelupusan barangan dalam Rajah 4.2 dan terangkan bagaimana barangan tersebut mengakibatkan pencemaran alam sekitar.
State two method how to dispose of item in Diagram 4.2 and explain how the item can cause environmental pollution.

.....

.....

.....

..... [3M]

(c) Suatu eksperimen telah dijalankan untuk mengkaji kekenyalan getah X dan getah Y.
Jadual 4 menunjukkan keputusan eksperimen tersebut.
An experiment was carried out to investigate the elasticity of rubber X and rubber Y. Table 4 shows the result of the experiment.

Jenis getah Type of rubber	Set	Panjang asal kepingan getah (cm) *Initial length of rubber strip (cm)*	Panjang kepingan getah dengan pemberat 100 g (cm) *Length of rubber strip with 100 g weight (cm)*	Panjang kepingan getah apabila pemberat 100 g dialihkan (cm) *Length of rubber strip when 100 g weight is removed (cm)*
Getah X Rubber X	I	12.00	12.35	12.10
	II	12.00	12.25	12.10
	III	12.00	12.30	12.15
Getah Y Rubber Y	I	12.00	12.05	12.00
	II	12.00	12.10	12.05
	III	12.00	12.00	12.00

Jadual 4/ Table 4

Berdasarkan Jadual 4, banding kekenyalan getah X dan getah Y. Terangkan jawapan anda.
Based on Table 4, compare the elasticity between rubber X and rubber Y. Explain your answer.

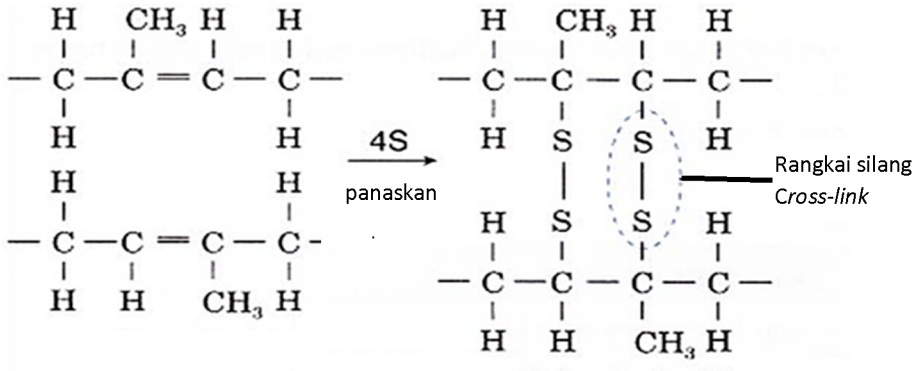
.....

.....

.....

..... [4M]

[2023-Perlis-03] Rajah 2 menunjukkan proses pemvulkanan getah asli kepada getah tervulkan.
Diagram 2 shows the process of vulcanization of natural rubber to vulcanized rubber.



Getah Asli
Natural rubber

Getah tervulkan
Vulcanized rubber

(a) Nyatakan maksud pemvulkanan getah.
State the meaning of rubber vulcanisation.

..... [1M]

(b) Polimer bagi getah asli ialah poliisoprena.
The polymer for natural rubber is polyisoprene.

(i) Apakah nama monomer bagi poliisoprena?
What is the name of the monomer for polyisoprene?

..... [1M]

(ii) Terangkan proses pemvulkanan getah.
Explain the process of vulcanization of rubber.

.....

..... [2M]

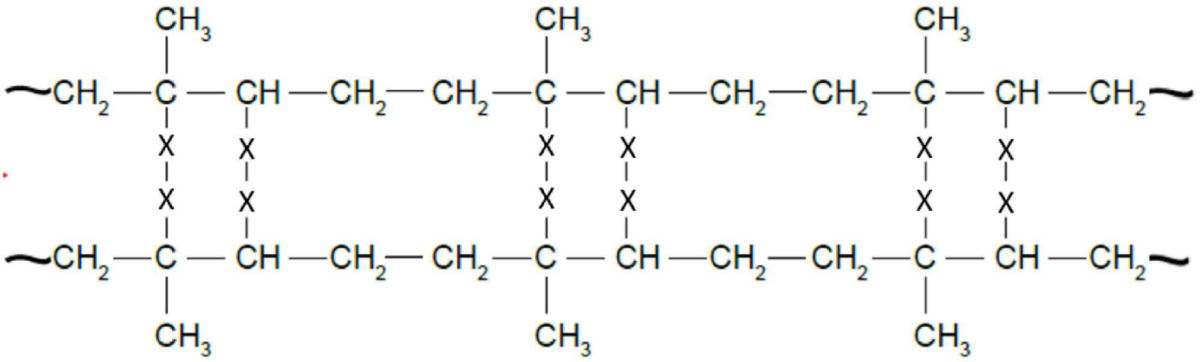
(c) (i) Nyatakan satu sifat getah tervulkan.
State one property of vulcanized rubber.

..... [1M]

(ii) Berikan satu contoh kegunaan getah tervulkan.
Give one example of the use of vulcanized rubber.

..... [1M]

[2023-Kelantan-01] Getah adalah polimer semula jadi. Rajah 1 menunjukkan polimer getah yang telah ditambahbaikkan dengan menambah bahan X membentuk rangkai silang melalui satu proses pemvulkanan.
Rubber is a natural polymer. Diagram 1 shows a rubber polymer that has been improved by adding substance X to form a cross-link through a vulcanization process.



Rajah 1/ Diagram 1

(a) (i) Apakah yang dimaksudkan dengan polimer?
What is meant by polymer?

..... [1M]

(ii) Namakan bahan X/*Name substance X*

..... [1M]

(ii) Lukiskan formula struktur monomer bagi polimer yang ditunjukkan.
Draw the structural formula of the monomer for the polymer shown.

[1M]

(b)(i) Nyatakan satu kelebihan getah yang telah melalui proses pemvulkanan berbanding getah asli.
State one advantage of vulcanized rubber over natural rubber.

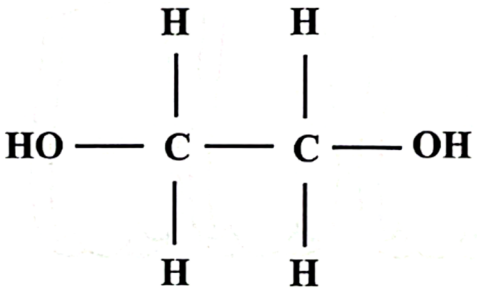
..... [1M]

(ii) Selain menggunakan getah asli atau getah tervulkan yang terdapat dalam pasaran untuk kegunaan dalam kehidupan, apakah alternatif lain yang bolah digunakan bagi menggantikan getah asli dan getah tervulkan.
In addition to using natural rubber or vulcanized rubber available in the market for use in life, what other alternatives can be used to replace natural rubber and vulcanized rubber.

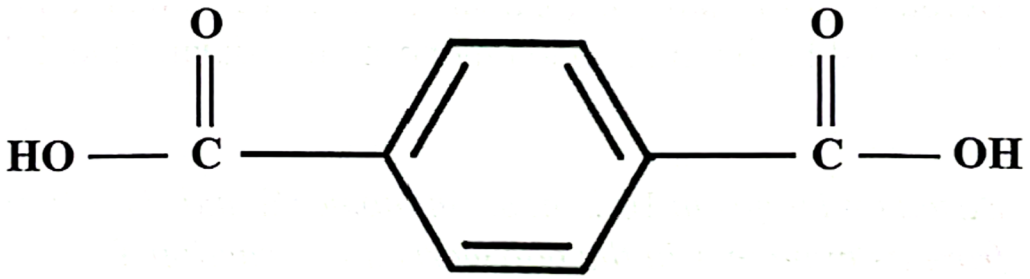
..... [1M]

Esei/ essay

[2023-NegeriSembilan-11] (a)(i) Rajah 10.1 menunjukkan monomer-monomer yang digunakan untuk menghasilkan terilena dalam satu tindak balas pempolimeran R.
Diagram 10.1 shows the monomers used to produce terylene in a polymerisation reaction R



1,2-etanadiol/ *1,2-ethanediol*



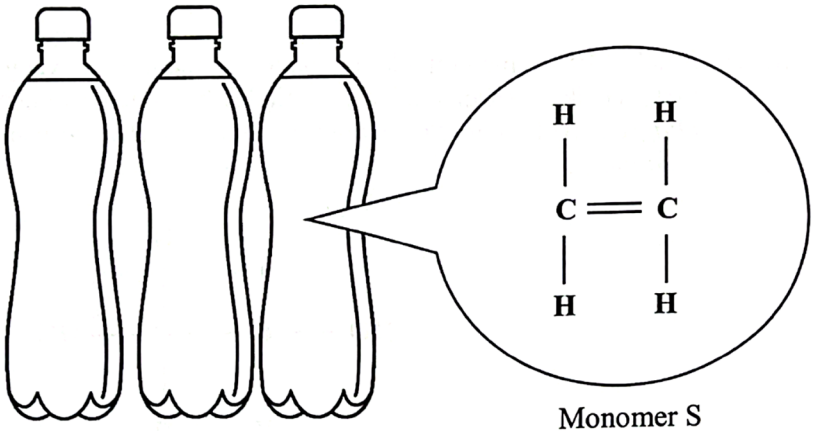
Asid tereftalik/ *Terephthalic acid*

Rajah 10.1/ Diagram 10.1

Berdasarkan Rajah 11.1, nyatakan maksud polimer, namakan hasil yang terbentuk selain terilena dan namakan tindak balas pempolimeran R.
Based on Diagram 11.1, state the meaning of polymer, name the product formed besides terylene and name polymerisation reaction R

[3 markah / 3 marks]

(ii) Rajah 10.2 menunjukkan monomer S bagi penghasilan produk plastik melalui tindak balas pempolimeran T.
Diagram 10.2 shows monomer S for the production of plastic products through the polymerization reaction T.



Rajah 10.2 / Diagram 10.2

Berdasarkan Rajah 10.2, namakan monomer S dan tunjukkan bagaimana polimer tersebut dihasilkan daripada monomemya dalam tindak balas pempolimeran T.
Based on Diagram 10.2, name monomer S and show how the polymer is produced from its monomer in the polymerisation reaction T.

[3 markah / 3 marks]

(iii) Bandingkan tindak balas pempolimeran R dan tindak balas pempolimeran T. Perbandingan anda harus mengandungi kriteria berikut:
• Nama tindak balas pempolimeran
• Jenis monomer
• Hasil tindak balas
• Contoh polimer lain
Compare polymerisation reaction R and polymerisation reaction T.
Your comparison should include the following criteria:
• *Name of polymerisation reaction*
• *Type of monomer*
• *Products*
• *Another example of polymer*

[4 markah / 4 marks]

(b) Jadual 6 menunjukkan dua situasi melibatkan lateks.
Table 6 shows two situations involving latex.

Situasi *Situation*	Bahan *Substance*
P	Lateks + Bahan penggumpal X *Latex + Coagulant X*
q	Lateks + Bahan anti-gumpal Y *Latex + Anticoagulant Y*

Jadual 6/ Table 6

Lateks perlu dihantar ke kilang untuk penghasilan sarung tangan pembedahan. Sebagai seorang pengurus ladang getah, situasi manakah paling sesuai digunakan untuk penghantaran lateks tersebut? Wajarkan pilihan anda.
Latex needs to be delivered to the factory to produce surgical gloves. As a rubber plantation manager, which situation is the most suitable to be used for the delivery of latex! Justify your choice.

[4 markah / 4 marks]

(c) Cadangkan satu bahan yang sesuai untuk menghasilkan tiub getah di dalam makmal. Huraikan secara ringkas penyediaan tiub getah tersebut menggunakan bahan dan radas berikut:
Suggest one suitable substance to produce rubber tubes in the laboratory. Briefly describe the preparation of the rubber tube by using following materials and apparatus.

Bahan *Materials*	Alat radas *Apparatus*
• Lateks *Latex*	• Silinder penyukat *Measuring cylinder*
• Bahan yang dinamakan *Named substance*	• Bikar *Beaker*
	• Rod kaca *Glass rod*

[6 markah / 6 marks]

[2023-Selangor-Set01-10] (a) Rajah 10.1 menunjukkan pelbagai barangan yang diperbuat daripada polimer.
Diagram 10.1 shows various items made from polymers.

	
Jaket keselamatan daripada polimer P *Life vest from polymer P*	Alat memasak tidak melekat daripada polimer Q *Non-stick cookware from polymer Q*
	
Bekas dan baldi daripada polimer R *Containers and pail from polymer R*	Payung terjun daripada polimer S *Parachute from polymer S*

Rajah 10.1/ Diagram 10.1

(i) Apakah yang dimaksudkan dengan polimer?
What is meant by polymer?

[1 markah] [1 mark]

(ii) Kelaskan polimer P. Q. R dan S mengikut tindak balas pempolimeran.
Classify polymers P, Q, R and S according to the polymerisation reaction.
[2 markah] [2 marks]

(iii) Namakan polimer Q.
Name the polymer Q.
[1 markah] [1 mark]

(b) Rajah 10.2 menunjukkan maklumat bagi dua jenis pinggan.
Diagram 10.2 shows the information for two types of plates.

Pinggan A/*Plates A*	Pinggan B/ *Plates B*
	
• Diperbuat daripada kanji jagung. tepung gandum, tepung kacang soya dan air *Made from corn starch, wheat flour, soybean flour and water* • Dapat diuraikan oleh mikroorganisma dengan mudah *Can easily be decomposed by microorganisms*	• Diperbuat daripada polimer termoset *Made from thermoset polymer* • Sukar diuraikan oleh mikroorganisma *Difficult to be decomposed by microorganisms*

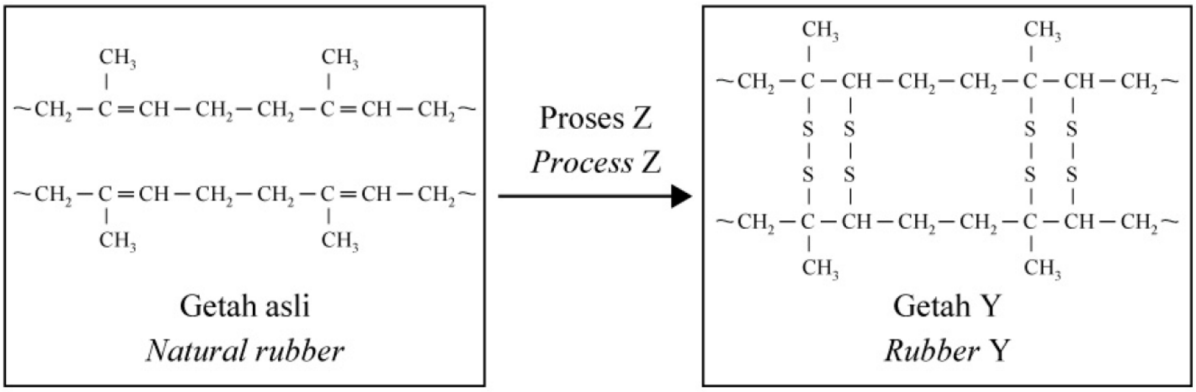
Rajah 10.2 / Diagram 10.2

Pinggan manakah yang boleh menyebabkan pencemaran alam sekitar?
Terangkan jawapan anda.
Cadangkan satu cara untuk mengatasi isu pencemaran itu.
Which plate can cause environmental pollution?
Explain your answer. Suggest one way to overcome the pollution issue.
[4 markah] [4 marks]

(c) Lateks dikumpulkan dalam bentuk cecair untuk diproses atau boleh dibiarkan menggumpal dan dipungut sehari selepas penorehan.
Latex is collected in liquid form for processing or it can be left to coagulate and collected a day after it was tapped.

Terangkan mengapa lateks akan menggumpal juga walaupun asid tidak ditambahkan.
Explain why the latex will coagulate as well even if no acid is added.
[4 markah] [4 marks]

(d) Rajah 10.3 menunjukkan formula struktur bagi duajenis getah yang berbeza.
Diagram 10.3 shows the structural formula of two different types of rubber.



Rajah 10.3 / Diagram 10.3

(i) Lukis formula struktur dan nyatakan nama IUPAC bagi monomer getah asli.
Draw the structural formula and state the IUPAC name for the monomer of natural rubber.

[2 markah] [2 marks]

(ii) Getah Y dapat dihasilkan daripada getah asli melalui proses Z.
Namakan proses Z dan huraikan dengan ringkas bagaimana proses Z dijalankan.
Rubber Y can be produced from natural rubber through process Z.
Name the process Z and describe briefly how process Z is carried out.

[2 markah] [2 marks]

(iii) Nyatakan satu perbezaan sifat bagi getah asli dan getah Y.
State one different characteristic between natural rubber and rubber Y.

[1 markah] [1 mark]

(e) Kelebihan untuk dihasilkan secara besar-besaran tanpa bergantung kepada faktor cuaca dan serangan penyakit pada pokok getah menjadikan getah sintetik pilihan utama industri pembuatan. Dengan ciri-ciri unik yang terdapat pada getah sintetik, pelbagai barangan dapat dihasilkan, contohnya sarung tangan.
Nyatakan tiga kelebihan sarung tangan yang diperbuat daripada getah sintetik berbanding dengan getah asli.
Having the advantage of mass production capacity, while not being reliant on the weather or diseases like rubber trees do, makes synthetic rubber the main choice for manufacturing industries. With the unique characteristics found in synthetic rubber, various items can be manufactured, such as gloves.
State three advantages of gloves made of synthetic rubber as compared to natural rubber.

[3 markah] [3 marks]

[2023-Selangor-Set02-10] Rajah 10.1 menunjukkan pelbagai barangan di sekeliling kita yang terdiri daripada polimer.
Diagram 10.1 shows various products around us that are made from polymers.

Rajah 10.1 / Diagram 10.1

(a) Apakah yang dimaksudkan dengan polimer dan nyatakan nama bagi unit asas yang membentuk polimer.
What is the meaning ofpolymer and state the name of the basic unit that forms polymer.

[2 markah] [2 marks]

(b) Polimer terdiri daripada polimer semula jadi atau polimer sintetik. Nyatakan satu contoh polimer semula jadi dan satu contoh polimer sintetik.
Polymer consists of natural polymer or synthetic polymer.
State one example of natural polymer and one example of synthetic polymer.

[2 markah] [2 marks]

(c) Rajah 10.2 menunjukkan satu poster yang dikeluarkan oleh sebuah pasar raya. Wajarkan tindakan pasar raya tersebut dan berikan satu sebab.
Diagram 10.2 shows one poster which released by one supermarket.
Justify the action of the supermarket and give one reason.

[2 markah] [2 marks]

(d) Lateks dikumpulkan dalam bentuk cecair untuk diproses atau boleh dibiarkan menggumpal dan dipungut sehari selepas penorehan. Sekumpulan murid ingin menjalankan eksperimen untuk mengkaji proses penggumpalan lateks dan cara mengelakkan penggumpalan.
Latex is collected in liquid form for processing or it can be left to coagulate and to be collected a day after it was tapped. One group of students want to carry out an experiment to study the coagulation process of latex and how to prevent coagulation.

Cadangkan dua jenis larutan berbeza yang boleh digunakan dalam eksperimen ini untuk mencapai objektif eksperimen. Dengan menggunakan dua jenis larutan yang dicadangkan, huraikan secara ringkas bagaimana eksperimen ini dilakukan di makmal.
Suggest two types of different solution that can be used in this experiment to achieve the objectives of this experiment. By using the two types of solutions suggested, describe briefly how is the experiment conducted in the laboratory.

Dalam huraian anda, sertakan/ *In your description, include'.*

- Prosedur/ *Procedures*
- Pemerhatian/ *Observations*

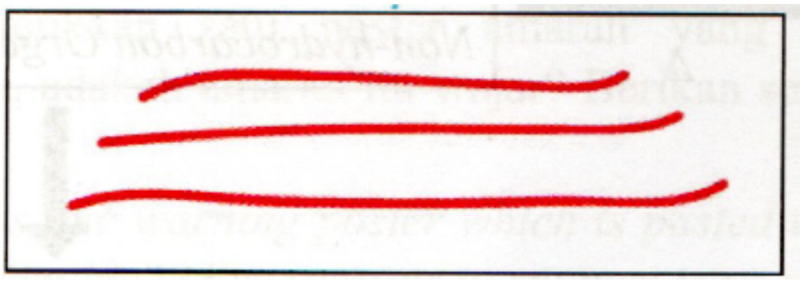
[8 markah] [8 marks]

(e) Pemvulkanan ialah proses penghasilan getah berkualiti melalui penghasilan rangkai silang antara rantai polimer. Sewaktu proses pemvulkanan, ikatan ganda dua antara karbon yang terdapat dalam molekul getah akan bertindak balas dengan suatu bahan untuk menghasilkan rangkai silang.
Vulcanisation is a process of producing better quality rubber through the production of cross-links between polymer chain. During a vulcanisation process, the double bond between carbons found in rubber molecules will react with certain substances to produce cross-link.

(i) Cadangkan bahan yang boleh ditambahkan ke dalam getah untuk proses pemvulkanan.
Suggest substance that can be added into rubber for the vulcanisation process.

[1 markah] [1 mark]

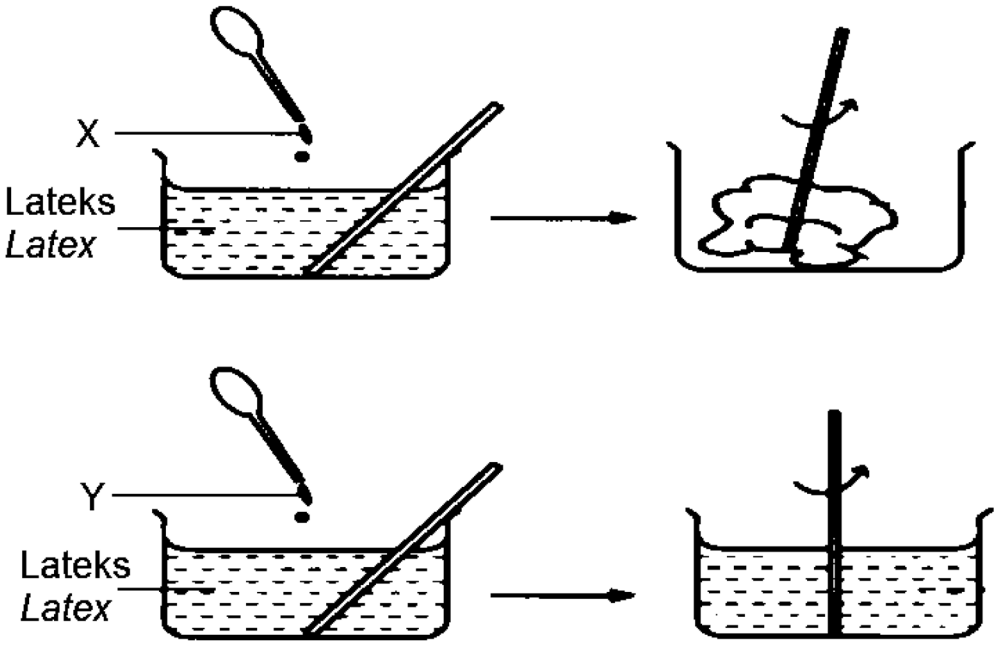
(ii) Rajah 10.3 menunjukkan ilustrasi polimer getah tak tervulkan. Lukiskan ilustrasi polimer getah tervulkan. Banding dan bezakan ciri-ciri getah tervulkan dan getah tak tervulkan.
Diagram 10.3 shows the illustration of unvulcanised rubber polymer. Draw the illustration of the vulcanized rubber polymer. Compare and contrast the characteristics of vulcanised and unvulcanised rubber.



Rajah 10.3 /Diagram 10.3

[5 markah] [5 marks]

[2023-JohorSkudai-11] Rajah 11.1 menunjukkan pemerhatian bagi lateks setelah ditambahkan bahan X dan bahan Y.
Diagram 11.1 shows the observation of latex after adding substance X and Y.



Rajah 11.1 / Diagram 11.1

(a) Lateks adalah polimer semulajadi. Apakah maksud polimer?
Latex is a natural polymer. What is the meaning of polymer?

[1 markah] [1 mark]

(b) Berdasarkan Rajah:/ *Based on Diagram:*

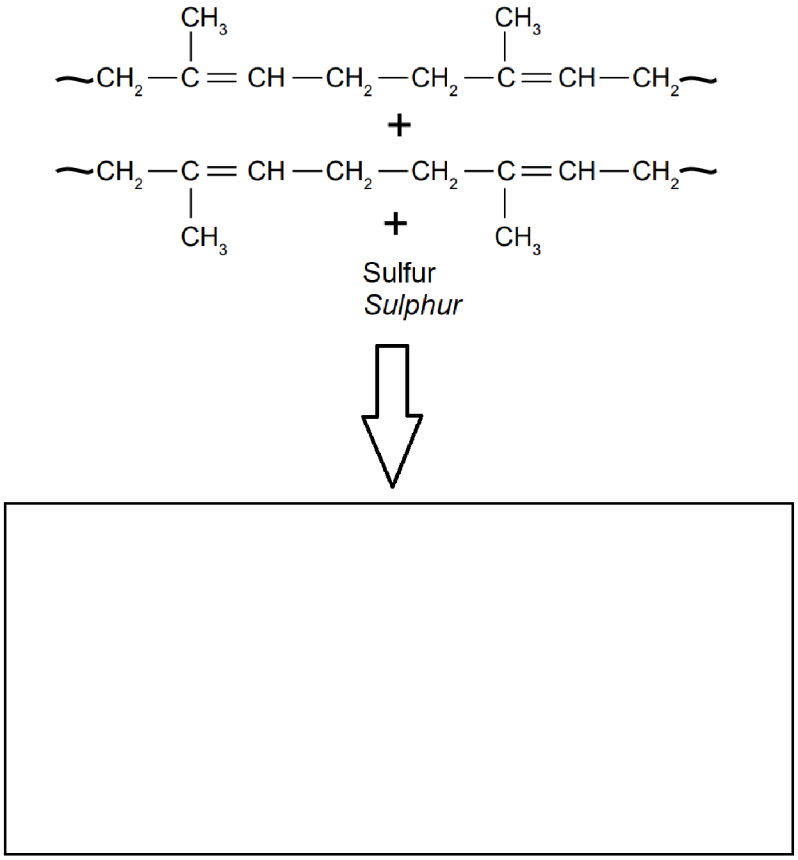
(i) Kenal pasti X dan Y./ *Identify X and Y.*

[2 markah] [2 marks]

(ii) Nyatakan perbezaan pemerhatian terhadap lateks oleh bahan X dan bahan Y. Terangkan jawapan anda.
State the difference in observations of latex by substance X and substance Y. Explain your answer.

[5 markah][5 marks]

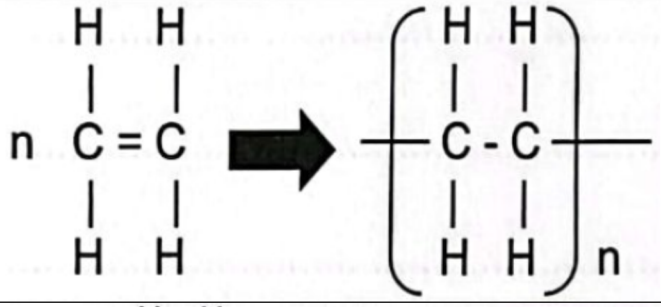
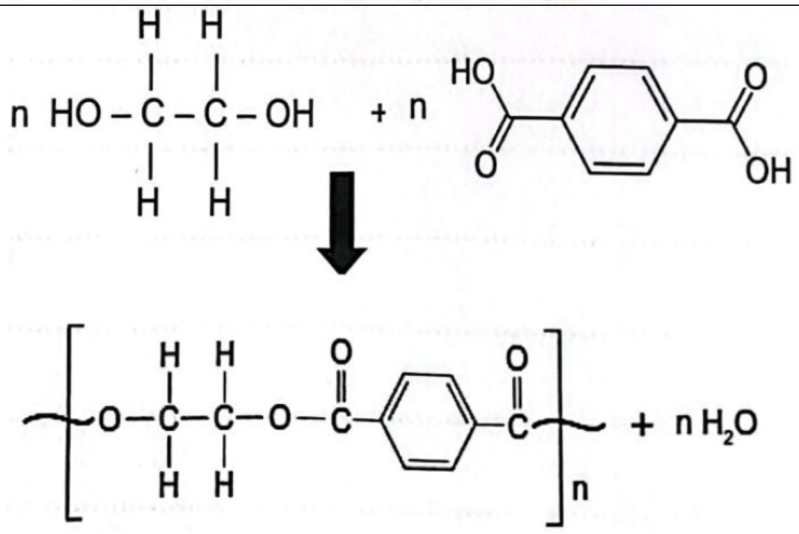
(iii) Rajah 11.2 menunjukkan proses pemvulkunan polimer lateks agar lebih elastik dan tidak mudah teroksida.
Diagram 11.2 shows the vulcanization process of latex polymer to make it more elastic and not easy to oxidize.



Lukis dan labelkan formula struktur polimer lateks ini.
Draw and label the structural formula of this latex polymer.
[2 markah][2 marks]

(iii) Hitung nilai pH bagi asid sulfurik berkepekatan 0.1 mol dm^{-3}
Calculate the pH value of sulfuric acid with a concentration of 0.1 mol dm^{-3}
[2 markah] [2 marks]

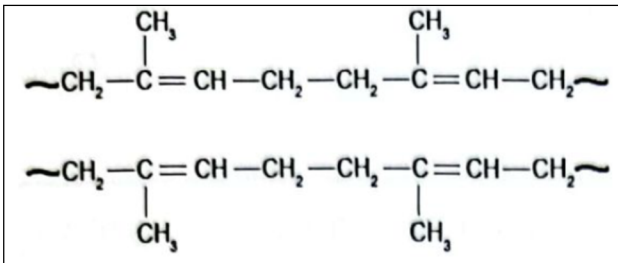
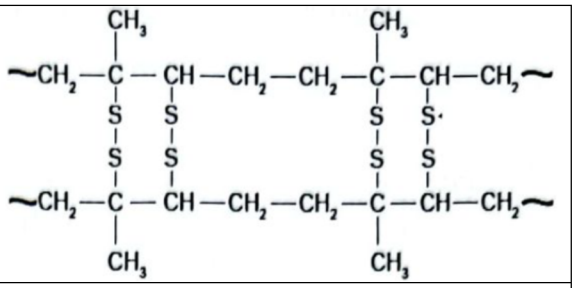
[2023-Kedah-11] (a) Rajah 11.1 menunjukkan contoh tindak balas dua pempolimeran berbeza.
Diagram 11.1 shows the examples of two different polymerisation.

Jenis pempolimeran *Type of polymerisation*	Contoh tindak balas *Example of reaction*
A	
B	

Nyatakan maksud tindak balas pempolimeran. Kenal pasti jenis pempolimeran A dan B. Banding dan beza kedua-dua tindak balas pempolimeran ini.
State the meaning of polymerisation reaction. Identify the types of polymerisation of A and B. Compare and contrast both polymerisation reactions.

(6 markah / marks)

(b) Rajah 11.2 menunjukkan formula struktur bagi dua jenis getah berbeza.
Diagram 11.2 shows structural formula of two type of different rubbers.

	
Getah P *Rubber P*	Getah Q *Rubber Q*

Rajah 11.2 / Diagram 11.2

pembuangan getah P dan getah Q yang tidak terkawal mengakibatkan pencemaran alam sekitar. Dengan memberi satu contoh produk yang diperbuat daripada getah P dan getah Q, cadangkan dua langkah yang boleh dilaksanakan untuk mengatasi masalah tersebut.
Uncontrolled disposal of rubber P and rubber Q causes environmental pollution. By using an example of product made from rubber P and rubber Q, suggest two ways that can be implemented to solve the problem.

(4 markah / marks)

(b) Bahan tambah makanan ialah bahan semula jadi atau sintetik yang ditambahkan pada makanan untuk menghalang kerosakan atau untuk memperbaiki rupa bentuk, rasa atau tekstur. Kesan daripada kemunculan makanan yang diproses dalam industri makanan pada masa ini, lebih banyak bahan tambahan makanan telah diperkenalkan sama ada berasal daripada bahan semula jadi atau sintetik.
Food additives are natural or synthetic substances added to food to prevent spoilage or to improve appearance, taste or texture. The impact of the emergence of processed foods in the food industry at this time, more food additives have been introduced either from ingredients natural or synthetic.

Rajah 11.3 /diagram 11.3

(i) Rajah 11.3 menunjukkan bahan tambah makanan yang banyak digunakan dalam kehidupan seharian. Wajarkan penggunaan bahan tambah makanan ini.
The diagram 11.3 shows an example of food addilivos that is widely uso in daily life. Justify the usage of this food additive.

(2 markah/ marks)

(ii)

Sebatian azo memberikan warna kuning, merah, perang atau hitam.
Azo compounds give a yellow color, red, brown or black.

Rajah 11.4 / Diagram 11.4

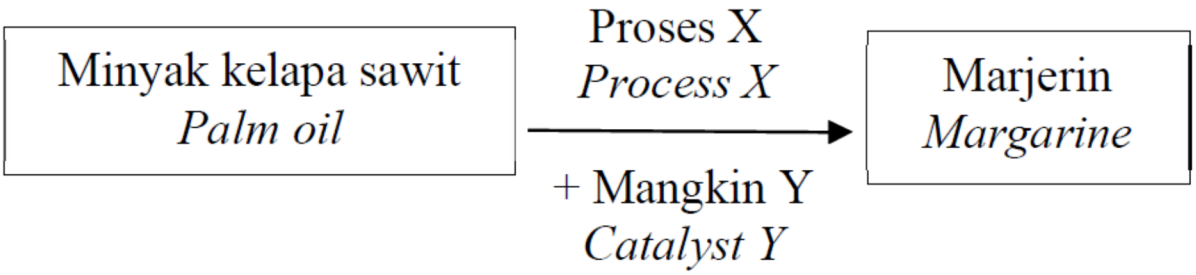
Sebatian azo merupakan sejenis pewarna dalam bahan tambah makanan dengan tujuan menambah atau mengembalikan warna makanan supaya kelihatan menarik dan lazat. Pewarna makanan boleh dikelaskan kepada pewarna asli dan sintetik. Berdasarkan Rajah 11.4, namakan kaedah yang digunakan untuk memisahkan campuran warna dan rancang satu penyiasatan menggunakan kaedah tersebut bagi memisahkan warna-warna dalam pewarna sintetik . Perancangan anda mestilah mengandungi aspek berikut:
• Prosedur
• Penjadualan data

Azo compounds are a type of dye in food additives with the purpose of adding or restoring the color of food so that it looks attractive and delicious. Food dyes can be classified into natural and synthetic. Based on Figure 11.4, name the method used to separate mixture of colors and plan an investigation using the method to separate the colors in synthetic food dyes. Your plan must include the following aspect:
• *Procedure*
• *Tabulation of data*

(8 markah / marks)

Bab 5 Kimia Konsumer dan Industri

[2023-JohorPPDTangkak-03] (a) Rajah 2.1 menunjukkan proses menyediakan marjerin daripada minyak kelapa sawit melalui proses X.
Diagram 2.1 shows a process of preparing margarine from palm oil through process X.



Rajah 2.1 / Diagram 2.1

Namakan Proses X dan Bahan Y.
Name Process X and Substance Y.

Proses X :.....
Process X

Mangkin Y :..... [2M]
Catalyst Y

(b) Rajah 2.2 menunjukkan sebuah poster "Sayangi Jantung Anda".
Diagram 2.2 shows a poster "Love Your Heart".

Rajah 2.2 / Diagram 2.2

Minyak sayuran dan lemak haiwan mengandungi lemak tepu dan lemak tak tepu. Berdasarkan Rajah 2.2, kenalpasti jenis lemak yang boleh menyebabkan perubahan keadaan arteri tersebut. Terangkan mengapa.
Vegetable oil and animal fats contain saturated and unsaturated fat. Based on Diagram 2.2, identify the types of fat that cause the change in the condition of the artery. Explain why.

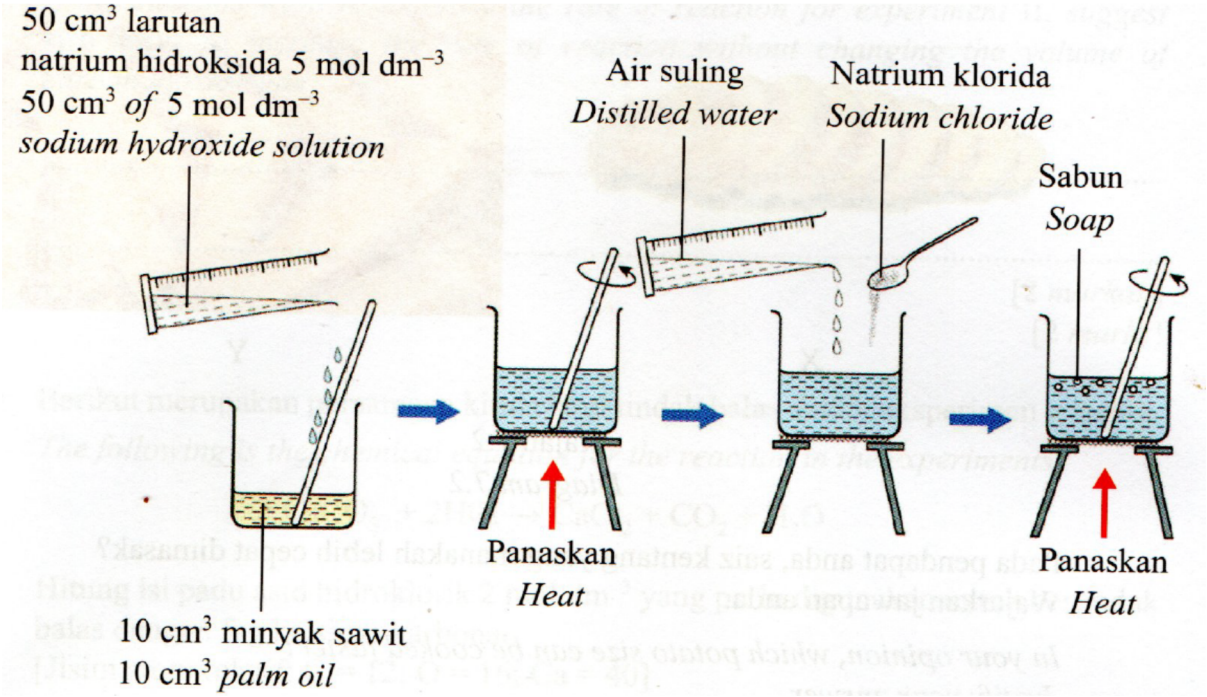
.....

.....

.....

..... [4M]

[2023-Selangor-Set02-08] Rajah 8 menunjukkan eksperimen yang dijalankan di makmal untuk menghasilkan sabun.
Diagram 8 shows experiment which carried out in laboratory to produce soap.



Rajah 8 / Diagram 8

(a) Nyatakan nama proses untuk menyediakan sabun.
State the name of the process to prepare soap.

..... [1M]

(b) Apakah fungsi natrium klorida dalam penyediaan sabun?
What is the function of sodium chloride in the preparation of soap?

..... [1M]

(c) Jadual 8 menunjukkan keputusan dua agen pencuci yang berbeza, A dan B, yang digunakan untuk mencuci pintu kaca di dalam bilik mandi.
Table 8 shows the result of glass shower doors in a bathroom after being washed by using two different cleansing agents, A and B.

Keadaan pintu kaca selepas di cuci *Result of glass shower door after being wash*		
Dicuci oleh *Washed by*	Agen pencuci A *Cleaning agent, A*	Agen pencuci B *Cleaning agent, B*

Jadual 8 / Table 8

(i) Pada pendapat anda, air di dalam bilik mandi itu adakah air Hat atau air lembut? Jelaskan jawapan anda.
In your opinion, is the water in the bathroom hard water or soft water! Explain your answer.

.....

.....

..... [2M]

(ii) Seorang pembantu rumah mencuci pakaian di dalam bilik mandi tersebut. Dia telah menggunakan kuantiti sabun yang banyak-untuk menanggalkan kotoran daripada pakaian, tetapi tidak berkesan. Dengan menggunakan pengetahuan kimia anda, bagaimanakah anda dapat membantu pembantu rumah itu untuk mengatasi masalah tersebut? Terangkan jawapan anda.
One house maid washed clothes inside the bathroom. She used large quantity of soap to remove the stain from clothes, but it was not effective. By using

your knowledge of chemistry, how can you help the house maid to overcome the problem? Explain your answer.

.....

.....

..... [3M]

(d) Dengan menggunakan bahan-bahan berikut, huraikan secara ringkas bagaimana membezakan antara agen pencuci A dan B di dalam makmal.
By using the following materials, describe briefly how to differentiate between cleaning agents A and B in laboratory.

- Air liat/ *Hard water*
- Agen pencuci A / *Cleaning agent A*
- Agen pencuci B / *Cleaning agent B*
- Dua tabung uji / *Two test tubes*

.....

.....

.....

.....

.....

..... [3M]

[2023-Perlis-05] Persamaan berikut menunjukkan bagaimana sabun boleh disediakan.
The following equation shows how soap can be prepared.

Minyak sawit + Alkali pekat → Bahan X + Sabun
Palm oil + Concentrated alkali → Material X + Soap

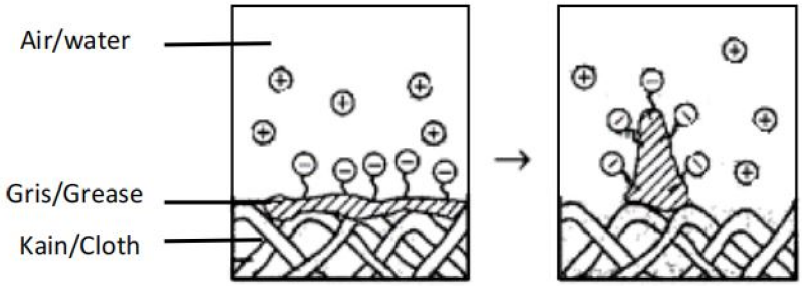
(a) (i) Apakah nama tindak balas di atas?
What is the name of the above reaction?

..... [1M]

(ii) Sabun yang terhasil adalah kalium palmitat. Apakah alkali yang perlu digunakannya?
The soap produced is potassium palmitate. What alkali should be used?

..... [1M]

(b) (i) Rajah 4 menunjukkan sebahagian daripada tindakan pencucian oleh zarah detergen ke atas kotoran bergris pada sehelai baju.
Diagram 4 shows part of the washing action of detergent particles on grease stain shirt.



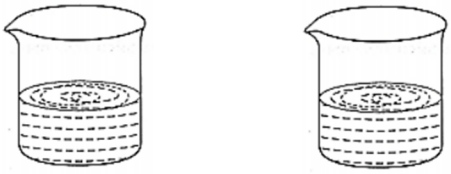
Berdasarkan Rajah 4, terangkan tindakan pencucian oleh zarah detergen ke atas kotoran bergris.
Based on the Diagram 4, explain the washing action of detergent particles on greasy stains.

.....

.....

..... [3M]

(ii) Anda dibekalkan dengan dua bikar, A dan B yang berisi sama ada larutan sabun atau larutan detergen.
You are given two separate beakers, A and B containing soap solution or detergent solution.



Bikar A/ Beaker A Bikar B/ Beaker B

Dengan menggunakan bahan-bahan berikut, huraikan secara ringkas bagaimana anda dapat membezakan antara sabun dengan detergen.
With the use of the following materials, describe briefly how you can distinguish between soap and detergent.

- Larutan magnesium nitrat/ *Magnesium nitrate solution*
- Tabung didih/ *Boiling tubes*
- Gabus getah/ *Rubber stopper*

.....

.....

..... [3M]

[2023-JohorPPDTangkak-05] Jadual 3 menunjukkan ion-ion dalam air sungai yang tidak tercemar di Sungai A.
Table 3 shows the ions in unpolluted river water in River A.

Jenis ion *Type of ion*	Kepekatan (mol dm^{-3}) *Concentration (mol dm^{-3})*
SO_4^{2-}	0.69×10^{-4}
Cl^-	1.60×10^{-4}
Ca^{2+}	3.30×10^{-4}
Mg^{2+}	1.50×10^{-4}
Na^+	0.23×10^{-4}
K^+	0.30×10^{-4}

Jadual 3 / Table 3

Sebuah kilang secara tidak sengaja membebaskan air buangan industri ke dalam Sungai A.
A factory accidently flowed the waste water industry into River A.

(a) Senaraikan anion yang terdapat dalam air sungai yang tidak tercemar di Sungai A.
List the anion present in unpolluted river water in River A.

..... [1M]

(b) Selain daripada ion -ion yang dinyatakan dalam Jadual 3, cadangkan satu kation dan satu anion yang terdapat dalam air buangan kilang yang menyebabkan air sungai itu keruh.
Besides the ions stated in Table 3, suggest one cation and one anion in the waste water that cause the river water cloudy.

Kation :..... Anion : .....
Cation *Anion*

[2M]

(c) Ali menggunakan sabun dan air sungai A untuk membersih kesan minyak pada pakaiannya tetapi kotoran tersebut tidak dapat ditanggalkan.
Ali uses a soap and river water in River A to clean oil stain on his clothes but the blood stain cannot be removed.

(i) Berdasarkan Jadual 3, kenal pasti satu ion dalam air sungai yang boleh menyebabkan pencucian pakaian menggunakan sabun menghasilkan kekat.
Based on Table 3, identify one ion in river water that can cause cleaning clothes using soap produce scum.

..... [1M]

(ii) Dengan menggunakan bahan kimia yang dinamakan, huraikan bagaimana ion dinyatakan di(c)(i) itu boleh disingkirkan dari air sungai.
By using a named chemical substance, describe how ion stated in (c)(i) can be eliminate from river water.

.....

.....

.....

..... [4M]

[2023 Johor Bahru-02]
2. (a) Maklumat berikut merupakan kesimpulan bagi keberkesanan agen pencuci dalam air liat.
The following information is the conclusion of the effectiveness of cleaning agents in hard water.

Tindakan pencucian detergen lebih berkesan daripada sabun
Cleansing action of detergent is more effective than soap

Berdasarkan maklumat di atas,/ *Based on the above information,*

(i) apakah maksud sabun?/ *what is the meaning of soap?*

.....

..... [1M]

(ii) apakah formula am bagi sabun?/ *what is the general formula for soap?*

..... [1M]

(iii) selain daripada air liat, nyatakan sejenis air yang lain yang boleh mengurangkan keberkesanan sabun.
other than hard water, state another type of water that can decrease the effectiveness of soap.

..... [1M]

[2023-Pahang-04] (a) Persamaan di bawah menunjukkan tindak balas dalam penyediaan sabun di makmal.
The equation below shows the reaction in the preparation of soap in the laboratory.

Asid laurik + Natrium hidroksida → Sabun X + Gliserol
Lauric acid + Sodium hydroxide → Soap X + Glycerol

(i) Apakah nama tindak balas ini? / *What is the name of this reaction?*

..... [1M]

(ii) Namakan sabun X./ *Name the soap X.*

..... [1M]

(iii) Asid laurik dari minyak kelapa dicampurkan dengan larutan natrium hidroksida pekat untuk menghasilkan sabun X, $CH_3(CH_2)_{10}COONa$. Persamaan berikut mewakili tindak balas yang berlaku.
Lauric acid from coconut oil is mixed with concentrated sodium hydroxide solution to produce soap X, $CH_3(CH_2)_{10}COONa$.
The following equation represents the reaction that occurs.

$CH_3(CH_2)_{10}COOH + NaOH \rightarrow CH_3(CH_2)_{10}COONa + H_2O$

Sekiranya 0.1 mol asid laurik digunakan dalam tindak balas ini, hitungkan jisim sabun yang terhasil.
[Jisim molar $CH_3(CH_2)_{10}COONa = 222\ g\ mol^{-1}$]
If 0.1 moles of lauric acid were used in this reaction, calculate the mass of soap produced.
[Molar mass of $CH_3(CH_2)_{10}COONa = 222\ g\ mol^{-1}$]

[2M]

[2023-Selangor-Set01-08] (a) Encik Wong mengalami sakit dada apabila batuk, hilang selera makan dan batuk berdarah.
Mr Wong suffers from chest pain when coughing, loss of appetite and coughing up blood.

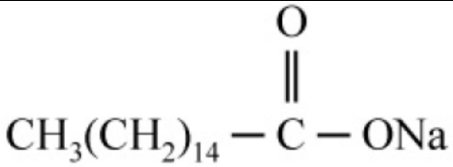
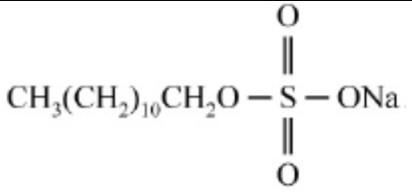
(i) Sebagai seorang doktor, nyatakan jenis ubat yang patut diambil oleh Encik Wong.
As a doctor, state the type of medicine that should be taken by Mr Wong.

..... [1M]

(ii) Nyatakan satu preskripsi yang perlu dipatuhi oleh Encik Wong semasa pengambilan ubat supaya penyakit itu tidak berulang.
State one prescription that Mr Wong needs to follow when taking the medicine so that the disease does not recur.

..... [1M]

(b) Rajah 8 menunjukkan formula struktur bagi dua jenis agen pencuci.
Diagram 8 shows the structural formula of two types of cleaning agents.

Agen pencuci X Cleaning agent X	Agen pencuci Y Cleaning agent Y
	

(i) Namakan proses untuk menyediakan agen pencuci X.
Name the process to prepare cleaning agent X.

..... [1M]

(ii) Agen pencuci X disediakan dengan mencampurkan asid palmitik daripada kelapa sawit dengan larutan natrium hidroksida pekat. Persamaan berikut mewakili tindak balas tersebut.
Cleaning agent X is prepared by mixing palmitic acid from palm oil with concentrated sodium hydroxide solution.
The following equation represents the reaction.

$$CH_3(CH_2)_{14}COOH + NaOH \rightarrow CH_3(CH_2)_{14}COONa + H_2O$$

Hitung jisim agen pencuci X yang terhasil jika 0.5 mol asid palmitik digunakan.
[Jisim molar $CH_3(CH_2)_{14}COONa$ = 278 g mol^{-1}]
Calculate the mass of cleaning agent X produced if 0.5 mol of palmitic acid is used.
[Molar mass of $CH_3(CH_2)_{14}COONa$ = 278 g mol^{-1}]

[2M]

(iii) Semasa menyertai perkhemahan di Pantai Cenang, Sam mendapati bajunya kotor kerana tertumpah kuah kari semasa makan tengah hari. Dia telah mencuci bajunya dengan sejenis agen pencuci, didapati kesan kotoran tidak dapat ditanggalkan. Cadangkan agen pencuci yang lebih sesuai digunakan untuk menghilangkan kotoran tersebut. Berikan alasan anda.
While participating a camping at Pantai Cenang, Sam found his shirt dirty because he spilled curry sauce during lunch. He has washed his clothes with a kind of cleaning agent, it was found that the stains could not be removed. Suggest cleaning agent which is more suitable to be used to remove the stain. Give your reasons.

.....

.....

.....

..... [3M]

(iv) Agen pencuci yang manakah lebih mesra alam? Terangkan jawapan anda.
Which cleaning agent is more environmentally friendly? Explain your answer.

.....

..... [1M]

[2023-JUJ-Set02-02] Rajah 2 menunjukkan jem strawberi yang mengandungi bahan tambah makanan.
Diagram 2 shows strawberry jam that contains food additives.

(a) Apakah fungsi bahan tambah makanan?
What is the function of food additives?

..... [1M]

(b) Namakan satu bahan tambah makanan dalam jem strawberi dalam Rajah 2.
Name one food additive in strawberry jam in Diagram 2.

..... [1M]

(c) Pektin digunakan secara meluas dalam pembuatan jem. Apakah fungsi pektin?
Pectin is widely used in the manufacture of jam. What is the function of pectin?

..... [1M]

(d) Selain memberikan rasa manis dalam pembuatan jem, gula juga bertindak sebagai bahan pengawet. Terangkan mengapa.
Other than providing sweetness in making jam, sugar can also act as a preservative. Explain why.

..... [1M]

(e) Nyatakan satu kesan buruk pengambilan bahan tambah makanan secara berlebihan.
State one bad effect of excessive consumption of food additives.

..... [1M]

[2023-Pahang-04b] (b) Rajah 4.1 menunjukkan sebahagian daripada label kandungan makanan pada bungkusan Marjerin Lazat.
Diagram 4.1 shows part of the food content label on the Marjerin Lazat packaging.

Marjerin Lazat

Ramuan: Minyak sayuran, garam, susu pepejal, pengemulsi, asid askorbik, perisa dan pewarna yang dibenarkan.
Ingredients: Vegetable oil, salt, solid milk, emulsifier, ascorbic acid, flavouring and permitted food dyes.

Rajah 4.1 / Diagram 4.1

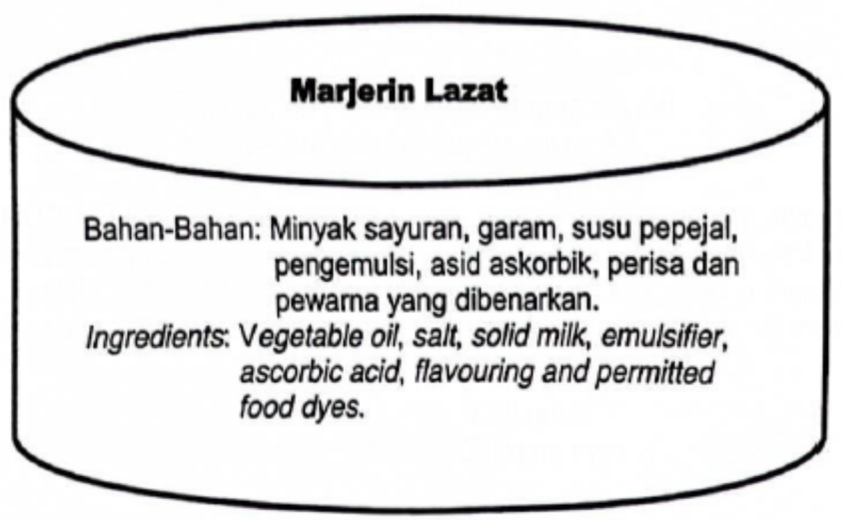
(i) Apakah jenis bahan tambah makanan bagi asid askorbik?
What type of food additive is ascorbic acid?

..... [1M]

(ii) Kenalpasti satu lagi bahan tambah makanan dalam marjerin itu.
Identify another food additive in the margarine.

..... [1M]

[2023-TerengganuMPP3-02] Rajah 2 menunjukkan pembungkus makanan yang memaparkan bahan tambah makanan yang terdapat dalam makanan itu.
Diagram 2 shows food packaging displaying the food additives found in the food.



(a) Nyatakan maksud bahan tambah makanan.
State the meaning of food additive.

..... [1M]

(b) Berdasarkan Rajah 2, pilih satu bahan tambah makanan dan nyatakan fungsinya.
Based on Diagram 2, choose one food addictive and state its function.

Bahan tambah makanan : .....
Food addictive

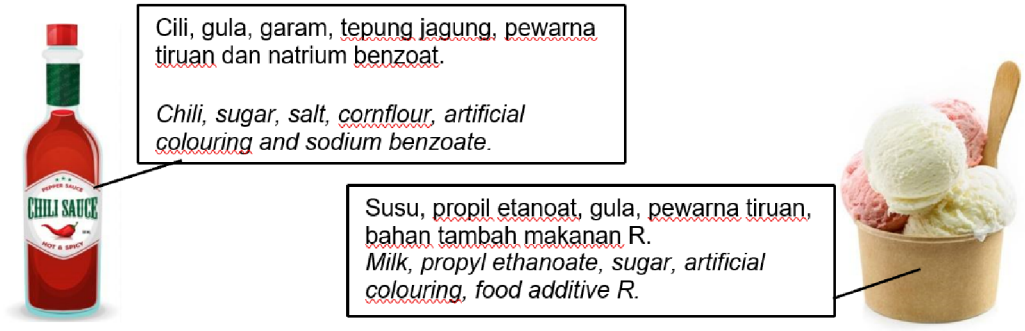
Fungsi : .....
Function [2M]

(c) Setelah mengambil makanan laut, Ali telah mengalami kegatalan dan hidung berair. Apakah yang dialami oleh Ali?
Nyatakan jenis ubat yang perlu diambil untuk meredakan gejala tersebut.
After consuming seafood, Ali has experienced itching and runny nose.
What is experienced by Ali?
State the type of medicine that should be taken to relieve the symptoms.

.....

..... [2M]

[2023-JohorSkudai-03] Rajah 3 menunjukkan kandungan pada label sebotol sos cili dan aiskrim.
Diagram 2shows the ingredients on a label of a bottle of chilli sauce and an ice-cream.



Rajah 3 / Diagram 3

(a) (i) Nyatakan jenis bahan tambah makanan bagi natrium benzoat dan fungsinya.
State the type of food additive is sodium benzoate and what is its function.

Jenis bahan tambah makanan : .....
Type of food additive:

Fungsi : .....
Function:

[2 markah][2 marks]

(ii) Apakah kesan pengambilan bahan tambah makanan natrium benzoat secara berlebihan dalam tempoh masa yang panjang?
What is the effect of taking excessive food additive sodium benzoate for a long period of time?

.....

..... [1M]

(iii) Bahan tambah makanan R memberikan tekstur yang seragam dan licin pada aiskrim. Nyatakan jenis bahan tambah R.
Food additive R gives uniformed and smooth texture in ice-cream. State the type of food additive of R.

.....

..... [1M]

(iv) Puan Azwa ingin menghasilkan suatu makanan pencuci mulut tanpa menggunakan pewarna sintetik. Cadangkan bahan yang perlu ditambah oleh Puan Azwa dalam makanan itu untuk mengantikan pewarna sintetik? Apakah kebaikan menggunakan bahan tersebut?

Puan Azwa wants to prepare a desert without using synthetic dyes. Suggest an ingredient should Puan Azwa add into the desert without using synthetic dye? What is the benefit of using this ingredient?

.....

..... [2M]

[2023-Putrajaya-04c] (c) Rajah 4 menunjukkan diagnosis dan cadangan seorang doktor terhadap seorang pesakit selepas sesi konsultasi dijalankan di sebuah klinik.
Diagram 4 shows the diagnosis and recommendation of a doctor towards one of the patient after the consultation session in a clinic.

•Wanita 35 tahun/ *Woman age 35*
•Mengadu sakit kepala yang teruk/ *Complaint of bad headache*
• Mempunyai sejarah sakit gastrik/ *Have history of gastric*

• Jangan berikan aspirin kepada pesakit ini
Do not give aspirin to this patient

Rajah/ Diagram 4

(i) Apakah jenis ubat bagi aspirin?
Mengapakah aspirin tidak boleh diberikan kepada pesakit itu?
What is the type of medicine for aspirin?
Why aspirin cannot be given to the patient?

.....

..... [2M]

(ii) Cadangkan ubat lain yang boleh menggantikan aspirin bagi membantu meredakan sakit kepala wanita itu. Nyatakan kesan sampingan ubat yang anda cadangkan sekiranya diambil secara berlebihan.
Suggest other medicine that can replace aspirin to help to reduce the woman headache. State the side effect of the medicine that you suggest if taken excessively.

.....

.....

..... [2M]

[2023-Putrajaya-04] Jadual 4 menunjukkan dua jenis kosmetik P dan Q yang digunakan secara meluas oleh pengguna.
Table 4 shows two types of cosmetics P and Q widely used by the consumers.

Jenis kosmetik *Type of cosmetics*	Maklumat *Informations*
P	Digunakan untuk mencantikkan wajah: bedak, gincu, pembayang mata *To beautify the face: facial powders, lipstics, eyeshadows*
Q	Rawatan pada tubuh: krim, pelembap kulit dan masker muka *To treat the body: creams, skin moisturisers, facial masks*

Jadual/ Table 4

(a) Berdasarkan Jadual 4, kenal pasti P dan Q.
Based on Table 4, identify P and Q.

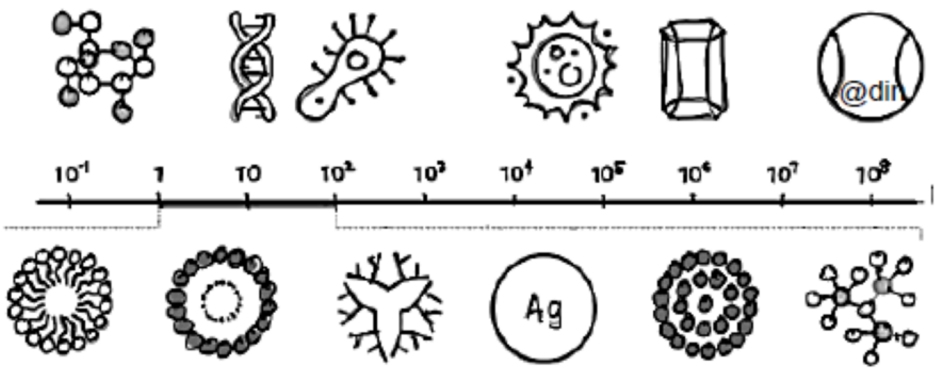
P : .....

Q : ..... [2M]

(b) Dalam lambakan produk kosmetik di pasaran, terdapat bahan kimia terlarang yang biasanya dimasukkan ke dalam krim pemutih yang boleh menyebabkan kulit merengsa, kerosakan buah pinggang dan sistem saraf jika diserap ke dalam salur darah. Apakah bahan kimia terlarang tersebut?
With the wide variety of cosmetic products in the market, there is harmful chemical that usually added illegally into the whitening creams that can caused skin irritation, damage to the kidney and nervous system if absorbed into the bloodstream. What is the harmful chemical?

..... [1M]

[2023-MRSM-01] Rajah 1 menunjukkan perhubungan di antara skala nano dengan bahan-bahan yang ada di sekeliling kita.
Diagram 1 shows the connection between nanoscale and the materials around us.



(a) Apakah yang dimaksudkan dengan nanoteknologi?
What is meant by nanotechnology?

.....

..... [1M]

(b) Senaraikan dua kegunaan nanoteknologi dalam kehidupan harian.
List two uses of nanotechnology in daily life.

.....

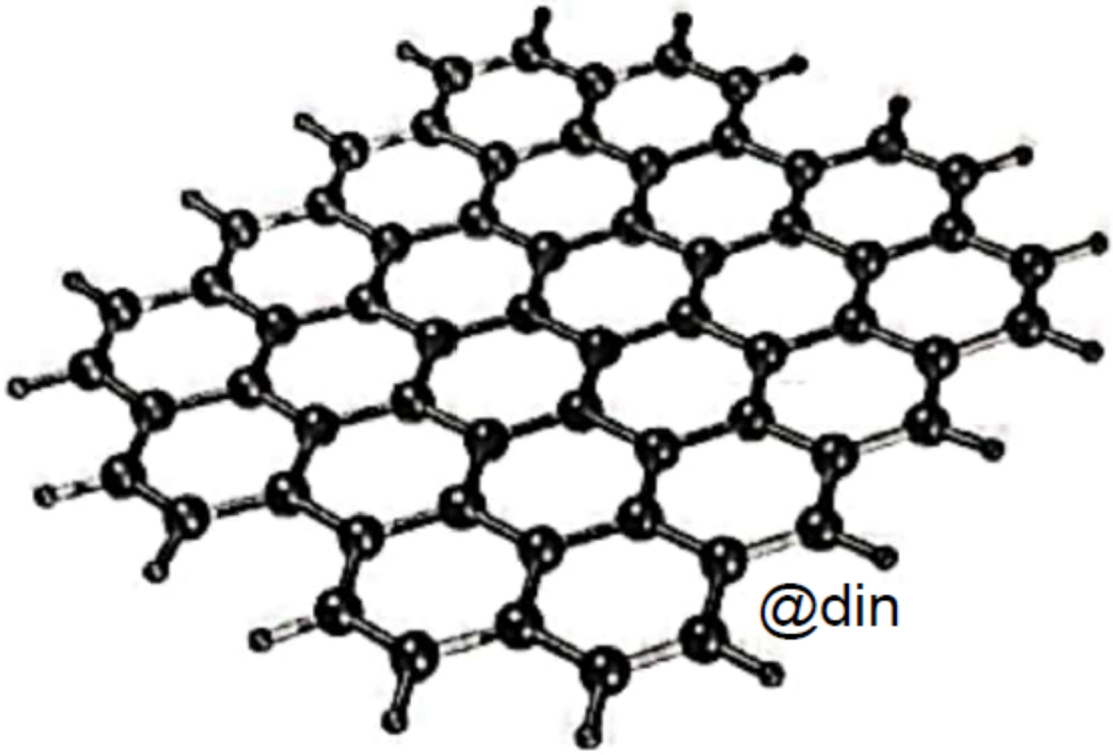
..... [2M]

(c) Grafen merupakan salah satu bahan yang diberi perhatian meluas dalam bidang nanoteknologi. Terangkan bagaimana ciri yang terdapat pada grafen yang membolehkan ia digunakan dalam penghasilan sensor.
Graphene has garnered wide attention material in nanotechnology. Explain how the characteristics of graphene that allow it to be used in sensor production.

.....

..... [2M]

[2023 Johor Bahru-02b] (b) Rajah 2 menunjukkan helaian grafen.
Diagram 2 shows graphene sheet.



Rajah 2 / Diagram 2

(i) Grafen adalah salah satu bahan yang digunakan dalam bidang nanoteknologi. Apakah maksud nanoteknologi?
Graphene is a material used in the field of nanotechnology.
What is the meaning of nanotechnology?

.....

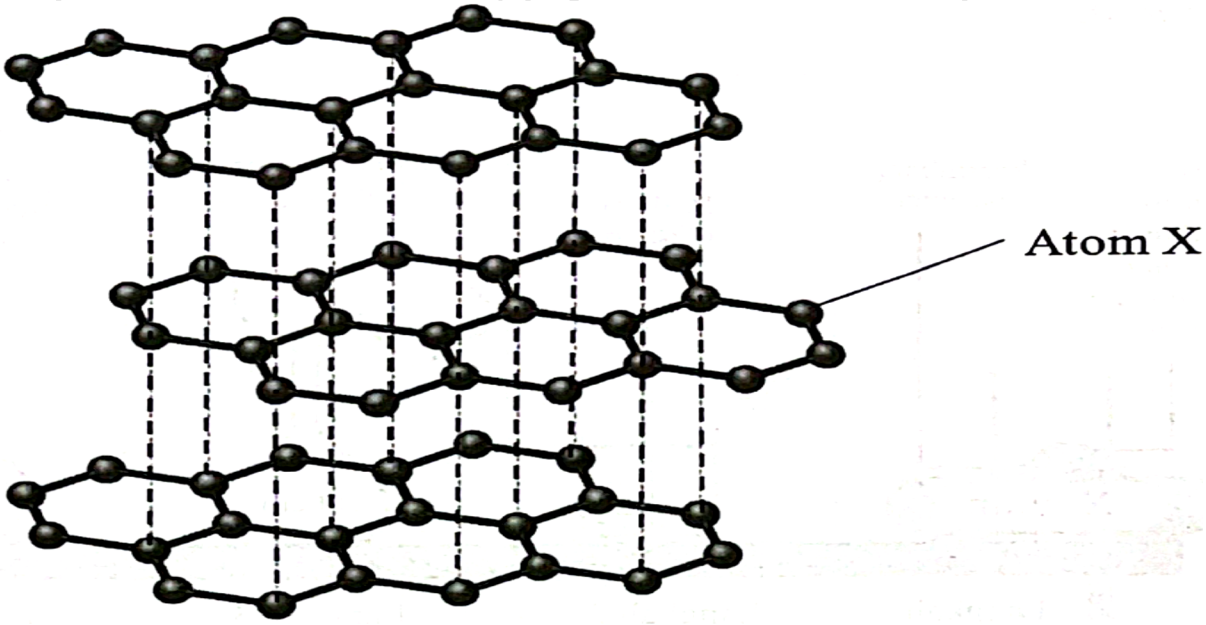
..... [1M]

(ii) Nyatakan sebab grafen digunakan dalam penapis air.
State the reason why graphene is used in water filters.

.....

..... [1M]

[2023-NegeriSembilan-02] Rajah 2 menunjukkan struktur grafen yang digunakan dalam satu industri.
Diagram 2 shows the structure of graphene used in an industry.



Rajah 2 / Diagram 2

(a) Namakan satu bidang yang menggunakan grafen.
Name one field that uses graphene.

..... [1M]

(b) Nyatakan satu sifat fizik bagi grafen.
State one physical property of graphene.

..... [1M]

(c) Apakah ciri istimewa bagi grafen menjadikannya sesuai dalam penghasilan sensor?
What is the special characteristic of graphene that make it suitable for the production of sensors?

.....
[1 markah / mark]

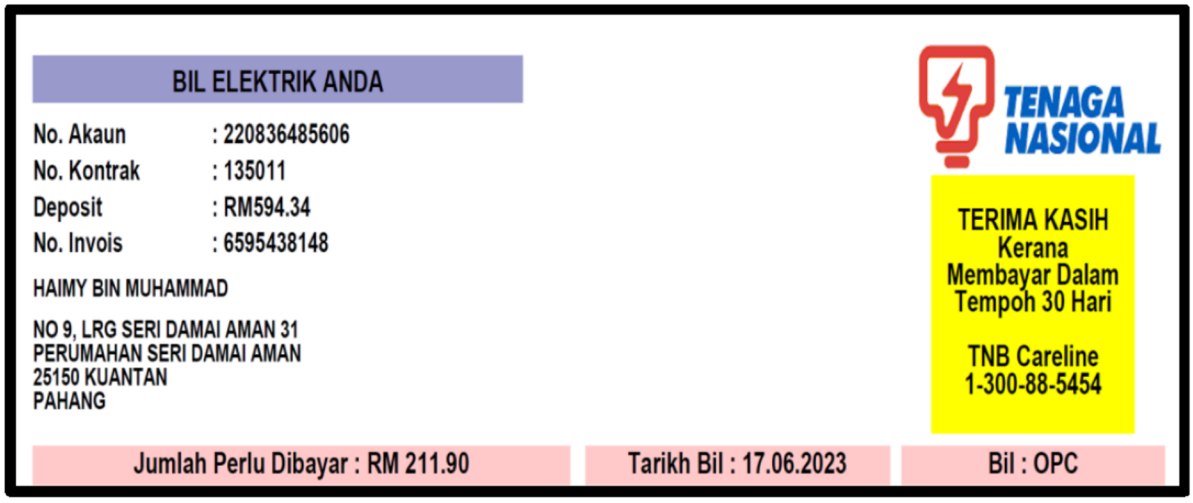
(d) Berdasarkan Rajah 2, namakan atom X dan jenis ikatan terbentuk.
Based on Diagram 2, name atom X and the type of bond formed.

Nama atom X : .....
Name of atom X

Jenis ikatan : .....
Type of bond

[2M]

[2023-Pahang-04c] (c) Rajah 4.2 menunjukkan bil elektrik yang tinggi akibat penggunaan penyaman udara di rumah Haimy.
Diagram 4.2 shows the high electricity bill due to the use of air conditioner in Haimy's house.



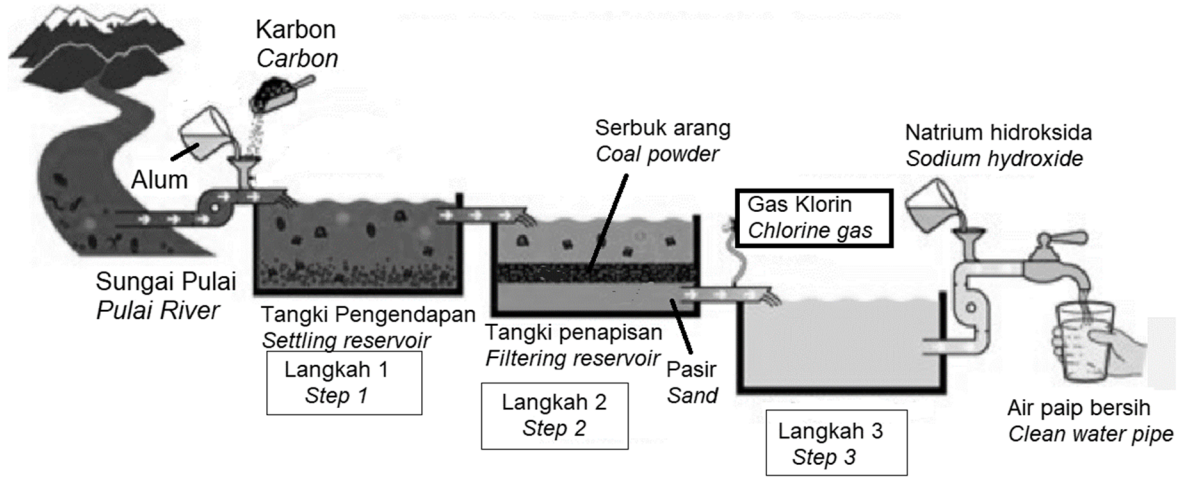
Rajah 4.2 / Diagram 4.2

Berdasarkan pengetahuan anda tentang aplikasi teknologi hijau, nyatakan bagaimana anda dapat mengurangkan penggunaan tenaga di rumah Haimy?
Based on your knowledge of green technology applications, state how you can reduce the energy usage in Haimy's house?

.....

..... [1M]

[2023-Selangor-Set02-10d] (d) Rajah 11.3 menunjukkan langkah-langkah pembersihan air dalam loji rawatan air.
Diagram 11.3 shows the water purification steps in a water treatment plant.



Pada langkah 3, Gas klorin akan dipamkan ke dalam tangki air dan gas klorin melarut dan bertindak balas dengan air seperti yang diwakili oleh persamaan kimia berikut:
In step 3, chlorine gas will be pumped into the tank and the chlorine gas will dissolve and react with water as shown in the following chemical equation:

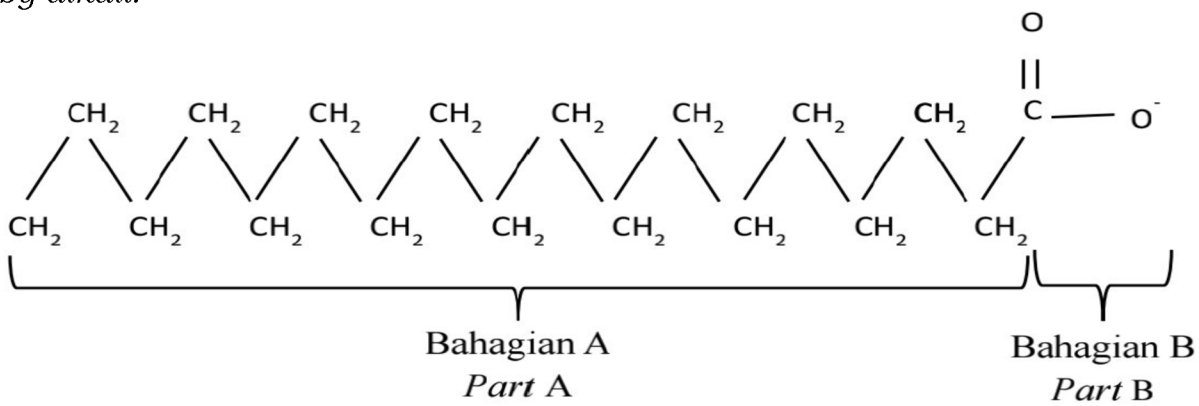
$$Cl_2(g) + H_2O(ce) \rightarrow HOCl(ak) + HCl(ak)$$
$$Cl_2(g) + H_2O(l) \rightarrow HOCl(aq) + HCl(aq)$$

Asid hidroklorik yang terdapat di dalam air paip perlu dineutralkan oleh larutan yang dinyatakan pada rajah langkah 3 sebelum dialirkan ke pengguna.
Hydrochloric acid found in tap water needs to be neutralized by the solution specified in step 3 diagram before it is fed to the user.

Dengan menggunakan pengetahuan kimia anda, huraikan cara untuk menentukan kepekatan asid hidroklorik di dalam air terawat tersebut di makmal dengan menggunakan bahan dan radas seperti larutan fenolhtalein, kelalang kon, buret dan lain-lain.
Using your knowledge of chemistry, describe how to determine the hydrochloric acid concentration in the treated water in the laboratory using materials and apparatus such as phenolphthalein solution, conical flask, burette and others.

[8 markah] [8 marks]

[2023-Melaka-08] (a) Rajah 6.1 menunjukkan formula struktur bagi anion sabun. Sabun boleh disediakan daripada sumber semula jadi melalui proses hidrolisis minyak atau lemak oleh alkali.
Diagram 6.1 shows the structural formula of soap anion. Soap can be prepared from natural sources through the process of hydrolysis of oil or fat by alkali.



Rajah 6.1/ Diagram 6.1

Berdasarkan Rajah 6.1,/ *Based on Diagram 6.1,*

(i) Nyatakan nama proses untuk menghasilkan sabun.
State the name of the process to produce soap.

..... [1M]

(ii) Kenal pasti bahagian yang larut dalam air.
Identify the part that dissolves in water.

..... [1M]

(b) Sewaktu ingin menyalakan unggun api di kawasan perkhemahan, tangan Hisham telah terkena api dan melecur.
While trying to light a bonfire at a campsite, Hisham s hand caught on fire and burned.

(i) Nyatakan satu ubat tradisional yang boleh digunakan untuk merawat tangan Hisham.
State a traditional medicine that can be used to treat Hisham's hand.

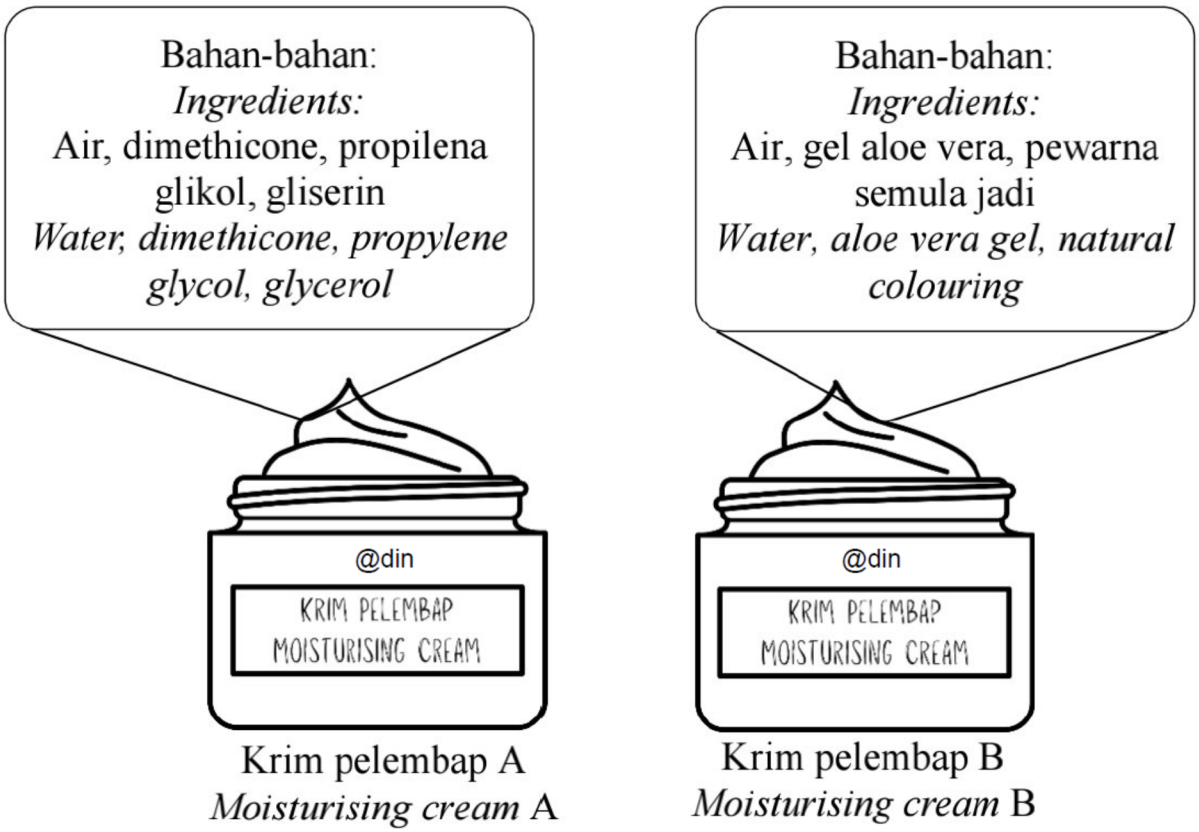
..... [1M]

(ii) Bagaimanakah Hisham boleh menggunakan bahan yang dinyatakan di 8(b)(i) untuk merawat lukanya?
Explain how Hisham can use the substance stated in 8(b)(1) to treat his wound?

.....

..... [2M]

(c) Rajah 6.2 menunjukkan dua produk kecantikan yang dimiliki oleh Mawar.
Diagram 6.2 shows two cosmetic products owned by .



Rajah 6.2/ Diagram 6.2

Sebagai seorang pengguna, cadangkan krim pelembap yang manakah yang boleh digunakan oleh Mawar, Wajarkan jawapan anda.
As a consumer, suggest which moisturising cream can be used by Mawar. Justify your answer.

.....

.....

.....

[3 markah/ marks]

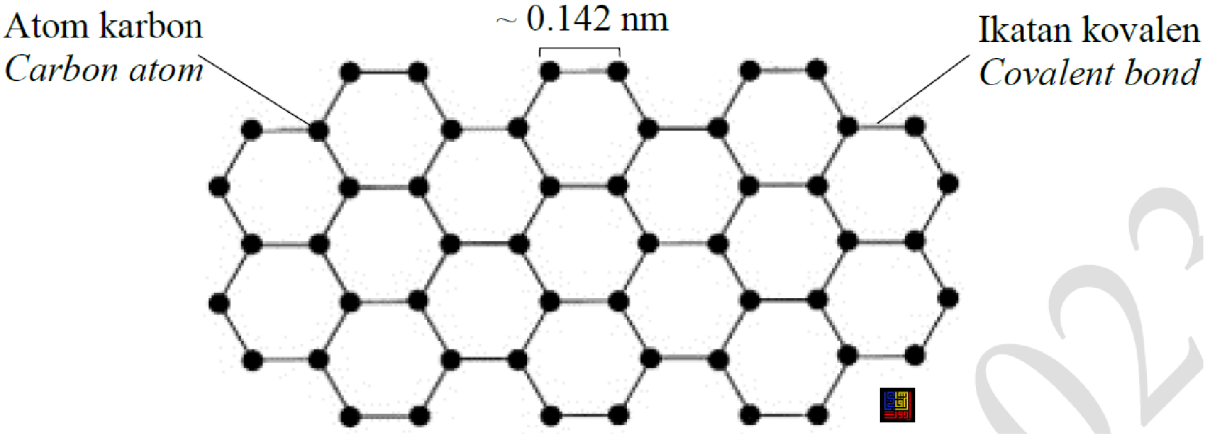
(d) Dialog dal am Rajah 6.3 menunjukkan perbincangan antara pekerja-pekerja sebuah syarikat pengeluaran makanan.
The dialogue in Diagram 6.3 shows the discussions among the staff at a food production company.

Berdasarkan Rajah 6.3, kenalpasti jenis bahan tambah makanan yang dibincangkan oleh pekerja-pekerja itu.
Based on Diagram 6.3, identify the type of food additives discussed by the staff

.....

..... [2M]

[2023-JUJ-Set01-07] (a) Rajah 7.1 menunjukkan helaian grafen.
Diagram 7.1 shows the graphene sheet.



Rajah 7.1 / Diagram 7.1

Grafen adalah bahan yang penting dalam bidang nanosains dan nanoteknologi kerana saiznya yang berukuran 0.1 nm.
Graphene is an important material in the field of nanoscience and nanotechnology due to its 0.1 nm in size.

(i) Apakah maksud nanoteknologi?
What is the meaning of nanotechnology?

.....

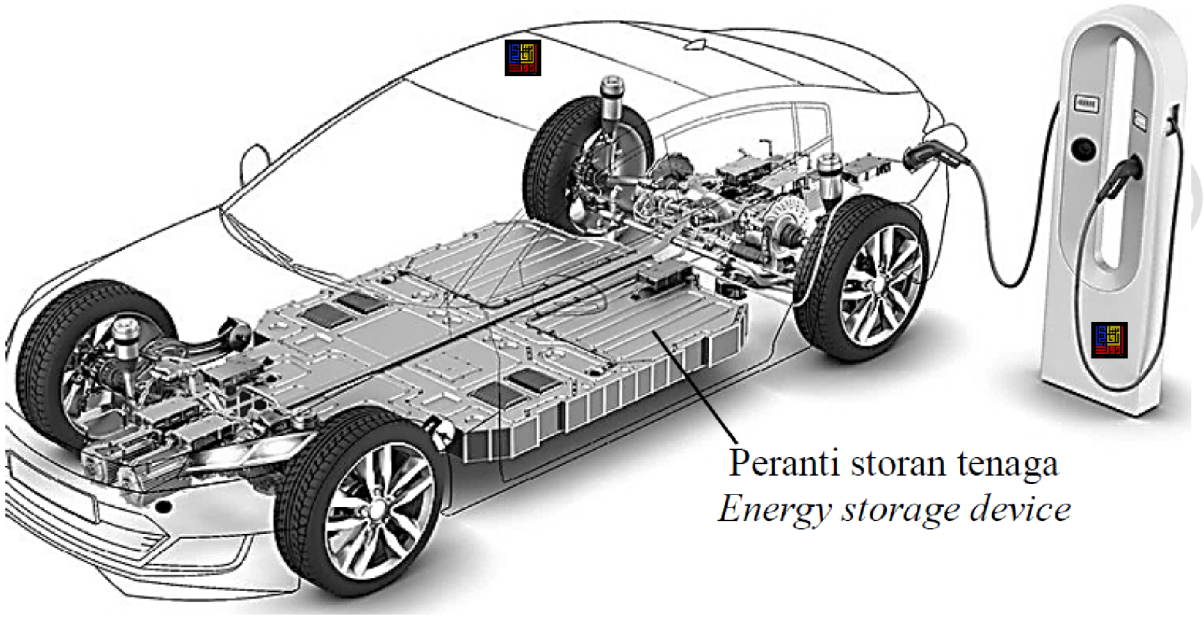
..... [1M]

(ii) Berdasarkan Rajah 7.1, terangkan mengapa grafen sesuai digunakan dalam pembuatan sensor.
Based on Diagram 7.1, explain why graphene is suitable for use in the manufacture of sensors.

.....

..... [1M]

(iii) Penghasilan bateri litium-ion yang dipertingkatkan dengan grafen boleh digunakan sebagai peranti storan tenaga bagi mengecas kenderaan elektrik dan hibrid seperti dalam Rajah 7.2.
The production of lithium-ion batteries enhanced with graphene can be used as an energy storage device to charge electric and hybrid vehicles as shown in Diagram 7.2.



Rajah 7.2 / Diagram 7.2

Nyatakan tiga ciri istimewa penggunaan grafen dalam peranti storan tenaga.
State three special features of using graphene in energy storage devices.

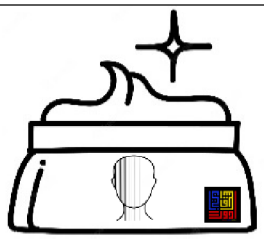
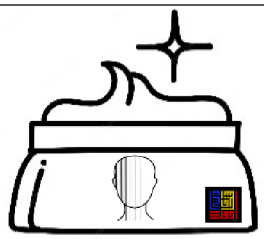
.....

.....

.....

..... [3M]

(b) Jadual 7 menunjukkan kandungan dan kesan penggunaan krim muka A dan krim muka B.
Table 7 shows the ingredient and effects of using face cream A and face cream B.

Krim Muka Face Cream		
Kandungan *Ingredient*	Bahan semula jadi *Natural substance*	Bahan kimia *Chemical substance*
Kesan selepas enam bulan penggunaan *Effects after six months of consumption*	• Kulit cerah Skin brightens • Kulit menjadi lebih lembap *Skin becomes more moisturised*	• Kulit cerah Skin brightens • Kulit menjadi gatal dan kemerahan Skin becomes itchy and reddish • Kulit menggelupas *Peeling skin*

Jadual 7 / Table 7

Berdasarkan Jadual 7,/ *Based on Table 7,*

(i) nyatakan jenis kosmetik bagi krim muka A dan krim muka B.
state the type of cosmetics for face cream A and face cream B.

..... [1M]

(ii) sebagai seorang pelajar kimia, jelaskan mengapa terdapat perbezaan kesan penggunaan krim muka A dan krim muka B selepas enam bulan.
as a chemistry student, explain why explain why there is a difference in the effects of using face cream A and face cream B after six months.

.....

.....

..... [2M]

(c) Terdapat pelbagai sisa buangan di sekolah anda seperti sisa makanan dan botol plastik. Sebagai seorang pelajar yang mempunyai pengetahuan mengenai Teknologi Hijau, cadangkan satu kaedah yang boleh mengatasi masalah itu dan wajarkan jawapan anda.
There are various wastes in your school such as food wastes and plastic bottles. As a student who has knowledge of Green Technology, suggest a method that can overcome the problem and justify your answer.

.....

.....

.....

..... [2M]