



TINGKATAN 5

Jom A⁺ Kimia

SPM 2022

Hak Milik :

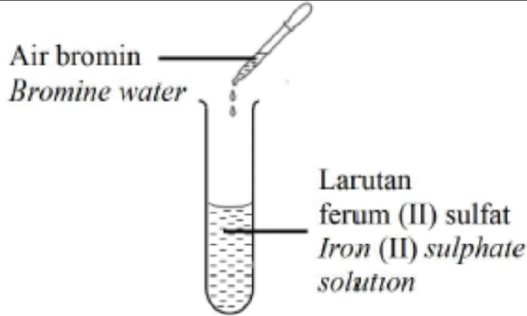
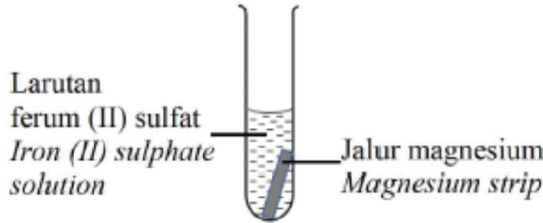
Nama :

Kelas : 5

Bab 1

[Kelantan2022-06] Seorang pelajar menjalankan dua set eksperimen bagi mengkaji tentang tindak balas redoks. Maklumat eksperimen ditunjukkan dalam Jadual 3.

A student conducts two sets of experiments to study redox reactions. The experimental information is shown in Table 3.

Set Set	Tindak balas Reaction	Pemerhatian Observation
I		Larutan berwarna hijau berubah menjadi perang The green solution turn to brown
II		Enapan pepejal kelabu terenal pada kepingan magnesium Grey solid deposited on magnesium strip

(a) Nyatakan maksud tindak balas redoks
State the meaning of redox reaction

.....
.....[1M]

(b) Berdasarkan Set I/ Based on Set I

(i) Terangkan perubahan yang berlaku
Explain the changes that occurred

.....
.....
.....[2M]

(ii) Berdasarkan pemerhatian, huraikan satu ujian kimia bagi mengesahkan kehadiran ion yang menyebabkan warna perang terbentuk.
Based on the observations, describe a chemical test to confirm the presence of ions that cause the brown colour to form.

.....

[2M]

(c) (i) Tuliskan setengah persamaan bagi tindak balas penurunan dalam
 Write the half equation for the reduction reaction in

Set I :

Set II :[2M]

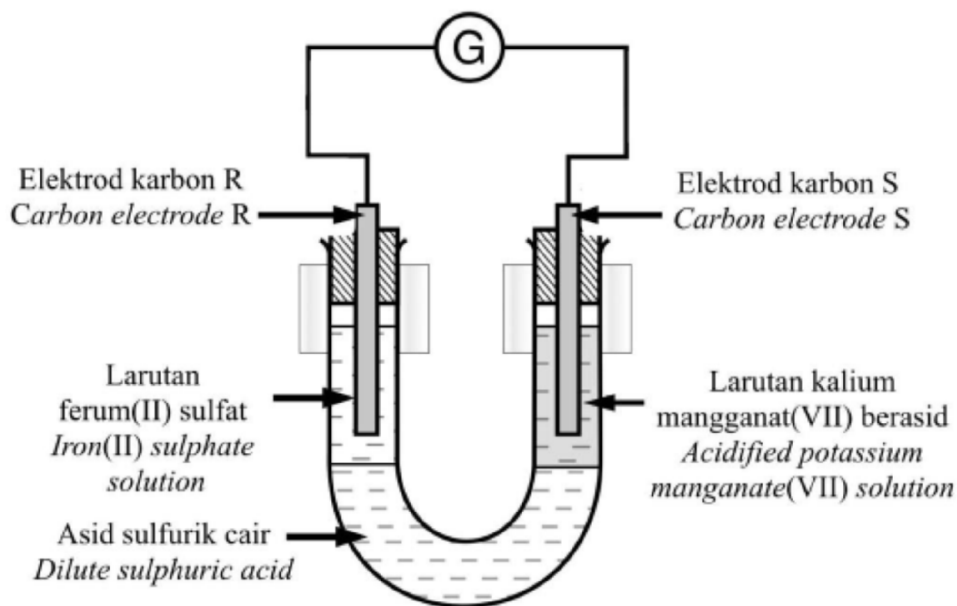
(ii) Nyatakan fungsi larutan ferum (II) sulfat dalam
 State the function of iron (II) sulphate solution in

Set I :

Set II :[2M]

[Perlis2022-02] Rajah 2 menunjukkan susunan radas bagi satu eksperimen untuk mengkaji pemindahan elektron pada suatu jarak dalam tindak balas redoks.

Diagram 2 shows the apparatus set-up for an experiment to investigate electron transfer at a distance in redox reaction.



(a) Nyatakan warna larutan ferum(II) sulfat.
 State the colour of iron(II) sulphate solution.

.....[1M]

(b) Apabila litar dilengkapkan, galvanometer menunjukkan satu pesongan. Nyatakan jenis tindak balas di elektrod R.

When the circuit is completed, the galvanometer shows a deflection.

State the type of reaction at R electrode.

.....[1M]

(c) Merujuk kepada tindak balas yang berlaku pada elektrod S,

Referring to the reaction that takes place at S electrode,

(i) Nyatakan pemerhatian pada larutan kalium manganat(VII) berasid.

State the observation for acidified potassium manganate(VII) solution.

.....[1M]

(ii) Nyatakan perubahan nombor pengoksidaan mangan dalam (c)(i).

State the change in oxidation number of mangan in (c)(i).

.....[1M]

(d) Lukiskan anak panah pada Rajah 2 untuk menunjukkan arah aliran elektron.

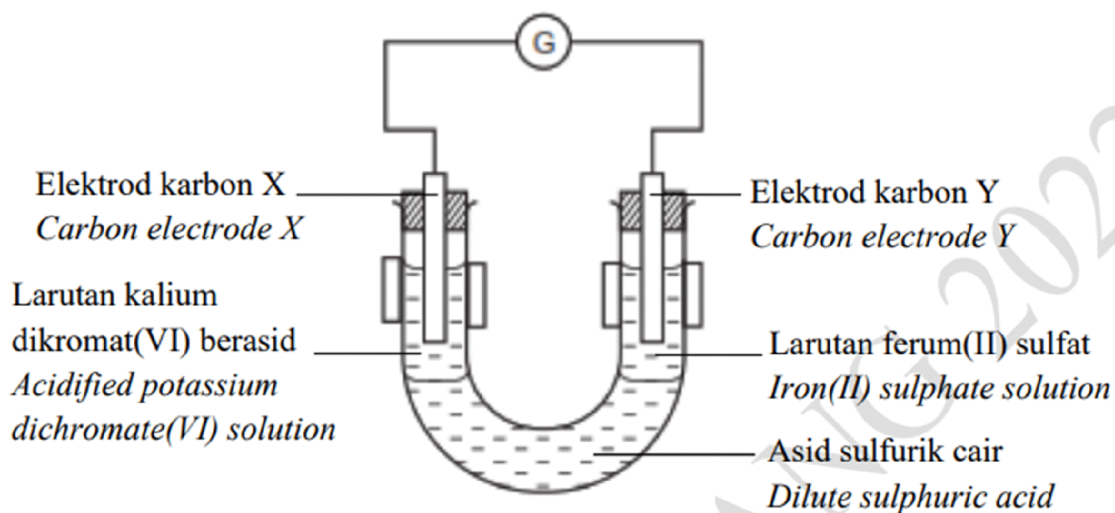
Draw the arrow on Diagram 2 to show the direction of electron flow. [1M]

[JUJ2022-Set01-08] Sekumpulan pelajar telah menjalankan eksperimen untuk mengkaji tindak balas redoks.

A group of students have conducted experiment to study redox reactions.

(a) Rajah 8.1 menunjukkan susunan radas untuk mengkaji pemindahan elektron pada suatu jarak.

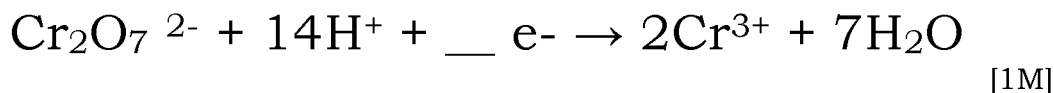
Diagram 8.1 shows the set-up of apparatus to study the transfer of electrons at a distance.



- (i) Nyatakan fungsi asid sulfurik cair.
State the function of dilute sulfuric acid.

.....[1M]

- (ii) Lengkapkan setengah persamaan berikut:
Complete the following half equation:



- (iii) Hitungkan nombor pengoksidaan kromiun dalam ion dikromat(VI).
Calculate the oxidation number of the chromium ion in the dichromate(VI) ion.

[2M]

(b) Seterusnya, kumpulan pelajar tersebut menyediakan dua set radas bagi mengkaji faktor pemilihan ion untuk dinyahcas dalam elektrolisis larutan natrium klorida. Jadual 8.1 menunjukkan pemerhatian di anod bagi kedua-dua set eksperimen tersebut.

Next, the students' group prepared two sets of apparatus to study the factor in choosing of ions to be discharged in the electrolysis of sodium chloride solution. Table 8.1 shows the observations at anode for both sets of experiments.

Set	Larutan Solution	Pemerhatian di Anod Observation at Anode
I	Larutan natrium klorida 0.001 mol dm ⁻³ Sodium chloride solution 0.001 mol dm ⁻³	- Gas tidak berwarna terbebas Colourless gas is produced - Gas menghasilkan bunyi "pop" apabila diuji dengan kayu uji bernyala The gas produces a "pop" sound when tested with a lighted wooden splinter
II	Larutan natrium klorida 1 0 mol dm ⁻³ Sodium chloride solution 1.0 mol dm ⁻³	- Gas kuning kehijauan terbebas Greenish yellow gas is produced - Gas menukarkan kertas litmus biru lembap kepada merah kemudian luntur The gas turns moist blue litmus paper to red and then bleached

Berdasarkan Jadual 8,/ Based on Diagram 8,

(i) Nyatakan ion yang terpilih untuk dinyahcas di anod dalam set I dan set II.

State the ion selected to be discharged at the anode in set I and set II.

Set I :

Set II :[2M]

(ii) Jelaskan faktor pemilihan ion di anod dalam set II.

Explain the factor in choosing the ions at anode in set II.

.....[1M]

(c) Dalam satu sesi yang lain, kumpulan pelajar tersebut dikehendaki menjalankan satu eksperimen untuk menyadur sebatang sudu besi bagi mencegah pengaratan.

In another session, the students' group was required to carry out an experiment to electroplate an iron spoon to prevent rusting.

Rajah 8.2 menunjukkan senarai radas dan bahan yang dibekalkan.

Diagram 8.2 shows the list of apparatus and materials supplied.

Radas dan bahan / Apparatus and materials		
• Bikar Beaker	• Wayar penyambung Connecting wires	• Kepingan kuprum Copper plate
• Ammeter Ammeter	• Sudu besi Iron spoon	• Larutan X Solution X
• Sel kering Dry cells	• Suis Switch	

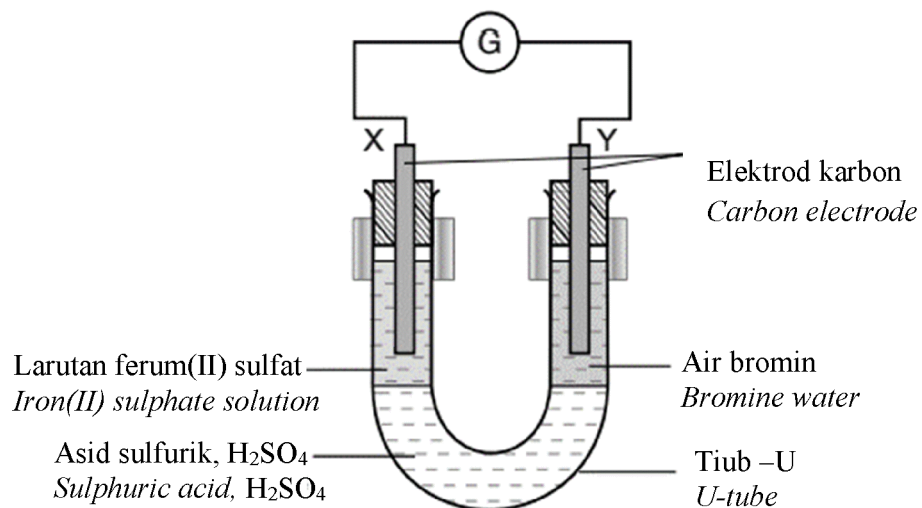
Dengan mencadangkan satu larutan X yang sesuai, lukiskan satu rajah berlabel bagi menunjukkan susunan radas bagi proses penyaduran tersebut. Rajah itu hendaklah menggunakan radas dan bahan yang dibekalkan dalam Rajah 8.2.

By suggesting a suitable solution X, draw a labelled diagram to show the set-up of the apparatus for the electroplating process. The diagram should use the apparatus and materials supplied in Rajah 8.2.

[3M]

[Pahang2022-08] (a) Rajah 8.1 menunjukkan susunan radas untuk mengkaji pemindahan elektron pada satu jarak dalam tindak balas redoks.

Diagram 8.1 shows the apparatus set-up to investigate electron transfer at a distance in redox reactions.



Berdasarkan Rajah 8.1,/ Based on Diagram 8.1,

(i) Apakah fungsi asid sulfurik, H_2SO_4 ?

What is the function of sulphuric acid, H_2SO_4 ?

.....[1M]

(ii) Tuliskan setengah persamaan pada elektrod X dan elektrod Y

Write the half equations for electrode X and electrode Y

Elektrod X / Electrode X:

Elektrod Y / Electrode Y: [2M]

(iii) Nyatakan perubahan nombor pengoksidaan bagi air bromin.

State the change in oxidation number for bromine water.

.....[1M]

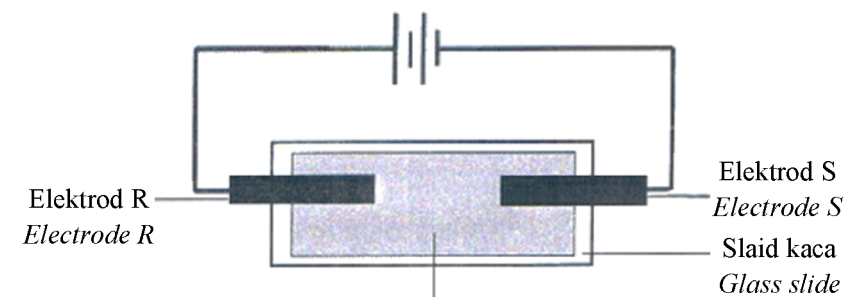
(b) Lukis satu susunan radas berlabel yang dapat digunakan untuk eksperimen untuk mengkaji pemindahan elektron pada suatu jarak dengan menggunakan semua bahan dan radas dalam Rajah 8.1, kecuali tiub-U dan kaki retort. Anda juga dibekalkan dengan larutan kalium iodida dan larutan kalium manganat(VII) berasid bagi menggantikan larutan ferum(II) sulfat dan air bromin. Beberapa radas lain yang sesuai boleh digunakan bagi mengubahsuai eksperimen ini.

Tunjukkan arah pengaliran elektron dalam rajah yang dilukis.

Draw labelled set-up of apparatus that could be used for an experiment to investigate the transfer of electrons at a distance using all the materials and apparatus in Diagram 8.1, except the U-tube and the retort stand. You are also supplied with potassium iodide solution and acidified potassium manganate(VII) solution to replace iron(II) sulphate solution and bromine water. Any other suitable apparatus can be used to modify this experiment. Show the direction of electron flow in the drawn diagram.

[3M]

(c) Sehelai kertas litmus biru dicelupkan ke dalam larutan natrium klorida pekat, NaCl dan diletakkan di atas sekeping slaid kaca. Dua elektrod karbon, R dan S diletakkan di atas kertas litmus itu. Elektrod-elektrod itu disambungkan kepada bateri seperti yang ditunjukkan dalam Rajah 8.2. A piece of blue litmus paper is dipped into a concentrated sodium chloride solution, NaCl and placed on a piece of glass slide. Two carbon electrodes, R and S are placed on the litmus paper. The electrodes are connected to the battery as shown in Diagram 8.2.



Kertas litmus biru dicelup ke dalam larutan natrium klorida pekat, NaCl
Blue litmus paper soaked in concentrated sodium chloride solution, NaCl

Jadual 8 menunjukkan pemerhatian pada kertas litmus biru selepas 15 minit.

Table 8 shows the observation on the blue litmus paper after 15 minutes.

Elektrod Electrode	Pemerhatian pada kertas litmus biru selepas 15 minit Observation on blue litmus paper after 15 minutes
R	Kertas litmus biru bertukar merah dan kemudian dilunturkan. <i>The blue litmus paper turns red and then bleached.</i>
S	Warna kertas litmus biru tidak berubah. <i>The colour of blue litmus paper remains unchanged.</i>

Nilai E° / E° value:



Berdasarkan Jadual 8, terangkan perbezaan pemerhatian bagi kertas litmus biru pada elektrod R dan elektrod S selepas 15 minit.

Based on Table 8, explain the differences in the observation of the blue litmus paper at the electrode R and the electrode S after 15 minutes.

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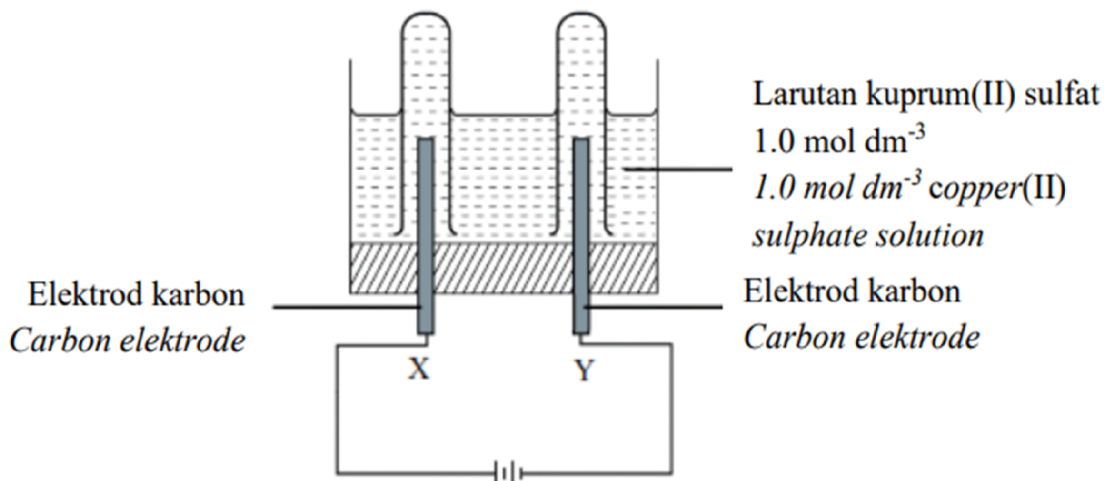
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.....

.....[3M]

[JUJ2022-Set02-07] Rajah 7 menunjukkan susunan radas untuk elektrolisis larutan kuprum(II) sulfat menggunakan elektrod karbon.

Diagram 7 shows the apparatus set up for electrolysis of copper(II) sulphate solution using carbon electrodes.



Jadual 7 menunjukkan sebahagian siri keupayaan elektrod piawai.
Table 7 shows part of the standard electrode potential series.

Tindak balas sel setengah Half-cell equation	E° / V (298 K)
$2\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{H}_2$	0.00
$\text{Cu}^{2+} + 2\text{e}^- \rightleftharpoons \text{Cu}$	+0.34
$\text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^- \rightleftharpoons 4\text{OH}^-$	+0.40
$\text{S}_2\text{O}_8^{2-} + 2\text{e}^- \rightleftharpoons 2\text{SO}_4^{2-}$	+2.01

(a) Nyatakan perubahan tenaga yang berlaku dalam proses elektrolisis.
State the energy change that take place in electrolysis process.

.....[1M]

(b) Tentukan elektrod yang bertindak sebagai katod.[1M]
Determine electrode that act as cathode.

(c) Apakah yang dapat diperhatikan pada elektrod X?
Terangkan jawapan anda.
What can be observed at electrode X? Explain your answer.

.....
.....

.....[3M]

(d) Tuliskan persamaan setengah bagi tindak balas yang berlaku pada elektrod X dan elektrod Y.

Write half equation for the reaction that takes place at electrode Y.

Elektrod X/ Electrode X :

Elektrod Y/ Electrode Y : [2M]

(e) Hilmi mendapati kunci besinya telah berkarat. Dengan menggunakan pengetahuan tentang elektrolisis:

Hilmi wants to electroplate his keys with copper metal to avoid rusting. By using the knowledge of electrolysis:

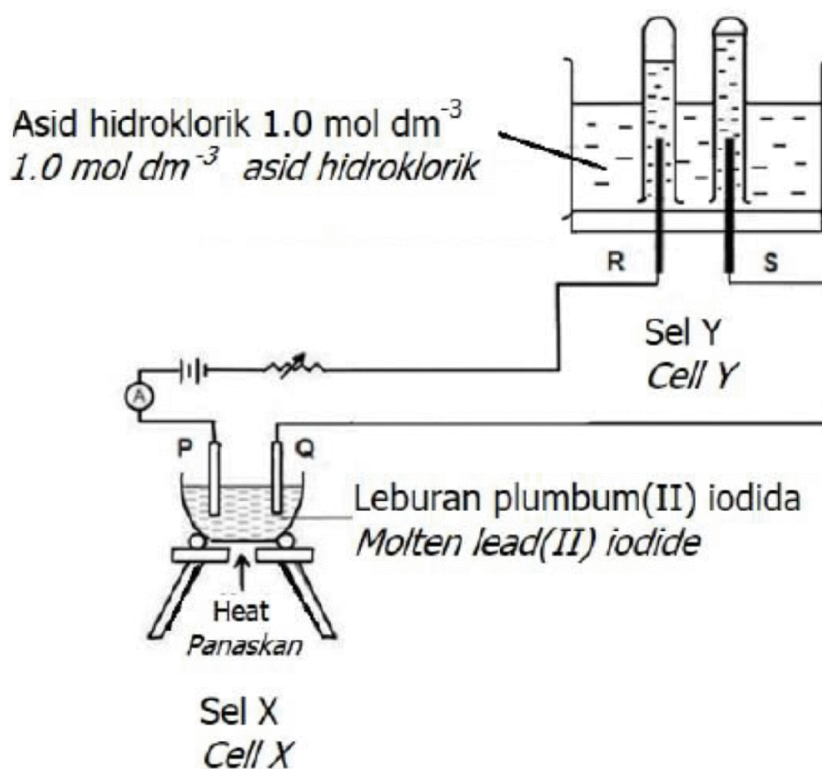
(i) cadangkan nama proses untuk menjadikan kunci besi tersebut lebih menarik dan tahan karat.
suggest the name of the process to make the iron key looks more attractive and resistance to corrosion.

.....[1M]

(ii) lukiskan susunan radas yang sesuai bagi membantu Hilmi menjalankan proses tersebut di dalam makmal.

draw a suitable apparatus set-up to help Hilmi carry out the process in the laboratory.

[Johor2022-SetB-07] Rajah 7.1 menunjukkan susunan radas bagi sel X dan sel Y menggunakan elektrod karbon P, Q, R dan S. [2M]
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.[1M]
State the cathodes for cell Y.

(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/ Electrode Q: [2M]

(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.

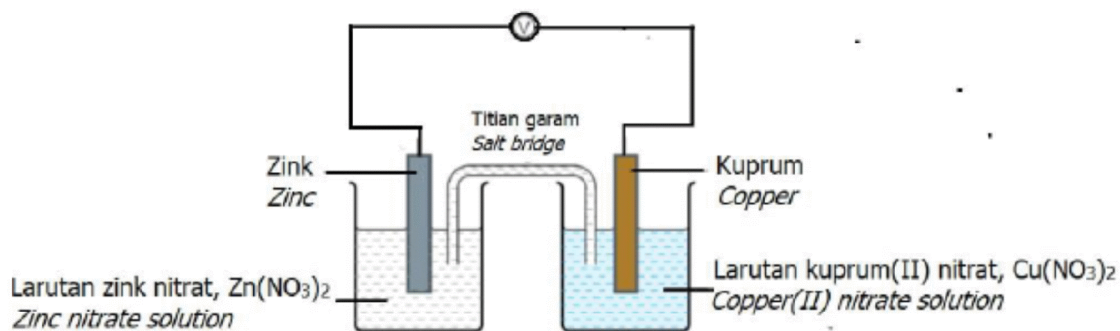
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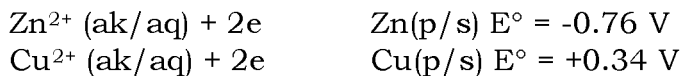
.....[2M]

(b) Rajah 7.2 menunjukkan susunan radas bagi satu sel kimia.

Diagram 7.2 shows an apparatus setup for a chemical cell.



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



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 mereka cipta 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.

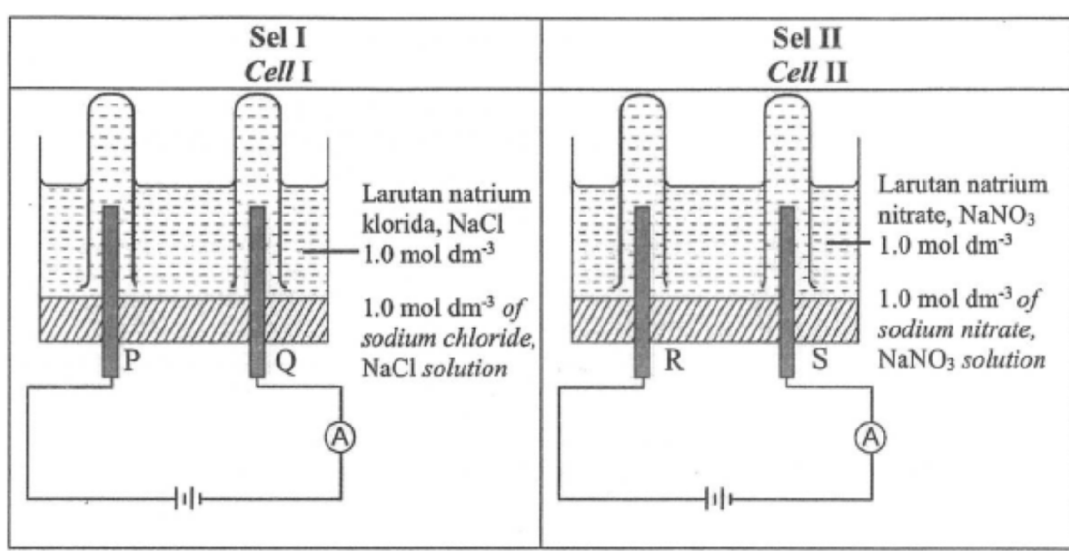
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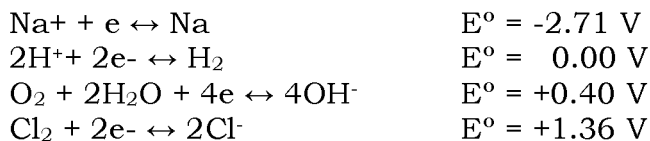
.....[2M]

[MRSM2022-08] Rajah 8 menunjukkan elektrolisis larutan natrium klorida, NaCl dan natrium nitrat, NaNO₃ dengan menggunakan elektrod-elektrod karbon.

Diagram 8 shows the electrolysis of sodium chloride, NaCl solution and sodium nitrate, NaNO₃ solution using carbon electrodes.



Diberi nilai keupayaan elektrod piawai berikut.
Given the following standard electrode potential value.



(a) Berdasarkan Sel I, / Based on Cell I,

(i) Nyatakan semua anion yang hadir dalam larutan natrium klorida, NaCl.
State all anions present in sodium chloride, NaCl solution.

.....[1M]

(ii) Namakan hasil yang terbentuk pada elektrod P.
Name the product formed at electrode P.

.....[1M]

(iii) Terangkan jawapan anda berdasarkan pemilihan ion yang dinyahcas di 8(a)(ii).
Explain your answer based on the selection of ions to be discharged in 8(a)(ii).

.....[1M]

(iv) Huraikan satu ujian kimia bagi menentusahkan hasil yang terbentuk pada elektrod P.
Describe a chemical test to verify the product formed at P electrode.

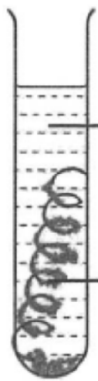
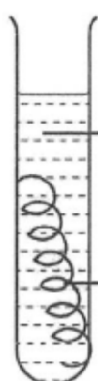
.....
.....[2M]

(b) Tuliskan setengah persamaan pada elektrod R dalam Sel II.
Write half equation at R electrode in Cell II.

.....[1M]

(c) Jadual 8 menunjukkan suatu eksperimen untuk mengkaji tindak balas penyesaran logam.

Table 8 shows an experiment to investigate the displacement of metals.

Tabung uji Test tube	I	II
	 Larutan plumbum(II) nitrat, $\text{Pb}(\text{NO}_3)_2$ Lead(II) nitrate, $\text{Pb}(\text{NO}_3)_2$ solution Dawai besi Iron wire	 Larutan plumbum(II) nitrat, $\text{Pb}(\text{NO}_3)_2$ Lead(II) nitrate, $\text{Pb}(\text{NO}_3)_2$ solution Dawai kuprum Copper wire
Pemerhatian Observations.	Pepejal kelabu terbentuk Grey solid formed	Tiada perubahan No changes

(i) Berdasarkan Jadual 8,
Bandingkan dan terangkan perbezaan dalam pemerhatian.

Based on Table 8,
Compare and explain the difference in the observations.

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.....

.....

.....[3M]

(ii) Berdasarkan jawapan anda di 8(c)(i), cadangkan satu langkah yang perlu diambil bagi memastikan tindak balas berlaku dalam tabung uji II.

Based on your answer in 8(c)(i), suggest an action to be taken to ensure reaction occurs in test tube II.

.....

.....[1M]

[Pahang PPD Jerantut 2022-05] Jadual 1 menunjukkan penerangan dan pemerhatian bagi dua eksperimen, I dan II.

Table 1 shows the description and observation for two experiments, I and II.

Eksperimen <i>Experiment</i>	Penerangan <i>Description</i>	Pemerhatian <i>Observation</i>
I	Elektrolisis larutan natrium sulfat 1 mol dm^{-3} dengan menggunakan elektrod karbon. <i>Electrolysis of 1 mol dm^{-3} sodium sulphate solution using carbon electrodes.</i>	Gelembung gas terbebas di anod dan di katod. <i>Gas bubbles are released at the anode and cathode.</i>
II	Pembakaran 1.2 g serbuk magnesium dalam oksigen berlebihan. <i>Combustion of 1.2 g magnesium powder in excess oxygen.</i>	Nyalaan putih berkilau dan serbuk putih dihasilkan. <i>Glaring white flame is seen and white powder is formed.</i>

(a) Berdasarkan Eksperimen I/ *Based on experiment I*

(i) Senaraikan kesemua ion yang terdapat dalam larutan natrium sulfat.

List all ions are present in sodium sulphate solution.

.....[1M]

(ii) Namakan gas yang terbebas di katod. Nyatakan bagaimana anda mengesahkan gas tersebut.

Name the gas liberated at the cathode. State how you would verify the gas.

.....

.....

.....[2M]

(iii) Terangkan bagaimana gas tersebut terhasil di katod.

Explain how the gas is formed at the cathode.

.....

.....

.....[3M]

(b) Berdasarkan Eksperimen II/ *Based on experiment II:*

(i) Namakan serbuk putih yang terhasil.[1M]

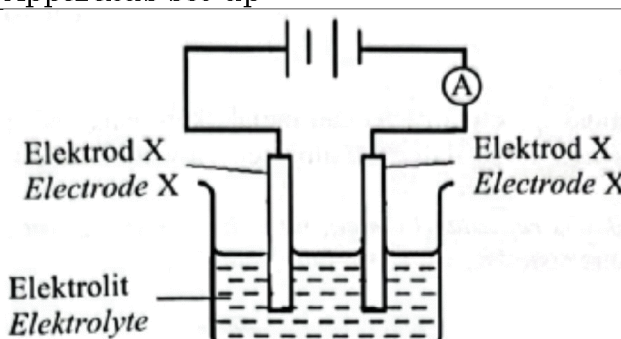
Name the white powder formed.

(ii) Nyatakan perubahan nombor pengoksidaan bagi magnesium
State the change in oxidation number for magnesium.

.....[1M]

[SBP2022-07] (a) Jadual 7.1 menunjukkan susunan radas dan pemerhatian bagi satu proses elektrolisis.

Table 7.1 shows the apparatus set-up and observation for the electrolysis process.

Susunan radas Apparatus set-up	Pemerhatian Observations	
	Anod Anode	Katod Cathode
	Elektrod menipis electrode becomes thinner	Pepejal kelabu berkilat terdeposit Shiny grey solid is deposited

Jadual 7.2 menunjukkan nilai E° bagi beberapa sel setengah.

Table 7.2 shows the E° value for a few half-cells.

Tindak balas sel setengah Half-cell equation	Nilai E° (V) E° value (V)
$\text{Na}^+ (\text{ak/aq}) + e \rightleftharpoons \text{Na} (\text{p/s})$	-2.71
$2\text{H}^+ (\text{ak/aq}) + 2e \rightleftharpoons \text{H}_2(\text{g})$	0.00
$\text{O}_2(\text{g}) + 2\text{H}_2\text{O}(\text{ce/l}) + 4e \rightleftharpoons 4\text{OH}^- (\text{ak/aq})$	+0.40
$\text{Ag}^+ (\text{ak/aq}) + e \rightleftharpoons \text{Ag} (\text{p/s})$	+0.80
$\text{NO}_3^- (\text{ak/aq}) + 4\text{H}^+(\text{ak/aq}) + 3e \rightleftharpoons \text{NO}(\text{g}) + 2\text{H}_2\text{O} (\text{ce/l})$	+0.96
$\text{Cl}_2 (\text{g}) + 2e \rightleftharpoons 2\text{Cl}^- (\text{ak/aq})$	+1.36

(i) Nilai keupayaan elektrod piawai, E° bagi sesuatu elektrod dapat diukur dengan menggandingkan elektrod tersebut dengan elektrod hidrogen piawai di bawah keadaan piawai. Nyatakan salah satu keadaan tersebut.

The value of standard electrode potential, E° of an electrode can be measured by pairing up the electrode to the standard hydrogen electrode under standard conditions. State one of the conditions.

.....[1M]

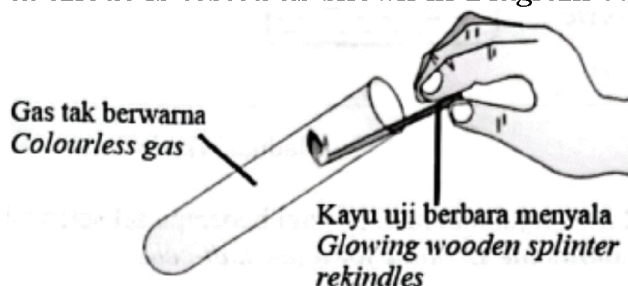
(ii) Berdasarkan pemerhatian dalam Jadual 7.1 dan nilai E° yang diberikan dalam Jadual 7.2, apakah elektrolit yang digunakan?

Based on the observation in Table 7.1 and E° value given in Table 7.2, what is the electrolyte used?

.....[1M]

(iii) Eksperimen dalam Jadual 7.1 diulang dengan melakukan pengubahsuaian pada susunan radas dan gas yang terhasil di anod diuji seperti yang ditunjukkan dalam Rajah 7.1.

Experiment in Table 7.1 is repeated by modifying the apparatus set-up and the gas collected at anode is tested as shown in Diagram 7.1.



Sebagai seorang pelajar kimia, apakah pengubahsuaian yang telah dilakukan terhadap susunan radas dalam Jadual 7.1? Terangkan bagaimana gas tersebut terhasil.

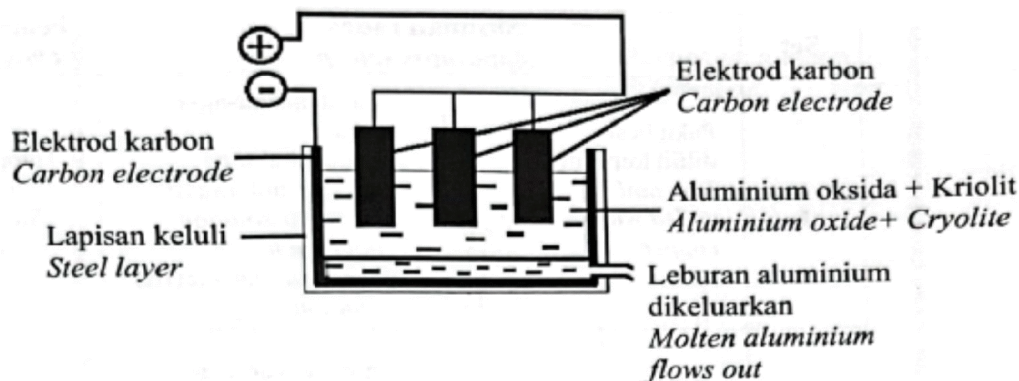
As a chemistry student, what modification that has been done to the apparatus set-up in Table 7.1? Explain how the gas is produced.

.....

[3M]

(b) Rajah 7.2 menunjukkan proses pengekstrakan aluminium daripada aluminium oksida.

Diagram 7.2 shows the extraction process of aluminium from aluminium oxide.



Adakah proses pengekstrakan tersebut sesuai dijalankan dalam industri? Wajarkan.

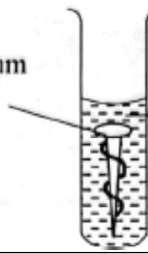
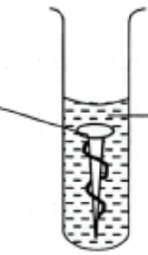
Is the extraction process suitable to be run in industry? Justify.

.....

[2M]

(c) Jadual 7.3 menunjukkan susunan radas dalam satu eksperimen yang digunakan untuk mengkaji kesan logam yang berbeza ke atas pengamatan paku besi.

Table 7.3 shows the apparatus set-up in an experiment to investigate the effect of different metals on the rusting of iron nail.

Set	Susunan radas Apparatus set-up	Pemerhatian Observation
I	Paku besi dililit kuprum <i>Iron nail coiled with copper</i>  Larutan agar-agar panas + larutan kalium heksasianoferat(III) <i>Hot agar solution + potassium hexacyanoferrate(III) solution</i>	Tompok biru hadir Blue spots present
II	Paku besi dililit zink <i>Iron nail coiled with zinc</i>  Larutan agar-agar panas + larutan kalium heksasianoferat(III) <i>Hot agar solution + potassium hexacyanoferrate(III) solution</i>	Tiada perubahan No change

Terangkan perbezaan pemerhatian dalam tabung uji bagi kedua-dua set eksperimen dalam Jadual 7.3

Explain the differences of observation in the test tubes for both sets of experiment in Table 7.3.

.....

[3M]

[Putrajaya2022-07] Seorang murid diberikan bahan dan radas seperti berikut.

A student is provided with the following materials and apparatus.

Bahan : Kepingan zink, kepingan kuprum, asid sulfurik cair, larutan zink sulfat, larutan kuprum(II) sulfat

Radas : Bikar, wayar penyambung, voltmeter, tiub kaca

Materials : Zinc plate, copper plate, dilute sulphuric acid, zinc sulphate solution, copper(II) sulphate solution

Apparatus : Beakers, connecting wire, voltmeter, glass tube

(a) Dengan menggunakan semua bahan dan radas yang disediakan, lukis susunan radas untuk menghasilkan elektrik daripada tindak balas kimia.
By using all the materials and apparatus provided, draw the set-up of the apparatus to produce electricity from chemical reaction.

[2M]

(b) Nyatakan nama larutan yang digunakan sebagai titian garam.
State the name of the solution that is used as a salt bridge.

.....[1M]

(c) Apakah fungsi titian garam? /What is the function of salt bridge?

.....[1M]

(d) Label susunan radas di atas dengan berikut:
Label on the set-up of apparatus with the following:

i) Terminal negatif dan terminal positif
Negative terminal and positive terminal

ii) Arah pengaliran elektron/ The direction of electron flow [2M]

(e) Tulis setengah persamaan bagi tindak balas yang berlaku di terminal negatif.

Write the half equation for the reaction that occurs in negative terminal.

.....[1M]

(f) Tulis setengah persamaan bagi tindak balas yang berlaku di terminal positif.

Write the half equation for the reaction that occurs in positive terminal.

.....[1M]

(g) Nyatakan nama bahan yang dioksidakan di dalam tindak balas di atas.
State the name of substance oxidised in the above reaction.

.....[1M]

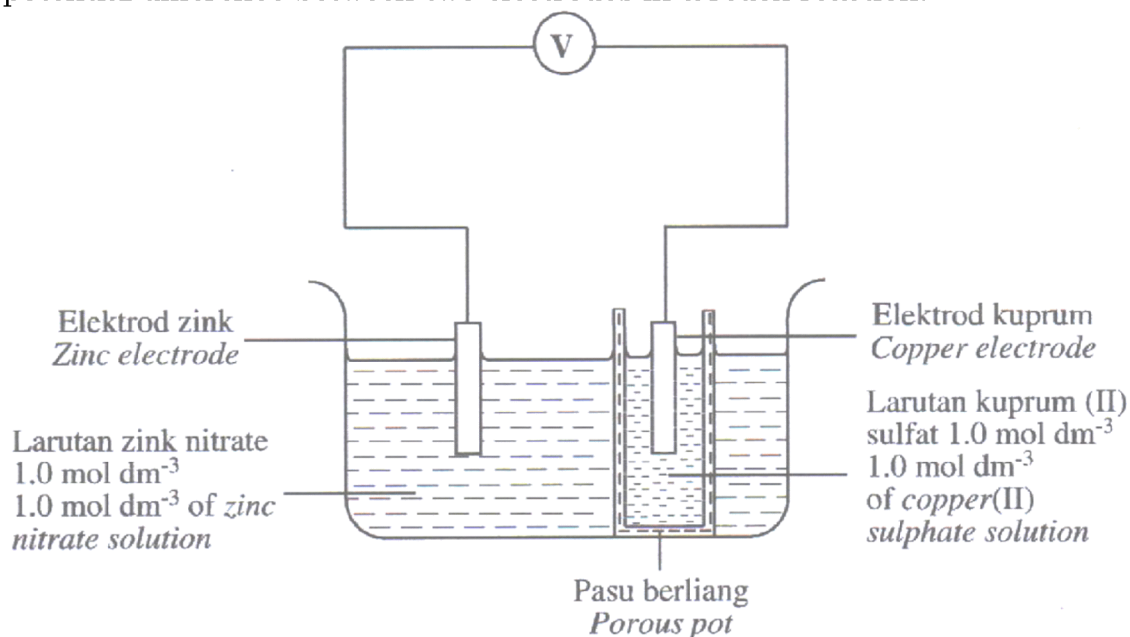
(h) Nyatakan nama bahan yang bertindak sebagai agen pengoksidaan di dalam tindak balas di atas.

State the name of substance that acts as an oxidising agent in the above reaction.

.....[1M]

[SPM2021-V2-08] Rajah 7.1 menunjukkan susunan radas bagi satu eksperimen untuk mengkaji beza keupayaan antara dua elektrod dalam tindak balas redoks.

Diagram 7.1 shows the apparatus set-up for an experiment to study the potential difference between two electrodes in a redox reaction.



(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 4 menunjukkan sebahagian daripada Siri Keupayaan Elektrod Piawai.
Table 4 shows a part of Standard Elect rod Potential Series.

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

Berdasarkan Rajah 7.1 dan Jadual 4,
Based on Diagram 7.1 and Table 4,

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

.....[2M]

(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 pada 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.

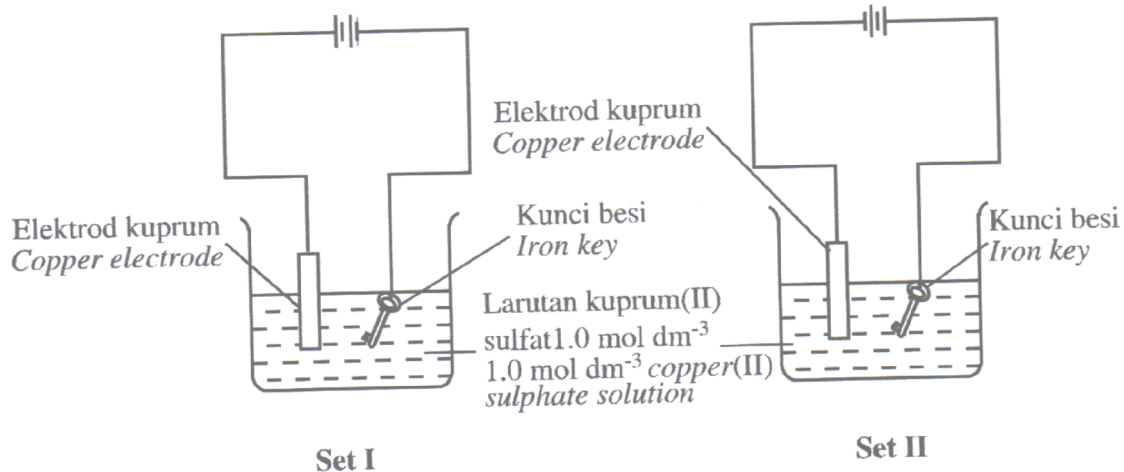
.....

.....

.....[3M]

(d) Rajah 7.2 menunjukkan susunan radas untuk penyaduran kunci besi menggunakan larutan kuprum(II) sulfat 1.0 mol dm^{-3} dan logam kuprum sebagai elektrod.

Diagram 7.2 shows the apparatus set-up for the electroplating of iron key using 1.0 mol dm^{-3} copper(II) sulphate solution and copper metal as electrode.



Terangkan perbezaan pemerhatian pada kunci besi bagi kedua-dua set eksperimen itu.

Explain the differences observation at the iron key for both sets of the experiment.

.....

.....

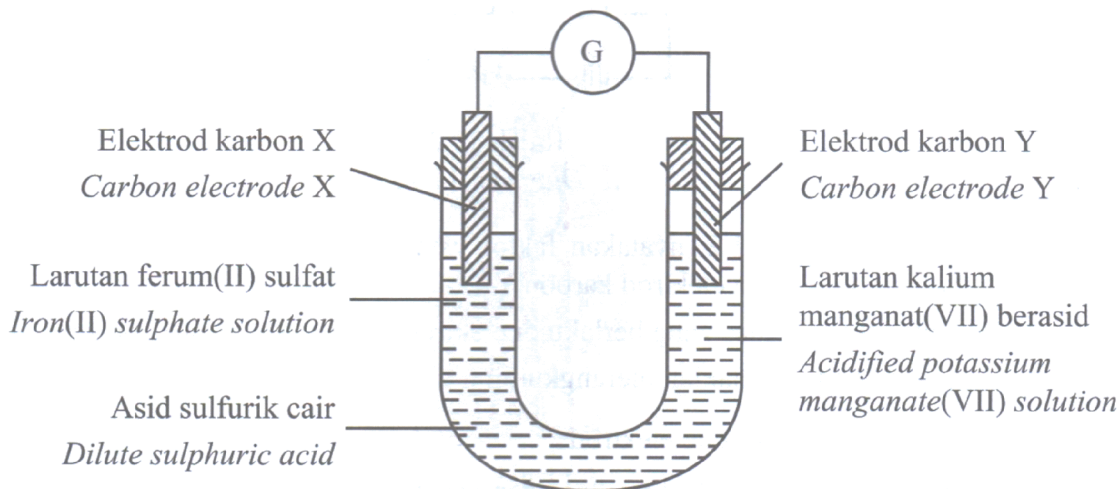
.....

.....[2M]

Esei**[Selangor2022-Set01-11] [Selangor2022-Set3-11]**

Rajah 11.1 menunjukkan susunan radas untuk menyiasat tindak balas redoks antara larutan ferum(II) sulfat dan larutan kalium manganat(VII) berasid melalui pemindahan elektron pada suatu jarak.

Diagram 11.1 shows the set-up of apparatus to investigate the redox reaction between iron(II) sulphate solution and acidified potassium manganate(VII) solution through the transfer of electrons at a distance.



Berdasarkan Rajah 11.1,/ Based on Diagram 11.1,

(i) nyatakan maksud tindak balas redoks.
state the meaning of redox reaction.

[1 markah] [1 mark]

(ii) nyatakan fungsi larutan ferum(II) sulfat dan larutan kalium manganat(VII) berasid. Tulis setengah persamaan bagi tindak balas yang berlaku di elektrod karbon Y.

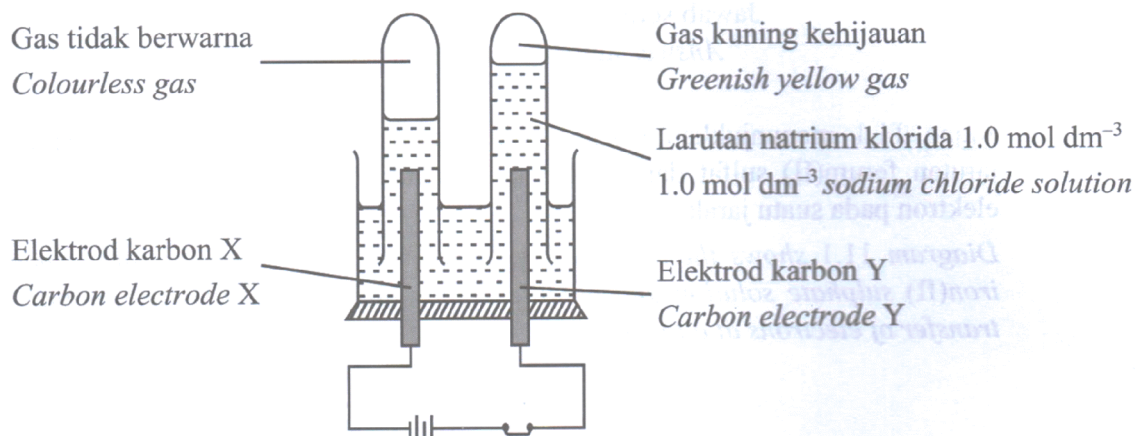
state the function of iron(II) sulphate solution and acidified potassium manganate(VII) solution.

Write the half equation for the reaction occurs at carbon electrode Y.

[4 markah] [4 marks]

(b) Rajah 11.2 menunjukkan susunan radas untuk elektrolisis larutan natrium klorida dengan menggunakan elektrod karbon.

Diagram 11.2 shows the apparatus set-up for the electrolysis of sodium chloride solution by using carbon electrodes.



Berdasarkan Rajah 11.2, nyatakan faktor yang mempengaruhi hasil yang terbentuk pada elektrod karbon X dan elektrod karbon Y.

Terangkan tindak balas yang berlaku di elektrod karbon X dan elektrod karbon Y. Penerangan anda hendaklah merangkumi:

- Ion-ion yang tertarik ke elektrod
- Ion yang dipilih untuk dinyahcas dan sebab ion tersebut dipilih untuk dinyahcas pada elektrod
- Setengah persamaan bagi tindak balas yang berlaku di elektrod

Based on Diagram 11.2, state the factor that affect the products formed at carbon electrode X and carbon electrode Y.

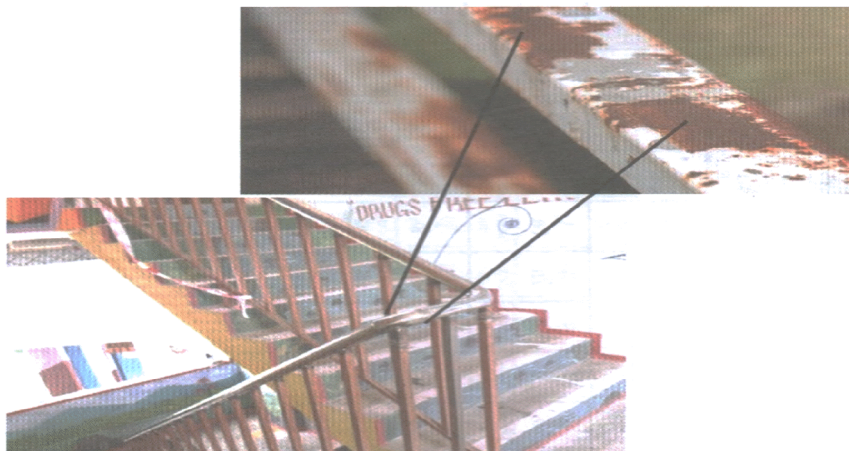
Explain the reactions occur at carbon electrode X and carbon electrode Y. Your explanation must include:

- Ions that attracted to electrodes
- Ions that are selectively discharged and the reason ions are selectively discharged at electrodes
- Half equations for the reaction occurs at electrodes

[10 markah] [10 marks]

(c) Rajah 11.3 menunjukkan selusur tangga yang diperbuat daripada besi di sekolah yang kelihatan berkarat.

Diagram 11.3 shows the stair handrail made from iron in school that look rusty.



Sempena Minggu Kokurikulum, ahli-ahli Persatuan Kimia telah ditugaskan untuk menambah baik keadaan selusur tangga tersebut.

In conjunction of Co-curricular Week, Chemistry Society members have been assigned to improve the condition of the stair handrail.

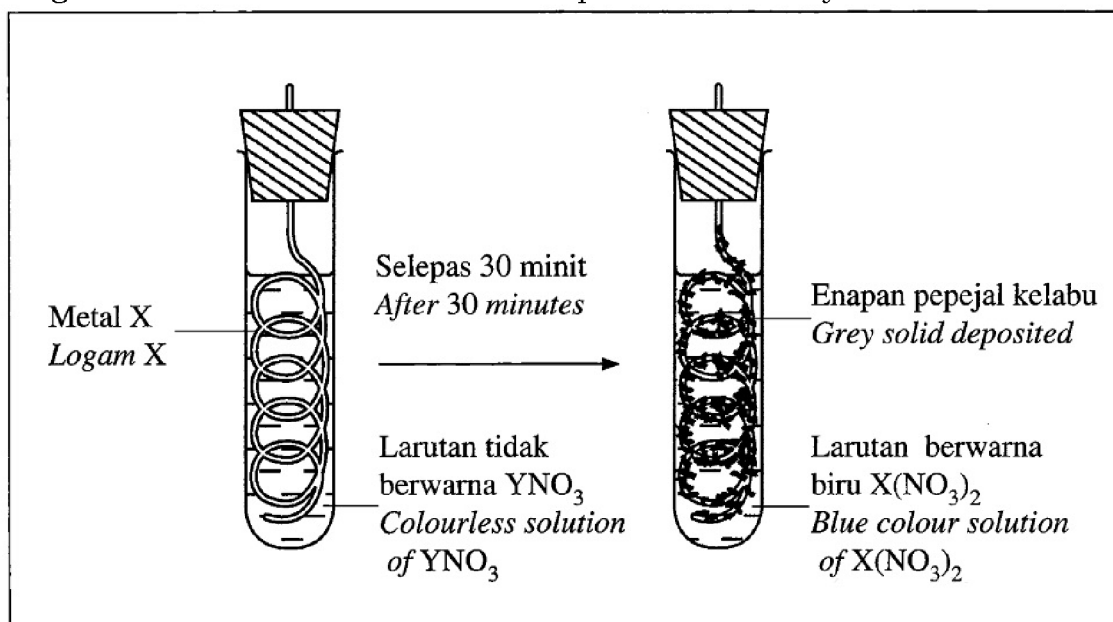
Cadang dan terangkan cara untuk menyelesaikan tugas tersebut supaya selusur tangga itu kelihatan seperti baharu semula.

Suggest and explain way to solve the task so that the stair handrail looks like new again.

[5 markah] [5 marks]

[SPM2021-V1-11] (a) Rajah 8.1 menunjukkan keputusan suatu eksperimen untuk mengkaji tindak balas redoks.

Diagram 8.1 shows the results of an experiment to study a redox reaction.



(i) Apakah maksud bagi tindak balas redoks?

What is meant by redox reaction?

[1 markah] [1 mark]

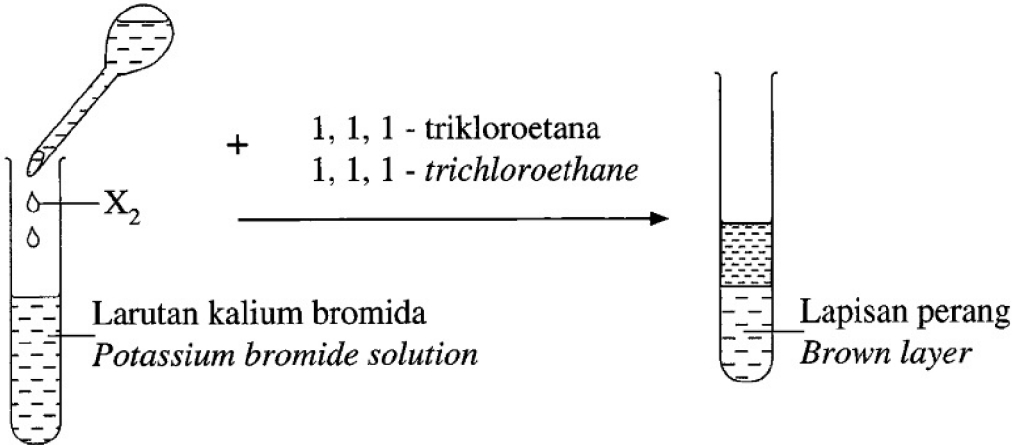
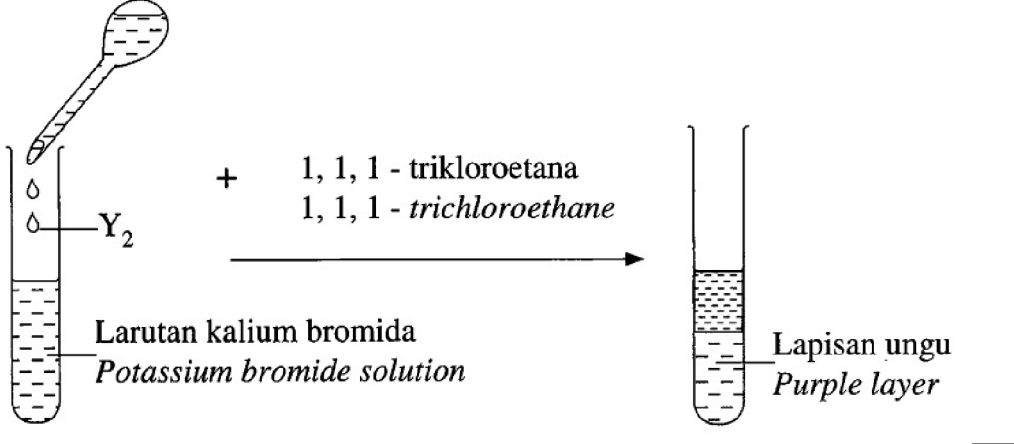
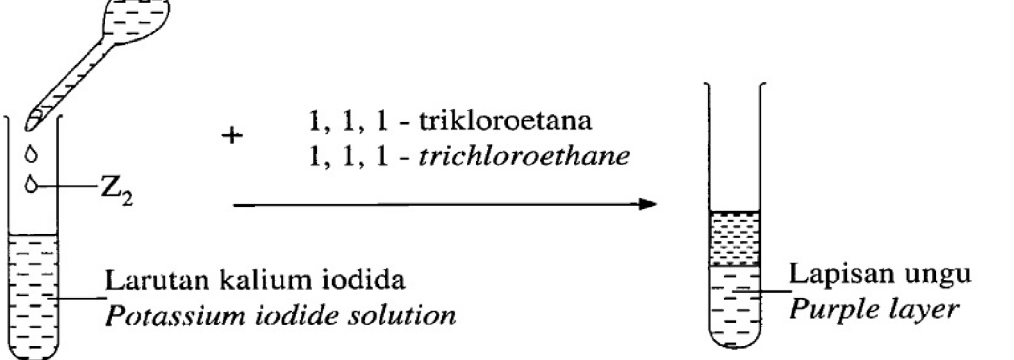
(ii) Berdasarkan Rajah 8.1, nyatakan logam X dan larutan YNO_3 . Tulis persamaan kimia bagi tindak balas yang berlaku.

Based on Diagram 8.1, state metal X and YNO_3 solution. Write the chemical equation for the redox reaction occurs.

[4 markah] [4 marks]

(b) Rajah 8.2 menunjukkan susunan radas bagi mengkaji tindak balas redoks dalam penyesaran halogen.

Diagram 8.2 shows the apparatus set-up to study a redox reaction in displacement of halogen.

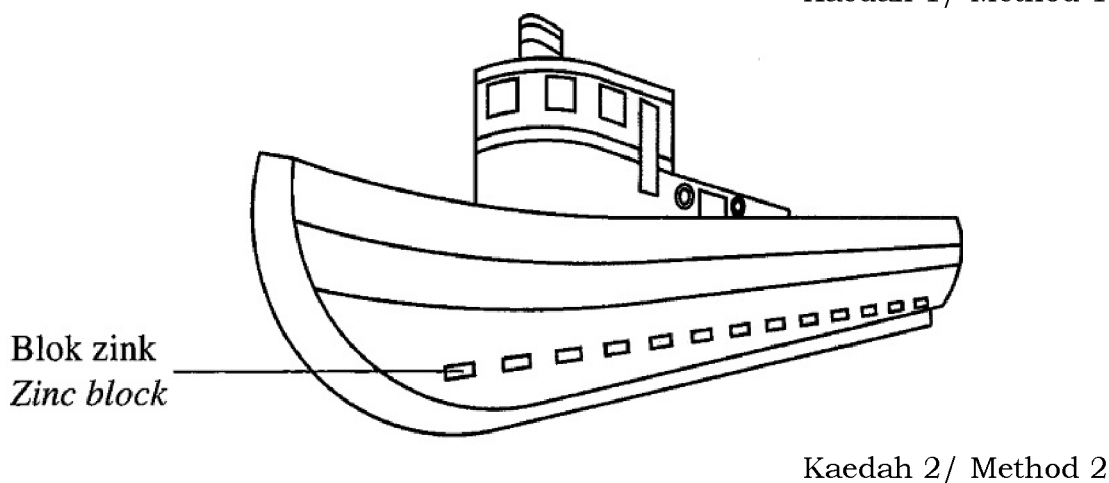
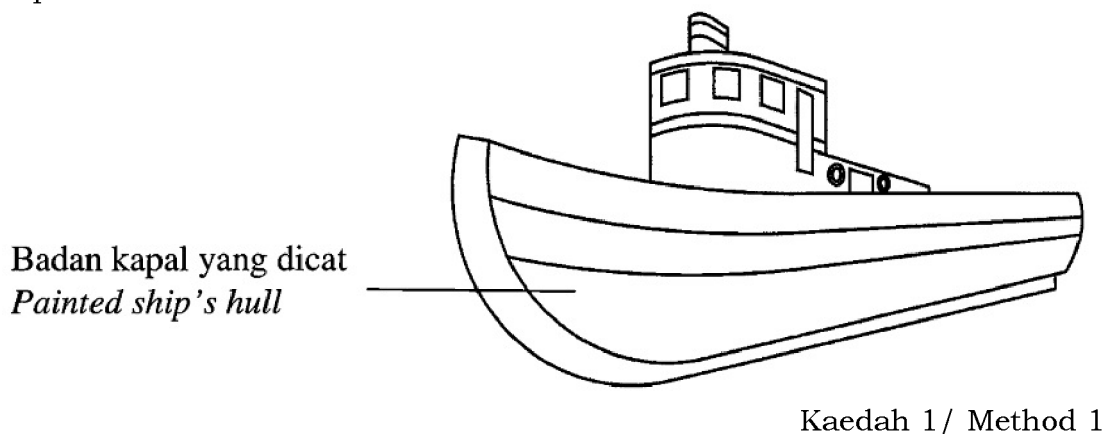
Set	Pemerhatian/ Observation
I	
II	
III	

Berdasarkan Rajah 8.2, kenal pasti halogen X, Y dan Z. Pilih dua eksperimen di mana tindak balas redoks berlaku. Tulis setengah persamaan pengoksidaan dan setengah persamaan penurunan daripada satu eksperimen yang anda pilih.

Based on Diagram 8.2, identify halogens X, Y and Z. Choose two experiments which redox reaction occurs. Write the oxidation half equation and reduction half equation from one of the experiment that you have chosen.

[7 markah] [7 marks]

(c) Rajah 8.3 menunjukkan dua kaedah yang boleh digunakan untuk melindungi dasar sebuah kapal daripada terkakis.
Diagram 8.3 shows two methods that can be used to protect the hull of the ships from corrodes.



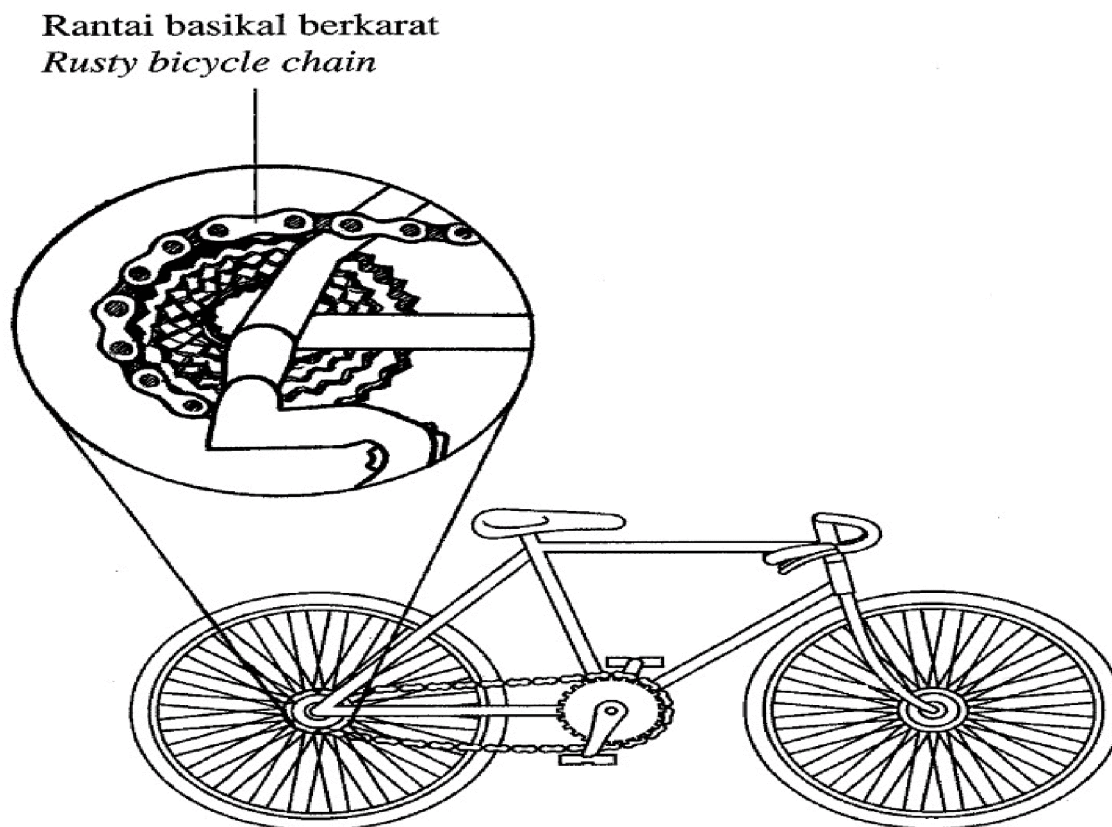
Anda ditugaskan untuk menilai kaedah yang lebih sesuai untuk melindungi dasar kapal itu daripada terkakis.

Nyatakan pilihan anda berdasarkan Rajah 8.3 dan wajarkan jawapan anda.
You are assigned to evaluate which method is more suitable to protect the hull of the ship from corrodes.

State your choice based on the Diagram 8.3 and justify your answer.
[2 markah] [2 marks]

(d) Rajah 8.4 menunjukkan sebuah basikal lama yang tidak boleh bergerak disebabkan rantai basikal yang berkarat.

Diagram 8 shows an old bicycle which is unable to move due to the rusty chain.



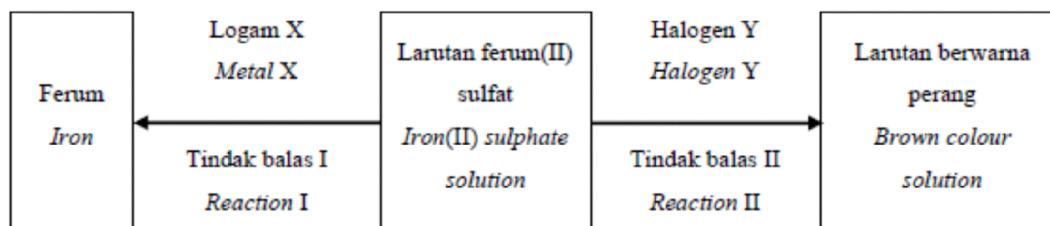
Cadangkan dan terangkan cara untuk mengatasi masalah tersebut supaya basikal itu boleh digunakan semula.

Suggest and explain way to overcome the problem so that the bicycle can be used again.

[6 markah] [6 marks]

[Perak2022-Set02-09] (a) Rajah 8 menunjukkan carta alir pertukaran ferum(II) sulfat melalui tindak balas redoks.

Diagram 8 shows a flow chart for the conversion of iron(II) sulphate through redox reactions.



(i) Nyatakan definisi bagi tindak balas redoks dan warna bagi ferum(II) sulfat.

State the definition of redox reaction and the colour of iron(II) sulphate.

[2 markah / marks]

(ii) Berdasarkan Tindak balas II, kenal pasti halogen Y dan kation yang hadir dalam larutan perang. Terangkan mengapa tindak balas itu adalah tindak balas redoks dari segi pemindahan elektron atau perubahan nombor pengoksidaan.

Based on Reaction II, identify halogen Y and the cation present in the brown solution. Explain why the reaction is a redox reaction in terms of electron transfer or change in oxidation number.

[6 markah / marks]

(iii) Kenal pasti logam X dan tulis persamaan kimia bagi Tindak balas I. Jika 50 cm^3 larutan ferum(II) sulfat 2.0 mol dm^{-3} dan logam X secara berlebihan digunakan, hitung jisim ferum yang terhasil.

[Jisim atom relatif : Fe = 56]

Identify metal X and write the chemical equation for Reaction I. If 50 cm^3 of 2.0 mol dm^{-3} iron(II) sulphate solution and excess metal X are used, calculate the mass of iron produced.

[Relative atomic mass : Fe = 56]

[5 markah / marks]

(b) Seorang murid sedang menjalankan satu eksperimen untuk mengkaji elektrolisis 1.0 mol dm^{-3} asid hidroklorik di dalam makmal kimia. Selepas 10 minit, murid tersebut berasa pening dan sukar bernafas, akibat terhidu gas W berwarna kuning kehijauan yang terhasil di anod semasa elektrolisis berlaku. Kenal pasti gas W. Terangkan bagaimana gas W dihasilkan di anod dan tulis setengah persamaan bagi tindak balas ini.

A student is carried out an experiment to investigate the electrolysis of 1.0 mol dm^{-3} hydrochloric acid in a chemistry lab. After 10 minutes, the student felt dizzy and difficulty in breathing, as a result of inhaling the greenish yellow gas W produced at the anode during electrolysis. Identify gas W.

Explain how gas W is produced at the anode and write the half equation for the reaction.

[4 markah / marks]

(c) Jadual 6 menunjukkan pemerhatian bagi eksperimen untuk mengkaji kesan logam lain ke atas pengaratan paku besi.

Table 6 shows the observation for the experiment of the effects of other metals on the rusting of iron nail.

Set	Eksperimen Experiment	Pemerhatian Observation
I	Paku besi dililit dengan logam P + larutan kalium heksasianoferat(III) + agar-agar Iron nail coiled with metal P + potassium hexacyanoferrate(III) solution + agar	Warna biru tua Dark blue colour
II	Paku besi dililit dengan logam Q + larutan kalium heksasianoferat(III) + agar-agar Iron nail coiled with metal Q + potassium hexacyanoferrate(III) solution + agar	Tiada perubahan No change

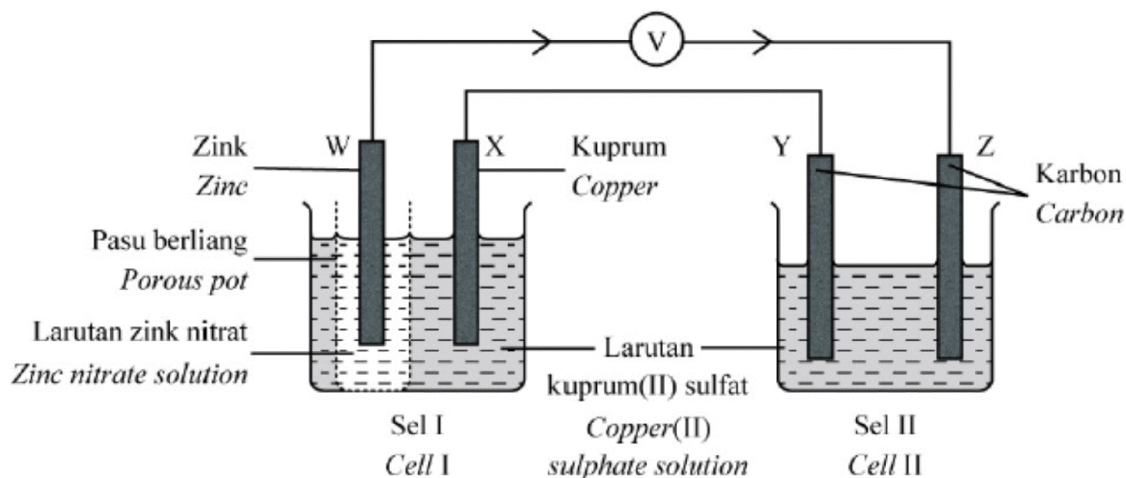
Berdasarkan maklumat dalam Jadual 6, terangkan mengapa terdapat perbezaan pemerhatian antara set I dan set II.

Based on the information in Table 6, explain why there is a difference in the observation of set I and set II.

[3 markah / marks]

[Selangor2022-Set02-11] Rajah 11 menunjukkan susunan radas bagi menyiasat tindak balas redoks dalam Sel I dan Sel II.

Diagram 11 shows the apparatus set-up to investigate redox reaction in Cell I and Cell II.



(a) Apakah yang dimaksudkan dengan tindak balas redoks? Kenal pasti jenis Sel I dan Sel II.

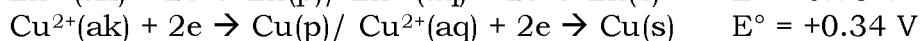
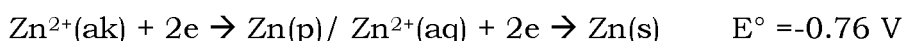
What is the meaning of redox reaction? Identify type of Cell I and Cell II.

[3 markah] [3 marks]

(b) Berdasarkan Sel I, /Based on Cell I,

(i) tulis notasi sel yang berlaku dan hitung nilai voltan yang terhasil dalam sel itu. Diberi nilai keupayaan elektrod piawai:

write the cell notation that occurs and calculate the value of the voltage produced in the cell. Given the standard electrode potential value:



[3 markah] [3 marks]

(ii) bahan manakah yang akan mengalami tindak balas penurunan?

Terangkan jawapan anda.

which substance will undergo reduction reaction?

Explain your answer.

[2 markah] [2 marks]

(c) Berdasarkan Sel II, kenal pasti terminal positif dan terminal negatif. Ramalkan pemerhatian pada elektrod Y dan elektrod Z. Based on Cell II, identify positive terminal and negative terminal. Predict the observation at electrode Y and electrode Z.

[4 markah] [4 marks]

(d) Tenaga elektrik boleh dihasilkan melalui tindak balas redoks. Anda dibekalkan dengan sebiji lemon, kepingan zink, paku besi, wayar penyambung dan mentol untuk membina sel kimia untuk membuktikan kenyataan di atas.

Lukis satu gambar rajah berlabel dan anak panah untuk menunjukkan arah aliran elektron. Tulis setengah persamaan dan persamaan ion yang sesuai. Cadangkan agen pengoksidaan dan agen penurunan yang sesuai. Electrical energy can be produced by redox reaction. You are supplied with a lemon, a piece of zinc, iron nail, connecting wires and bulb to build a chemical cell to prove the above statement.

Draw a labelled diagram and the arrows to show the direction of electron flow. Write suitable half equation and ionic equation. Suggest suitable oxidising agent and reducing agent.

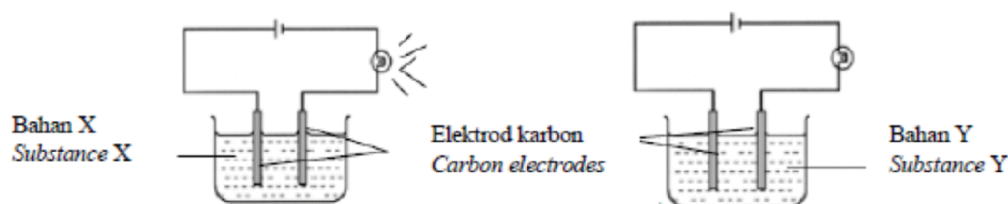
[8 markah] [8 marks]

[Perak2022-Set01-09] Bahan X dan Y merupakan dua bahan tidak berwarna dalam keadaan cecair.

Rajah 9.1 menunjukkan susunan radas untuk menentukan sama ada bahan X dan Y adalah suatu elektrolit.

Substances X and Y are two colourless substances in a liquid state.

Diagram 9.1 shows the set-up of apparatus to determine whether substances X and Y are electrolyte.



Berdasarkan Rajah 9.1,/ Based on Diagram 9.1,

(a) (i) Nyatakan maksud elektrolit./ State the meaning of electrolyte.

[1 markah / mark]

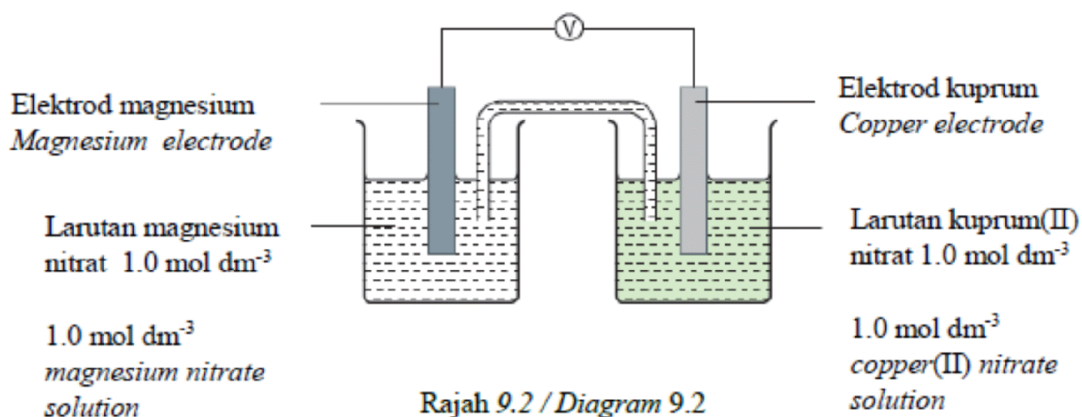
(ii) Bahan manakah X atau Y ialah suatu elektrolit? Terangkan.

Which substance X or Y is an electrolyte? Explain.

[2 markah / marks]

(b) Rajah 9.2 menunjukkan susunan radas untuk sel kimia A.

Diagram 9.2 shows the apparatus set-up for chemical cell A.



Berdasarkan Rajah 9.2,/ Based on Diagram 9.2,

- (i) Tuliskan notasi sel bagi sel kimia ini
Write cell notation of the chemical cell.

[1 markah / mark]

- (ii) Nyatakan pemerhatian dan tuliskan setengah persamaan pada elektrod magnesium.

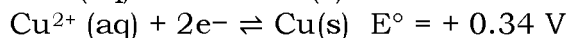
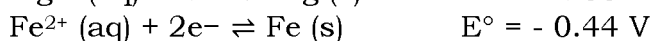
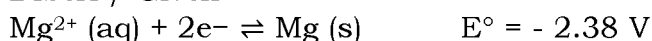
State the observation and write half equation at magnesium electrode.

[2 markah / marks]

- (iii) Sekiranya elektrod magnesium dan larutan magnesium nitrat dalam sel kimia A digantikan dengan elektrod ferum dan larutan ferum(II) klorida untuk membentuk sel kimia B, jelaskan perbezaan voltan sel bagi sel kimia A dan B.

If the magnesium electrode and magnesium nitrate solution in Chemical Cell A are replaced by an iron electrode and iron(II) chloride solution to form Chemical Cell B, explain the difference of the cell voltages of chemical cells A and B.

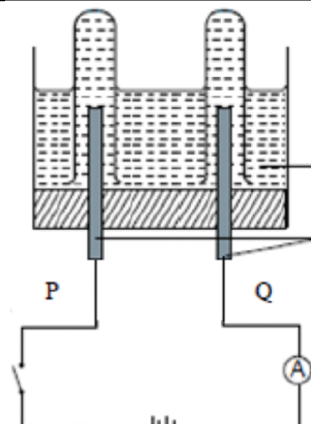
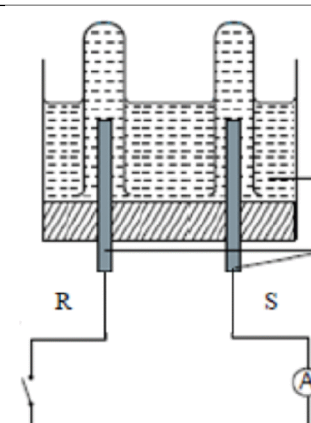
Diberi / Given



[4 markah / marks]

- (c) Rajah 9.3 menunjukkan susunan radas yang digunakan dalam eksperimen untuk mengkaji elektrolisis larutan kuprum(II) klorida.

Diagram 9.3 shows the apparatus set-up used in experiment to study the electrolysis of copper(II) chloride solution.

Eksperimen Experiment	Susunan radas Apparatus set-up
I	 Larutan kuprum(II) klorida 1.0 mol dm^{-3} 1.0 mol dm^{-3} copper(II) chloride solution Elektrod karbon Carbon electrodes
II	 Larutan kuprum(II) klorida $0.0001 \text{ mol dm}^{-3}$ $0.0001 \text{ mol dm}^{-3}$ copper(II) chloride solution Elektrod karbon Carbon electrodes

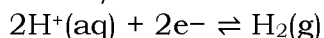
Suis ditutup dan dibiarkan selama 20 minit. Jadual 9 menunjukkan pemerhatian selepas 20 minit.

The switch is closed and left for 20 minutes. Table 9 shows the observations after 20 minutes.

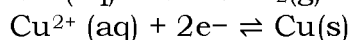
Eksperimen Experiment	Pemerhatian Observation
I	Gas kuning kehijauan terbentuk pada elektrod karbon P. Pepejal perang terbentuk pada elektrod karbon Q. Keamatan larutan biru semakin berkurang. Greenish-yellow gas is produced at carbon electrode P. Brown solid is formed at carbon electrode Q. Intensity of blue colour solution decrease
II	Gas tidak berwarna terbentuk pada elektrod karbon R. Pepejal perang terbentuk pada elektrod karbon S. Keamatan larutan biru semakin berkurang. Colourless gas is produced at carbon electrode R. Brown solid is formed at carbon electrode S. Intensity of blue colour solution decrease.

Nyatakan nama hasil pada elektrod P, Q, R dan S. Jelaskan pemerhatian dan tuliskan persamaan setengah pada anod dan katod eksperimen I.
State the name of the products at electrodes P, Q, R and S. Explain the observations and write half equations at the anode and cathode of experiment I.

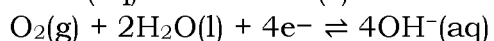
Diberi/ Given



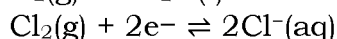
$$E^\circ = 0.00 \text{ V}$$



$$E^\circ = + 0.34 \text{ V}$$



$$E^\circ = + 0.40 \text{ V}$$



$$E^\circ = + 1.36 \text{ V}$$

[8 markah / marks]

(d) Rajah 9.4 menunjukkan perbualan di antara Ahmad dan Mei Ling.
Diagram 9.4 shows the conversation between Ahmad and Mei Ling.



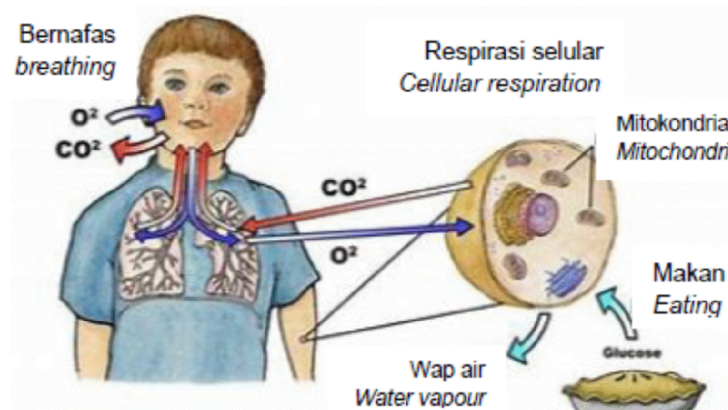
Rajah / Diagram 9.4

Lukiskan satu gambar rajah berlabel susunan radas untuk aktiviti Ahmad.
Draw a labelled diagram of the apparatus set-up for Ahmad's activity.

[2 markah / marks]

[PPinang2022-Set02-09] (a) Rajah 9 menunjukkan respirasi selular, sumber tenaga utama bagi manusia. Makanan yang kita makan ditukarkan kepada tenaga di dalam mitokondria. Semasa pernafasan, oksigen diturunkan manakala glukosa dioksidakan.

Diagram 9 shows cellular respiration, the ultimate source of energy in human beings. The food that we consume is converted into energy in mitochondria. During respiration, oxygen is reduced whereas the glucose is oxidised.



Bahan tindak balas Reactants	$C_6H_{12}O_6 + 6O_2$
Hasil tindak balas Products	$6CO_2 + 12H_2O + \text{Energy (ATP)}$

Berdasarkan Rajah 9;/ Based on Diagram 9,

(i) Nyatakan nama tindak balas yang berlaku bagi respirasi selular?

State the name of the reaction that takes place for cellular respiration?

[1 markah/mark]

(ii) Apakah fungsi gas oksigen dan terangkan mengapa?

Berapakah jisim makanan yang dimakan bagi menghasilkan 1000 cm³ gas karbon dioksida?

What is the function of oxygen gas and explains why?

Calculate the mass of food intake to produce 1000 cm³ of carbon dioxide gas?

[Isipadu molar gas pada keadaan bilik = 24 dm³ mol⁻¹]

[Molar volume of gas at room conditions = 24 dm³ mol⁻¹]

[4 markah/marks]

(b) Jadual 9 menunjukkan pemerhatian bagi tindak balas di antara logam X dengan dua larutan garam yang berbeza. Garam X sulfat dan garam X klorida merupakan garam tidak terlarutkan.

Table 9 shows the observation for the reaction between metal X with two different salt solutions.

Larutan garam Salt solution	Pemerhatian Observation
Kuprum(II) sulfat Copper (II) sulphate	Enapan perang terbentuk Brown deposit is formed
Zink sulfat Zinc sulphate	Tiada perubahan No change

Jadual 9/Table 9

Nilai keupayaan elektrod piawai sel setengah beberapa logam diberikan seperti berikut:

Given the standard electrode of potential values of half-cells of some metals:



Berdasarkan nilai E° yang diberi,

Based on E° value given,

(i) Kenal pasti logam X dan hitung voltan sel secara teori dengan menggunakan nilai keupayaan elektrod piawai sel setengah bagi tindak balas antara logam X dan larutan kuprum (II) sulfat.

Identify metal X and calculate the theoretical voltage of the cells using standard electrode potential value of the half-cells for the reaction between metal X and copper (II) sulphate solution.

(ii) Tuliskan setengah persamaan pengoksidaan, setengah persamaan penurunan dan persamaan ion keseluruhan bagi tindak balas ini.

Write the half equation for oxidation reaction, half equation for reduction and the overall ionic equation for this reaction.

[5 markah/marks]

(iii) Susun ion dalam tertib menaik kekuatan agen pengoksidaan.

Susun atom dalam tertib menaik kekuatan agen penurunan.

Arrange the ions in order of increasing strength of the oxidizing agent.

Arrange the atoms in order of increasing strength of the reducing agent.

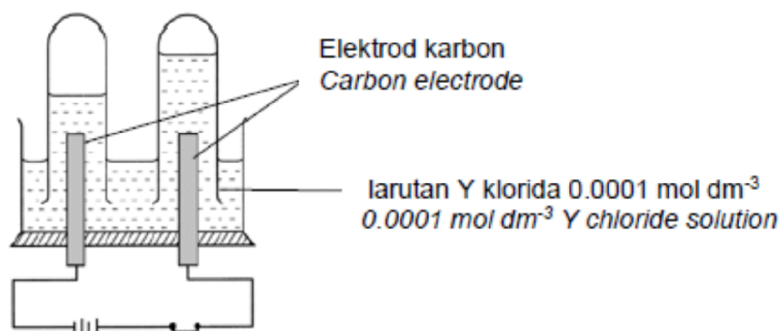
[2 markah/marks]

(iv) Seterusnya, terangkan mengapa terdapat perbezaan dalam pemerhatian yang diperolehi di dalam Jadual 9.

Next, explain why there are differences in observation obtained in the Table 9.

[8 markah/marks]

[PPinang2022-Set01-10] (a) Rajah 10.1 menunjukkan susunan radas bagi elektrolisis larutan Y klorida $0.0001 \text{ mol dm}^{-3}$ menggunakan elektrod karbon. Hasil di anod dan katod ialah gas. Diagram 10.1 shows the apparatus set-up for electrolysis of $0.0001 \text{ mol dm}^{-3}$ Y chloride solution using carbon electrode. The products at cathode and anode are gases.



Cadangkan Y klorida. Tuliskan setengah persamaan bagi tindak balas yang berlaku di anod.

Jika larutan digantikan dengan larutan Y klorida 1.0 mol dm^{-3} nyatakan hasil di anod dan berikan satu sebab bagi jawapan anda.

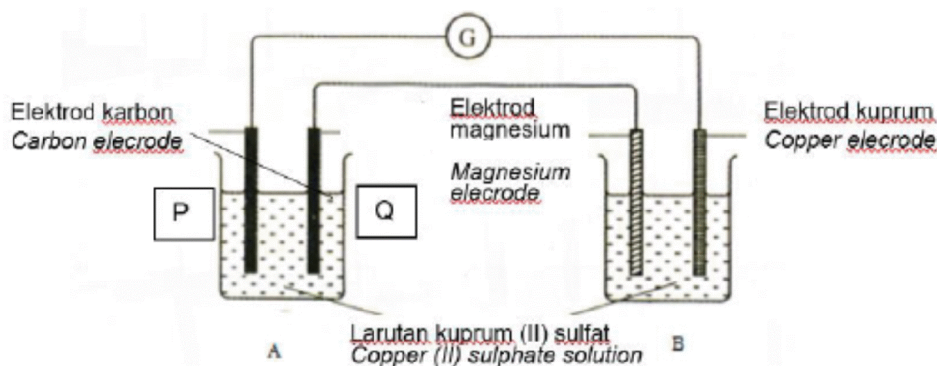
Suggest Y chloride. Write half equation for the reaction occurred at anode.

If the solution is replaced with 1.0 mol dm^{-3} of Y chloride solution, state the product at anode. Give reason for your answer.

Persamaan setengah sel Half-cell equation	E° / V
$\text{Cl}_2 + 2\text{e}^- \rightleftharpoons 2\text{Cl}^-$	+1.36
$\text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^- \rightleftharpoons 4\text{OH}^-$	+0.40
$2\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{H}_2$	0.00

[4 markah/marks]

(b)



Rajah 10.2
Diagram 10.2

Persamaan setengah sel Half-cell equation	E° / V
$\text{Mg}^{2+} + 2\text{e}^- \rightleftharpoons \text{Mg}$	-2.38
$\text{Cu}^{2+} + 2\text{e}^- \rightleftharpoons \text{Cu}$	+0.34
$\text{S}_2\text{O}_8^{2-} + 2\text{e}^- \rightleftharpoons 2\text{SO}_4^{2-}$	+2.01
$\text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^- \rightleftharpoons 4\text{OH}^-$	+0.40
$2\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{H}_2$	0.00

(i) Berdasarkan Rajah 10.2, nyatakan elektrod yang bertindak sebagai katod dalam sel A.

Based on Diagram 10.2, state the electrode that act as the cathode in cell A.
[1 markah / mark]

(ii) Terangkan tindak balas pada katod. Jawapan anda perlulah mengandungi aspek-aspek berikut:

- Senarai ion-ion yang tertarik
- Nama ion yang dipilih untuk dinyahcas
- Sebab ion ini dipilih untuk dinyahcas
- Jenis tindak balas yang berlaku
- Pemerhatian

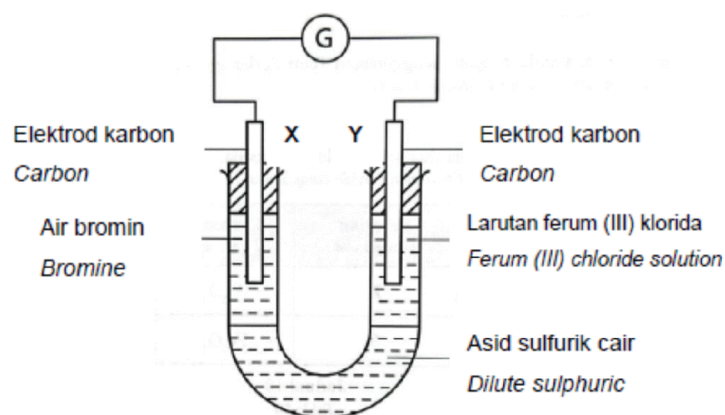
Explain the reactions at the cathode. Your answer should include the following

aspects:

- List of the ions that attracted
- Name the selectively discharged ions
- The reason why the ion is selectively discharged
- Type of the reaction occurred
- Observation

[6 markah / marks]

(c)



Rajah 10.3 / Diagram 10.3

Rajah 10.3 menunjukkan susunan radas yang dijalankan oleh Ally untuk mengkaji pemindahan elektron pada suatu jarak. Selepas beberapa ketika, Ally mendapati jarum galvanometer tidak terpesong dan tiada sebarang perubahan pada larutan yang digunakan.

Diagram 10.3 shows the arrangement of the apparatus set up carried out by Ally to study the transfer of electrons at a distance. After a while, Ally noticed that the galvanometer needle was not deflected and there was no change in the solution used.

(i) Kaji Rajah 10.3 dan kenal pasti kesalahan yang dilakukan.

Study Diagram 10.3 and identify the mistake made.

[1 markah /mark]

(ii) Dengan bantuan gambarajah berlabel, cadangkan pengubahsuaian yang perlu dilakukan oleh Ally dan tandakan arah pengaliran elektron.

With the help of a labelled diagram, suggest the modifications that Ally should make and mark the direction of electron flow.

[2 markah/marks]

(iii) Selepas pengubahsuaian dijalankan, didapati jarum galvanometer terpesong.

Berdasarkan jawapan di (c) (ii)

- Kenal pasti agen pengoksidaan dan agen penurunan
- Nyatakan pemerhatian di X dan Y
- Tuliskan setengah persamaan yang berlaku di X dan Y
- Tuliskan persamaan ion yang terlibat

After the modification was carried out, it was found that the galvanometer needle was deflected.

Based on the answer in (c) (ii)

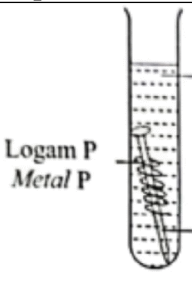
- Identify oxidising agents and reducing agents
- State the observations at X and Y
- Write the half equation that occurs at X and Y
- Write the ionic equation involved

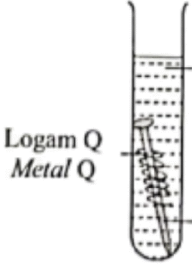
[7 markah/marks]

[Negeri Sembilan 2022-11]

(a) Jadual 3.1 menunjukkan dua set eksperimen yang dijalankan untuk mengkaji kesan logam lain terhadap pengurangan besi.

Table 3.1 shows two sets of experiment which are carried out to study the effect of other metals on rusting of iron.

Set	eksperimen experiment	Pemerhatian Observation
I	 Larutan agar-agar + larutan kalium heksasianoferat(III) + fenolftalein Jelly solution + potassium hexacyanoferrate(III) + phenolphthalein Logam P Metal P Paku besi Iron nail	Keamatan warna biru tua yang tinggi terbentuk High intensity of dark blue colour is formed Keamatan warna merah jambu yang rendah terbentuk Low intensity of pink colour is formed

II		Keamatan warna merah jambu yang tinggi terbentuk High intensity of pink colour is formed Tiada biru tua yang terbentuk No blue colour is formed
----	---	--

(i) Apakah yang dimaksudkan dengan kakisan logam?

What is meant by metal corrosion?

[1 markah / 1 mark]

Berdasarkan pemerhatian dalam Jadual 3.1.

Based on the observations in Table 3.1.

(ii) nyatakan nama logam P dan logam Q.

Tuliskan setengah persamaan bagi pengoksidaan dan penurunan dalam Set I dan Set II.

state the name of metal P and Q.

Write the half equations for the oxidation and reduction processes in Set I and Set II

[6 markah / 6 marks]

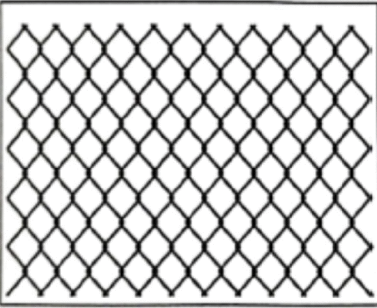
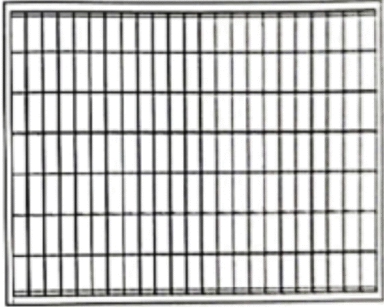
(iii) Terangkan mengapa terdapat perbezaan dalam pemerhatian.

Explain why there is a difference in observations.

[4 markah / 4 marks]

(b) Rajah 10.1 menunjukkan dua jenis dawai pagar.

Diagram 10.1 shows two types of fence wire.

	
Disalut dengan plastik Covered with plastic	Disadur dengan Zink Plated with zinc

Anda ditugaskan untuk menilai dua jenis dawai pagar untuk dipasang di rumah bagi kegunaan jangka masa panjang dan tidak mudah terkakis.

Nyatakan pilihan anda dan wajarkan jawapan anda.

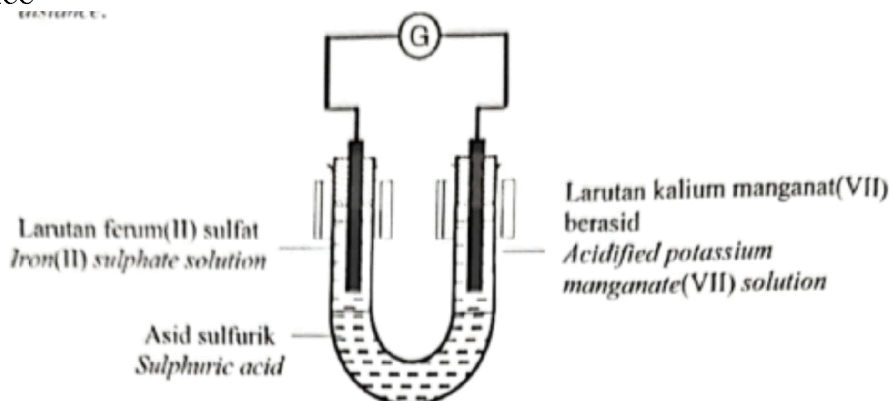
You are assigned to evaluate two types of fence wire to be installed in a house for long-term use and not easily corroded.

State your choice and justify your answer.

[3 markah / 3 marks]

(c) Rajah 10.2 menunjukkan susunan radas bagi mengkaji perpindahan elektron pada satu jarak.

Diagram 10.2 shows the apparatus set-up to investigate electron transfer at a distance



Sekumpulan murid telah menggantikan asid sulfurik kepada larutan glukosa, didapati jarum galvanometer tidak terpesong.

Wajarkan tindakan kumpulan murid tersebut.

A group of students have replaced sulphuric acid with glucose solution, it was found that the galvanometer needle does not deflect.

Justify the actions of the group of students.

[3 markah / 3 marks]

(d) Jadual 3.2 menunjukkan senarai radas dan bahan

Table 3.2 shows a list of apparatus and materials.

Radas dan bahan/ Apparatus and materials		
• Bikar Beaker	• Voltmeter Voltmeter	• Kepingan Zink Zinc plate
• Wayar penyambung Connecting wire	• Pasu berliang Porous pot	• Kepingan kuprum Copper plate
	• Titan garam Salts bridge	• Larutan zink nitrat Zinc nitrate solution
		• Larutan kuprum(II) sulfat Copper (II) sulphate solution

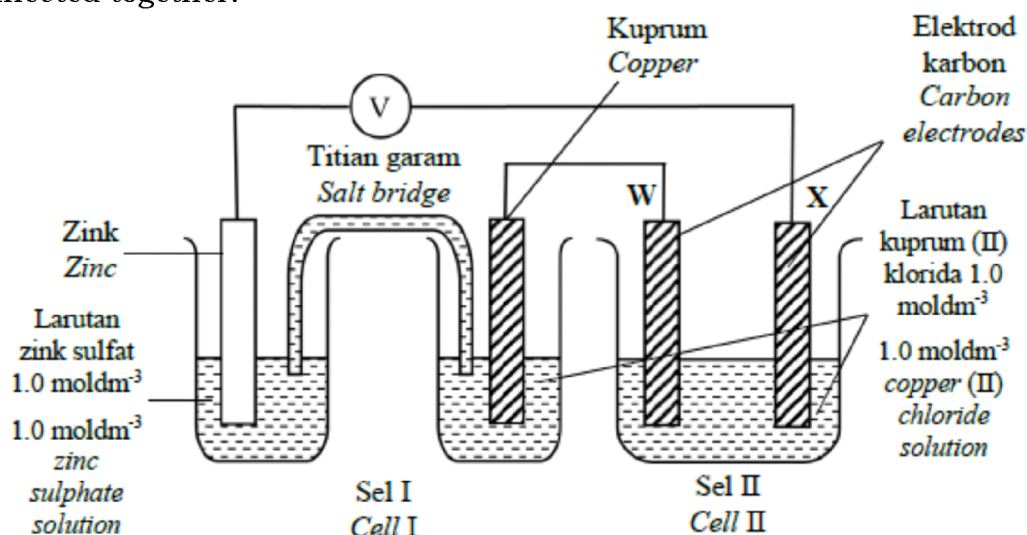
Lukis satu rajah berlabel untuk menunjukkan susunan radas bagi mengkaji pemindahan elektron pada satu jarak menggunakan radas dan bahan diberikan dalam Jadual 3.2. Tandakan arah pengaliran elektron dalam rajah.

Draw a labelled diagram to show the apparatus set-up to investigate electron transfer at a distance by using the apparatus and materials given in Table 3.2. Mark in the diagram the direction of the electron flow.

[3 markah / 3 marks]

[Melaka2022-09] (a) Rajah 8.1 menunjukkan susunan radas bagi dua sel, Sel I dan Sel II yang disambungkan bersama.

Diagram 8.1 shows the apparatus setup for two cells, Cell I and Cell II connected together.



Jadual 4 menunjukkan sebahagian daripada nilai keupayaan elektrod piawai sel setengah.

Table 4 shows a part of the standard electrode potential of half-cells.

Tindak balas sel setengah Half-cell equations	E° / V (298K)
$\text{Zn}^{2+} + 2 \text{e}^- \rightleftharpoons \text{Zn}$	- 0.76
$\text{Cl}_2 + 2 \text{e}^- \rightleftharpoons 2 \text{Cl}^-$	+1.36
$\text{O}_2 + 2 \text{H}_2\text{O} + 4 \text{e}^- \rightleftharpoons 4\text{OH}^-$	+ 0.40
$\text{Cu}^{2+} + 2 \text{e}^- \rightleftharpoons \text{Cu}$	+ 0.34
$2 \text{H}^+ + 2 \text{e}^- \rightleftharpoons \text{H}_2$	0.00
$\text{S}_2\text{O}_8^{2-} + 2 \text{e}^- \rightleftharpoons 2 \text{SO}_4^{2-}$	+ 2.01

Berdasarkan Rajah 8.1 dan Jadual 4,/ Based on Diagram 8.1 and Table 4,

(i) Nyatakan fungsi titian garam. Kenal pasti terminal negatif dalam Sel I dan terangkan mengapa.

State the function of the salt bridge in Cell I. Identify the negative terminal in Cell I and explain why.

[3 markah/ marks]

(ii) Terangkan tindak balas yang berlaku pada elektrod karbon W dan elektrod karbon X dalam Sel II dari segi:

- ☐ Pergerakan ion-ion ke setiap elektrod
- ☐ Pemilihan ion untuk dioksidakan dan diturunkan dan sebab mengapa ion itu dipilih
- ☐ Setengah persamaan di setiap elektrod
- ☐ Pemerhatian di setiap elektrod

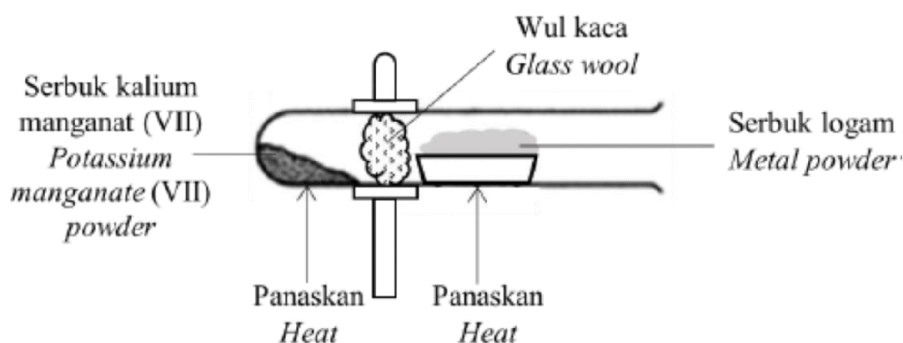
Explain the reaction that occurs on carbon electrodes W and X in Cell II based on:

- ☐ Movement of ions to each electrode
- ☐ Choice of ions to be oxidized and reduced and the reason why the ions were chosen
- ☐ Half-equation at each electrode
- ☐ Observations at each electrode

[10 markah/ marks]

(b) Rajah 8.2 menunjukkan susunan radas yang digunakan didalam makmal untuk mengkaji kereaktifan logam terhadap oksigen untuk membentuk logam oksida.

Diagram 8.2 shows the apparatus setup used in the lab to investigate the reactivity of metals towards oxygen to form metal oxide



Apabila ferum dipanaskan menggunakan radas dalam Rajah 8.2, ferum(III) oksida terhasil. Nyatakan warna bagi ferum(III) oksida yang terhasil dan tulis persamaan kimia bagi tindak balas itu. Hitung jisim logam oksida yang terhasil apabila 14 g serbuk ferum dipanaskan.

When iron is heated using the apparatus in Diagram 9.2, iron (III) oxide is formed. State the colour of iron (III) oxide formed and write a chemical equation for the reaction. Calculate the mass of metal oxide formed when 14 g of iron is heated.

[Jisim atom relatif: O = 16; Fe = 56]

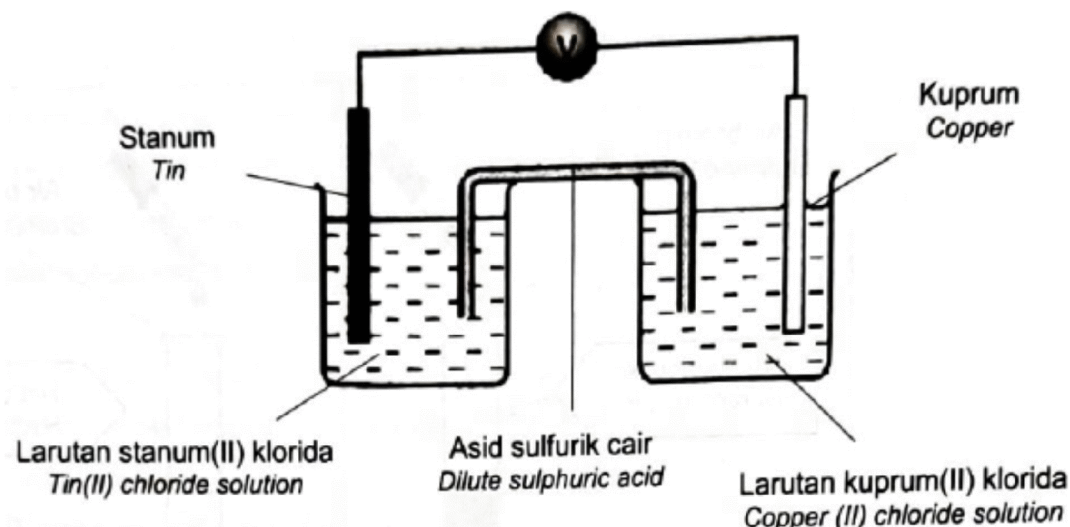
[Relative atomic mass: O = 16; Fe = 56]

[7 markah/ marks]

[Kedah2022-10]

(a) Rajah 10.1 menunjukkan suatu sel kimia dan jadual 10.1 menunjukkan nilai E° bagi logam yang terlibat.

Diagram 10.1 shows a chemical cell and table 10.1 shows a E° value involved metals.



$\text{Sn}^{2+} (\text{ak}) + 2\text{e} \rightleftharpoons \text{Sn} (\text{p})$ $\text{Sn}^{2+} (\text{aq}) + 2\text{e} \rightleftharpoons \text{Sn} (\text{s})$	$E^\circ = -0.14 \text{ V}$
$\text{Cu}^{2+} (\text{ak}) + 2\text{e} \rightleftharpoons \text{Cu} (\text{p})$ $\text{Cu}^{2+} (\text{aq}) + 2\text{e} \rightleftharpoons \text{Cu} (\text{s})$	$E^\circ = + 0.34 \text{ V}$

Berdasarkan rajah 10.1 dan jadual 10.1,

Based on diagram 10.1 and table 10.1,

(i) Apakah fungsi asid sulfurik cair dan warna larutan kuprum(II) klorida?
What is the function of dilute acid sulphuric and colour of copper(II) chloride solution?

[2 markah/marks]

(ii) Kenal pasti terminal negatif dan terminal positif dalam sel itu.

Identify negative terminal and positive terminal in the cell.

[2 markah/marks]

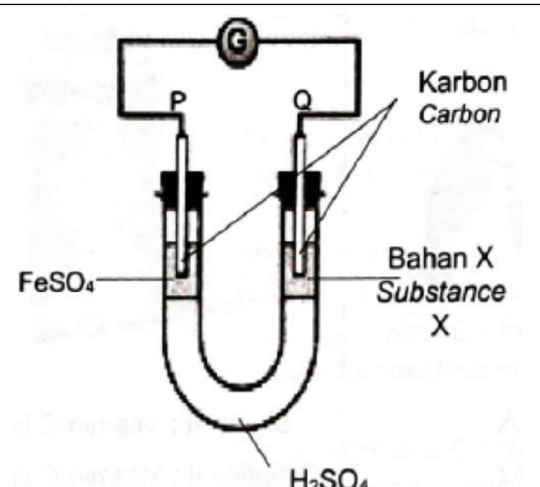
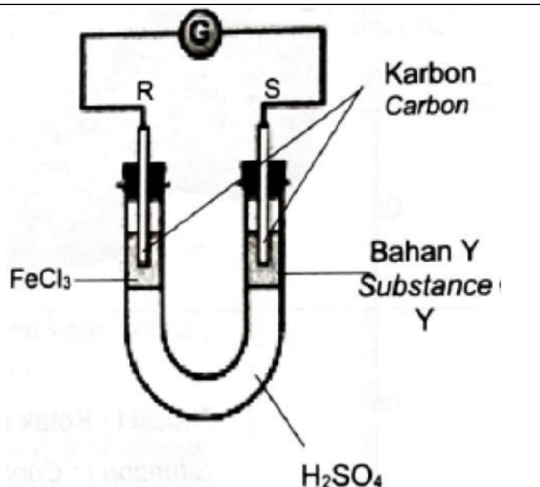
(iii) Tuliskan persamaan setengah bagi tindak balas pengoksidaan dan penurunan, persamaan ion keseluruhan, notasi sel dan hitungkan nilai voltan yang terhasil dalam sel tersebut.

Write half equation for oxidation and reduction of the reaction, overall ionic equation, cell notation and calculate the voltage value that produced in the cell.

[6 markah/marks]

(b) Rajah 10.2 menunjukkan dua set susunan radas untuk mengkaji pemindahan elektron pada suatu jarak.

Diagram 10.2 shows two set of apparatus set-up to Investigate the transfer of electron at a distance.

Set I	Set II
	
Larutan hijau FeSO_4 bertukar perang. Green FeSO_4 solutions turns brown.	Larutan perang FeCl_3 bertukar hijau. Brown FeCl_3 solution turns green.

Dengan menamakan bahan X dan bahan Y, bandingkan tindak balas redoks dalam set I dan set II daripada aspek :

By naming substance X and substance Y, compare the redox reaction of set I and set II in term of:

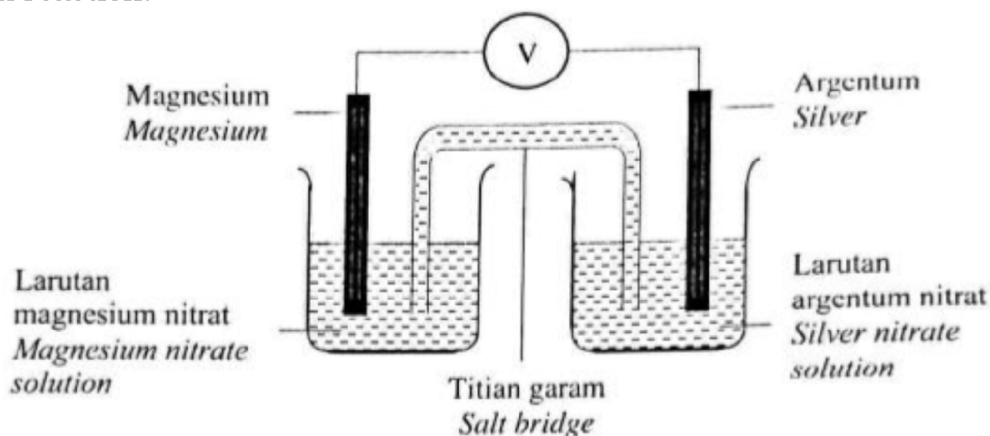
- bahan yang dioksidakan
oxidized substance
- setengah persamaan bagi tindak balas penurunan
half equation of reduction reaction
- arah pengaliran elektron
direction of electron flow
- agen pengoksidaan dan agen penurunan
oxidizing agent and reducing agent

[10 markah/marks]

[JohorPPD Tangkak 2022-11]

Rajah 11.1 menunjukkan susunan radas bagi satu sel kimia dalam satu tindak balas redoks

Diagram 11.1 shows the apparatus arrangement of a chemical cell in a redox reaction.



Nilai E° bagi dua sel setengah tersebut adalah :

The E° value for the two half-cells are :

$\text{Mg}^{2+} (\text{ak/aq}) + 2\text{e}^- \rightleftharpoons \text{Mg} (\text{p/s})$	$E^\circ = - 2.38 \text{ V}$
$\text{Ag}^{2+} (\text{ak/aq}) + \text{e}^- \rightleftharpoons \text{Ag} (\text{p/s})$	$E^\circ = + 0.80 \text{ V}$

Berdasarkan Rajah 11.1,/ Based on Diagram 11.1,

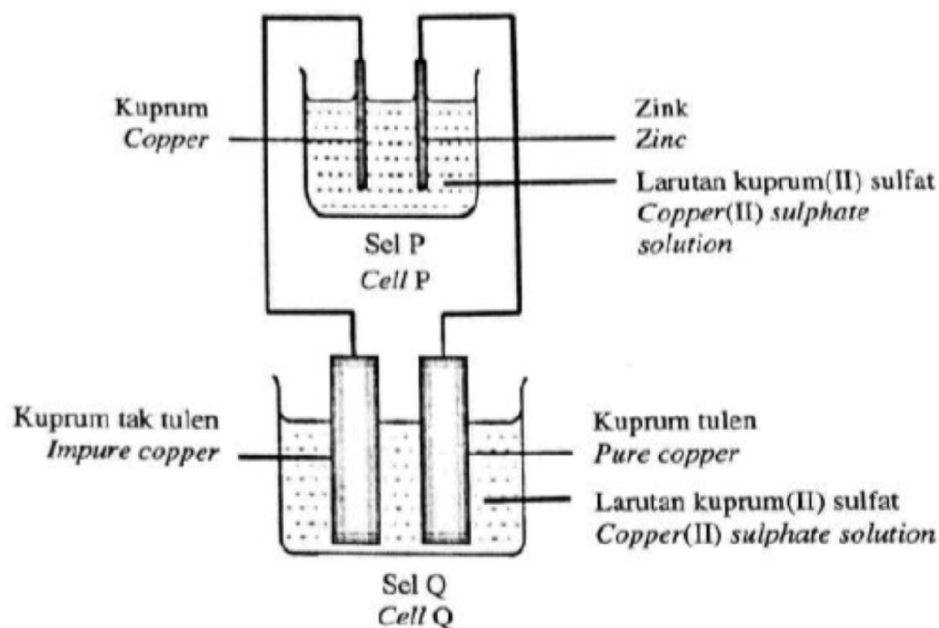
(a) Apakah yang dimaksudkan dengan tindak balas redoks dan nyatakan terminal negatif dan terminal positif bagi sel ini. Seterusnya, tuliskan persamaan ion dan notasi sel bagi sel tersebut.

What is meant by a redox reaction and state the negative terminal and positive terminal of this cell. Next, write the ionic equation and cell notation for the cell.

[7 markah] [7 marks]

(b) Rajah 11.2 menunjukkan susunan radas proses penulenan logam kuprum

Diagram 11.2 shows the apparatus setup of purification process of copper metal.



Nilai E° bagi beberapa sel setengah adalah :
The E° value for a few half-cells are :

$\text{Zn}^{2+} (\text{ak/aq}) + 2\text{e}^- \rightleftharpoons \text{Zn} (\text{p/s})$	$E^\circ = - 0.76 \text{ V}$
$2\text{H}^+ (\text{ak/aq}) + 2\text{e}^- \rightleftharpoons \text{H}_2 (\text{g})$	$E^\circ = 0.00 \text{ V}$
$\text{Cu}^{2+} (\text{ak/aq}) + 2\text{e}^- \rightleftharpoons \text{Cu} (\text{p/s})$	$E^\circ = + 0.34 \text{ V}$
$\text{O}_2(\text{g}) + 2\text{H}_2\text{O} (\text{ce/l}) + 4\text{e}^- \rightleftharpoons 4\text{OH}^- (\text{ak/aq})$	$E^\circ = + 0.40 \text{ V}$
$\text{S}_2\text{O}_8^{2-} (\text{ak/aq}) + 2\text{e}^- \rightleftharpoons 2\text{SO}_4(\text{ak/aq})$	$E^\circ = + 2.01 \text{ V}$

Berdasarkan Rajah 11.2, bandingkan pemerhatian pada warna elektrolit dalam sel P dan sel Q selepas 30 minit. Terangkan jawapan anda.

Based on Diagram 11.2, compare the observations on the colour of electrolytes in cell P and cell Q after 30 minutes. Explain your answer.

[5 markah] [5 marks]

(c). Rajah 11.3 menunjukkan senarai bahan dan radas yang dibekalkan untuk membina satu sel kimia.

Diagram 11.3 shows the list of materials and apparatus provided to construct a voltaic cell

Tomato	Wayar penyambung	Mentol LED
Tomato	Connecting wire	LED bulb
Paku besi	Kepingan zink	Kepingan kuprum
Iron nail	Zink strip	Copper strip
Sudu plastik	Kepingan magnesium	Rod karbon
Plastic spoon	Magnesium strip	Carbon rod
Kertas pasir		
Sand paper		

Jadual 11 menunjukkan sebahagian daripada nilai siri keupayaan elektrod piawai.

Table 11 shows part of the standard electrode potential series values.

Tindak balas sel setengah Half cell reaction	E° / V (298 K)
$\text{Mg}^{2+} (\text{ak/aq}) + 2\text{e}^- \rightleftharpoons \text{Mg} (\text{p/s})$	$E^\circ = - 2.38 \text{ V}$
$\text{Zn}^{2+} (\text{ak/aq}) + 2\text{e}^- \rightleftharpoons \text{Zn} (\text{p/s})$	$E^\circ = - 0.76 \text{ V}$
$\text{Fe}^{2+} (\text{ak/aq}) + 2\text{e}^- \rightleftharpoons \text{Fe} (\text{p/s})$	$E^\circ = - 0.44 \text{ V}$
$2\text{H}^+ (\text{ak/aq}) + 2\text{e}^- \rightleftharpoons \text{H}_2 (\text{g})$	$E^\circ = 0.00 \text{ V}$
$\text{Cu}^{2+} (\text{ak/aq}) + 2\text{e}^- \rightleftharpoons \text{Cu} (\text{p/s})$	$E^\circ = + 0.34 \text{ V}$

Dengan menggunakan pengetahuan kimia anda, lukis susunan radas sel kimia yang dapat menyalakan mentol LED. Susunan radas yang dibina perlulah menggunakan bahan dan radas yang sesuai seperti yang disenaraikan dalam Rajah 11.3.

Huraikan secara ringkas langkah pembinaan sel kimia tersebut dan terangkan tindak balas redoks yang berlaku. Kemudian, tentukan nilai bacaan voltan yang diperoleh.

By using your chemistry knowledge, draw an apparatus setup of a voltaic cell that can light up on LED bulb. The apparatus setup constructed should use suitable materials and apparatus as listed in Diagram 11.3.

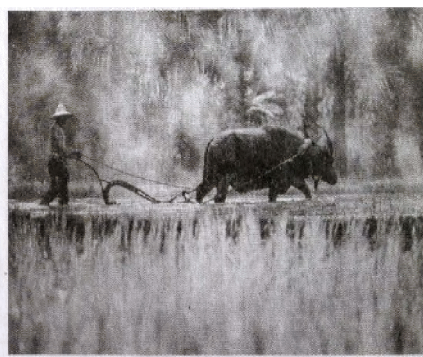
Describe briefly the steps of constructing the voltaic cell and explain the redox reaction that take place. Then determine the value of the voltage reading obtained.

[8 markah][8 marks]

[JohorPPD BatuPahat 2022-11]

11. (a) Rajah 10 menunjukkan dua persekitaran yang berbeza.

Diagram 10 shows two different environments.



Kawasan industri Industrial area	Kawasan pertanian Agricultural area
-------------------------------------	--

Rajah 10
Diagram 10

Pintu pagar besi di rumah yang berhampiran dengan kawasan industri berkarat lebih cepat berbanding pintu pagar besi yang berada di kawasan pertanian. Jelaskan fenomena ini.

Iron gates of houses situated near the industrial areas rust faster than those situated in agricultural area. Explain this phenomenon.

[2 markah/ 2 marks]

(b)

Peneutralan bukan tindak balas redoks
Neutralization is not a redox reaction

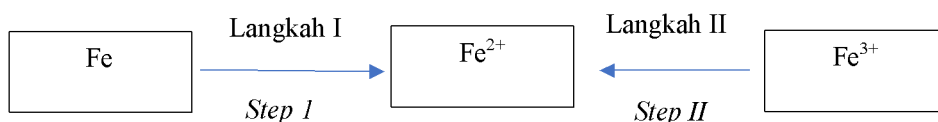
Dengan menggunakan satu contoh, jelaskan pernyataan di atas.

By using one example, explain the statement above.

[4 markah/ 4 marks]

(c) Rajah 10.1 menunjukkan perubahan yang melibatkan ferum, ion ferum (II) dan ion ferum (III).

Diagram 10.1 shows the changes involving iron, iron (II) ion dan iron (III) ions.



Dengan merujuk kepada rajah 10.1, cadangkan bahan kimia yang sesuai untuk penukaran dalam Langkah I dan Langkah II.

Jawapan anda hendaklah disertakan dengan pemerhatian bagi setiap langkah yang terlibat.

By referring to Diagram 10.1, suggest a suitable chemical substance to carry out the changes in Step I and Step II. Your answer should include the observation for each step involved.

[4 markah/ 4 marks]

(d) Pernyataan berikut adalah mengenai tindak balas redoks

The following statement is about a redox reaction.

Dengan menggunakan kalium iodida, asid sulfurik cair dan air bromin, huraikan satu eksperimen untuk mengesahkan pernyataan di atas melalui pemindahan elektron pada suatu jarak.

By using potassium iodide solution, dilute sulphuric acid and bromine water, describe one experiment to verify the statement above by the transfer of electron at a distance.

Huraian anda perlu mengandungi: /Your description should include:

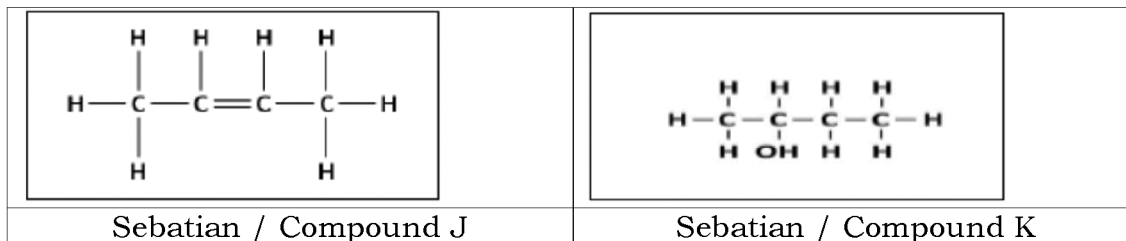
- Rajah berlabel/ Labelled diagram
- Prosedur/ Procedure
- Pemerhatian/ Observations

[10 markah/10 marks]

Bab 2

[PPinang2022-Set01-08] Rajah 8 menunjukkan formula struktur sebatian J dan sebatian K.

Diagram 8 shows the structural formulae of compounds J and K.



(a) Nyatakan siri homolog bagi sebatian J dan K.
State the homologous series for compounds J and K

Sebatian / Compound J :

Sebatian/Compound K : [2M]

(i) Namakan sebatian K.[1M]
Name compound K

(ii) Namakan tindak balas tersebut.[1M]
Name the reaction.

(ii) Lukiskan satu lagi isomer bagi sebatian K dan namakannya mengikut penamaan IUPAC.

Draw another isomer of compound K and name it according to IUPAC nomenclature.

[2M]

(c) Sebatian L dihasilkan apabila larutan kalium dikromat berasid (VI) ditambah ke dalam tabung uji yang mengandungi sebatian K
Compound L is produced when an acidic potassium dichromate (VI) solution is added into a test tube containing compound K.

(i) Nyatakan satu pemerhatian bagi tindak balas tersebut.
State one observation for this reaction.

.....[1M]

(ii) Tuliskan formula molekul bagi sebatian L.[1M]
Write the molecular formula of compound L.

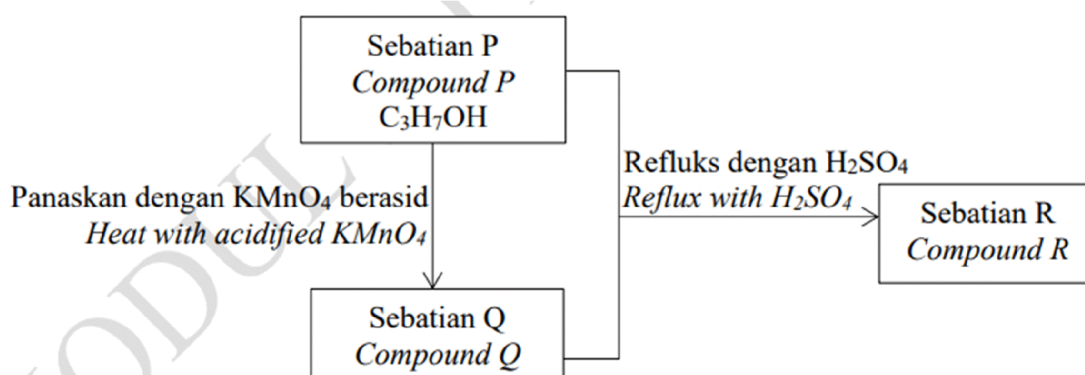
(d) Sebatian J terbakar dengan oksigen yang berlebihan.
Compound J burns completely in excess oxygen.

Tulis persamaan kimia bagi pembakaran lengkap J.
Write the chemical equation for the complete combustion of J.

.....[2M]

[JUJ2022-Set01-06] Rajah 6 menunjukkan tindak balas yang melibatkan sebatian P.

Diagram 6 shows the reactions involving compound P.



Berdasarkan Rajah 6,/ Based on Diagram 6,

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

.....[1M]

(ii) Lukis dua isomer bagi sebatian P./ Draw two isomers for compound P.

[2M]

(b) Kenal pasti sebatian Q.[1M]
Identify compound Q.

(c) (i) Kenal pasti siri homolog dan nyatakan nama sebatian R.
Identify homologous series and name compound R.

Siri homolog/ Homologous series:

Nama/ Name : [2M]

(ii) Tulis persamaan kimia seimbang bagi tindak balas antara sebatian Q dan sebatian P untuk menghasilkan sebatian R.
Write a balanced chemical equation for the reaction between compound Q and compound P to produce compound R.

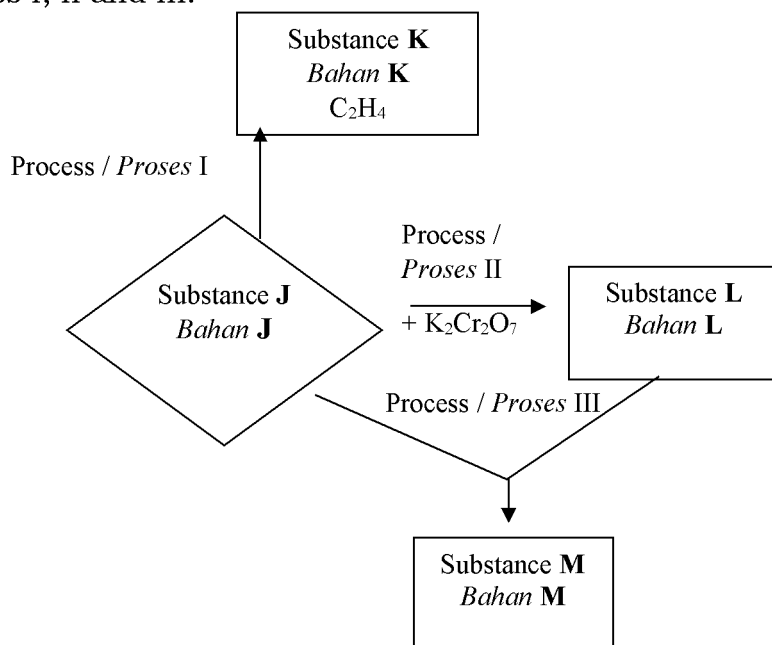
.....[2M]

(iii) Dalam satu eksperimen makmal, Faiz mendapati sebatian R berbau wangi. Cadangkan produk yang boleh dihasilkan oleh Faiz menggunakan sebatian R dalam kehidupan harian.
In a laboratory experiment, Faiz observed that compound R has fragrant smell. Suggest product that can be produce by Faiz by using compound R in daily life.

.....[1M]

[JohorPPD BatuPahat 2022-08] Rajah 7 di bawah menunjukkan carta alir bagi proses penukaran satu sebatian organik kepada sebatian organik yang lain bermula dengan bahan J melalui Proses I, II dan III.

Diagram 7 shows the flow chart for the conversion processes of a organic compound to another organic compound starting with substance J through Process I, II and III.



a)

Bahan **J** yang mempunyai jisim molekul relatif 46
*Substance **J** has relative molecular mass 46.*

Komposisi unsur mengikut jisim seperti berikut :
Composition of element according to mass as follow:

Carbon / *Karbon*, 52.2%
Hydrogen / *Hidrogen*, 13.0 %
Oxygen / *Oksigen*, 34.8%

(i) Hitungkan formula empirik bahan J.
Calculate the empirical formula of substance J.

Gunakan maklumat jisim atom relatif H = 1, C = 12, O = 16
Use the information atomic mass relative: H, 1; C, 12; O, 16

[2M]

(ii) Tentukan formula molekul bahan J
Determine the molecular formula for substance J.

[2M]

(iii) Lukiskan formula struktur bahan J.
Draw the structural formula for substance J.

[1M]

b) Bahan K, C_2H_4 yang dihasilkan melalui Proses I dicampurkan dengan air bromin dalam sebuah tabung uji. Nyatakan pemerhatian dalam tabung uji itu.
Substance K, C_2H_4 produced through Process I is added with bromine water in a test tube. State the observation in the test tube.

.....[1M]

c) (i) Namakan jenis tindak balas dalam Proses II
Name the type of reaction in Process II.

.....[1M]

(ii) Tuliskan persamaan kimia bagi tindak balas yang berlaku dalam Proses II
Write the chemical equation for the reaction occur in the Process II.

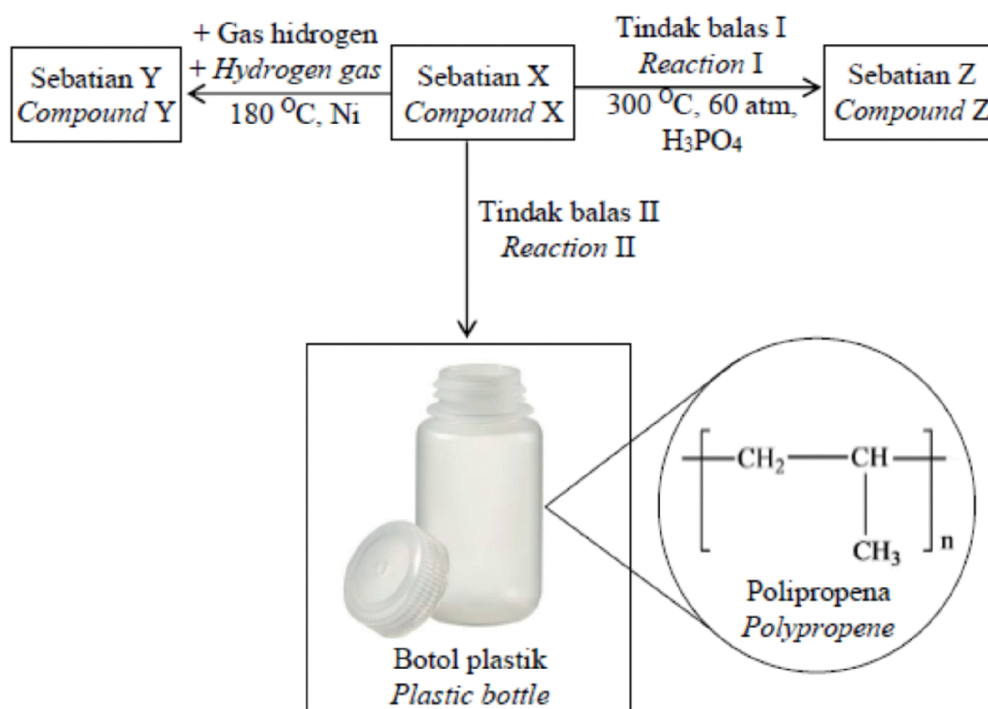
.....[2M]

d) Nyatakan satu sifat istimewa bahan M yang terhasil dalam Proses III
State a special characteristic of substance M produced in Process III.

.....[1M]

[Melaka2022-05] Rajah 4 menunjukkan satu siri tindak balas yang berlaku ke atas Sebatian X.

Diagram 4 shows a series of reaction that occurred on Compound X.



(a) Sebatian X dan Sebatian Y adalah hidrokarbon.
Compound X and Compound Y is a hydrocarbon.

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

.....
.....[1M]

(b) Kedua-dua Sebatian X dan Sebatian Y sesuai digunakan sebagai bahan bakar dan dapat menghasilkan nyalaan yang berjelaga.
Both Compound X and Compound Y are suitable to be used as fuel and can produce a sooty flame.

(i) Sebatian yang manakah akan menghasilkan lebih banyak jelaga?
Terangkan mengapa.
Which compounds will produce more soot? Explain why.

.....
.....[2M]

(ii) Tulis persamaan kimia bagi pembakaran lengkap sebatian di (b)(i).
Write the chemical equation for the complete combustion of the compound in (b)(i).

.....[2M]

(c) Berdasarkan Rajah 4,/ Based on Diagram 4,

(i) Kenal pasti Sebatian Y dan Sebatian Z
Identify Compound Y and Compound Z

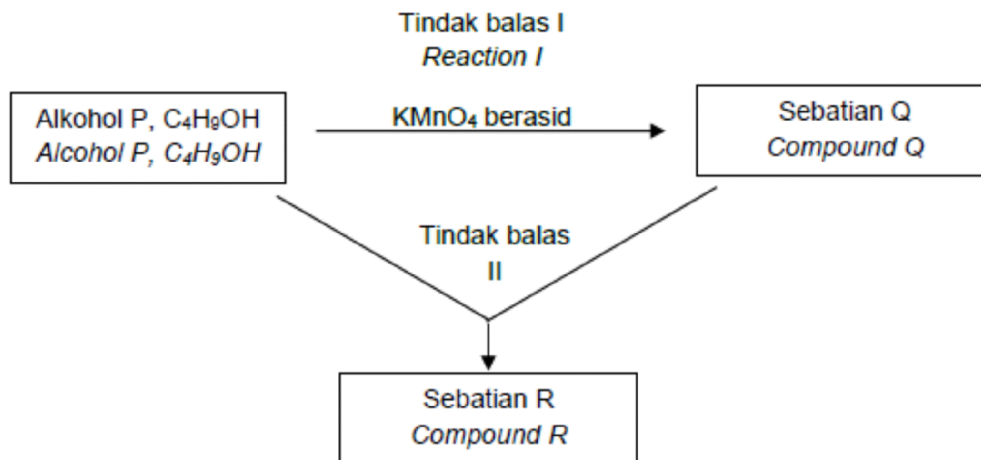
Y : Z : [2M]

(ii) Lukiskan formula struktur bagi monomer botol plastik itu.
Draw the structural formula for the monomer of the plastic bottle.

[1M]

[PPinang2022-Set02-07] Rajah 7 menunjukkan alkohol P, C_4H_9OH yang berantai lurus melalui tindak balas I membentuk sebatian Q. Alkohol P melalui tindak balas II membentuk sebatian R.

Diagram 7 shows alcohol P, C_4H_9OH straight line undergoes reaction I to form compound Q. Alcohol P undergoes reaction II to form compound R.



(a) Nyatakan nama bagi alkohol P, C_4H_9OH[1M]
State the name for alcohol P, C_4H_9OH .

(b) Lukis formula struktur untuk dua isomer bagi alkohol P, C_4H_9OH
Draw the structural formulae for two isomer of alcohol P, C_4H_9OH

(c) (i) Nyatakan pemerhatian bagi tindak balas I. [2M]
State the observation for reaction I

.....[1M]

(ii) Namakan kumpulan berfungsi bagi sebatian Q.
Name the functional group of compound Q.

.....[1M]

(d) Apabila sebatian Q bertindak balas dengan magnesium, gas tidak berwarna dihasilkan. Terangkan kaedah bagi menguji kehadiran gas tersebut.

When compound Q react with magnesium, colourless gas is produced. Describe the method to test the presence of this gas.

.....
[2M]

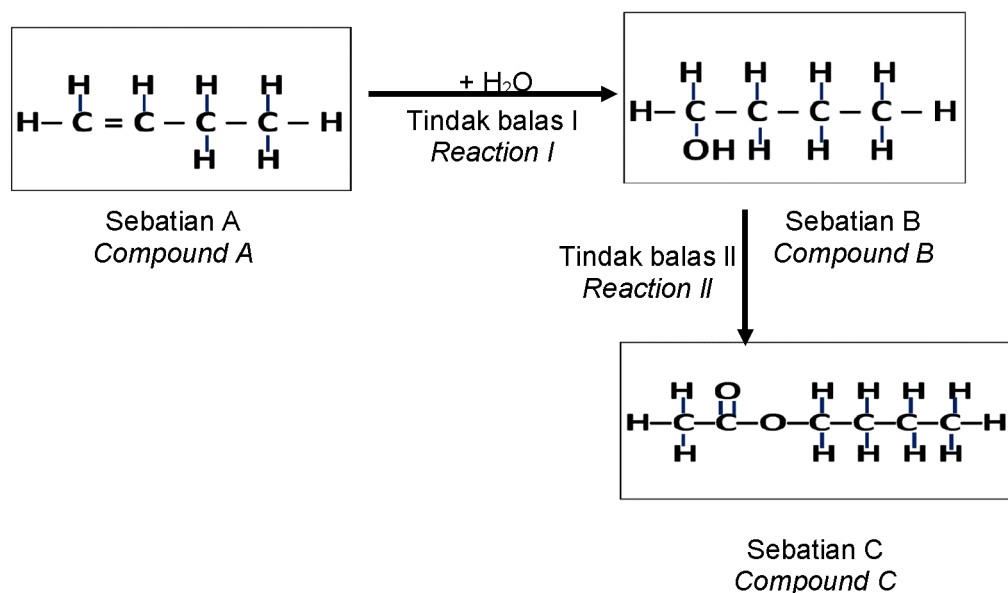
(e) (i) Namakan tindak balas II.....[1M]
 Name the reaction II

(ii) Tulis persamaan kimia seimbang bagi tindak balas II
 Write the balanced chemical equation for reaction II

.....[2M]

[Pahang PPD Jerantut 2022-08] Rajah 6 menunjukkan penukaran bagi beberapa sebatian organik.

Diagram 6 shows the conversions of several organic compounds.



(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.

[2M]

(b) (i) Namakan tindak balas I.[1M]
Name the reaction I.

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

.....[1M]

(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]

(d) Huraikan secara ringkas bagaimana anda boleh menyediakan sebatian C di dalam makmal melalui tindak balas II.

Explain briefly how you can prepare the compound C in laboratory through reaction II.

.....

.....

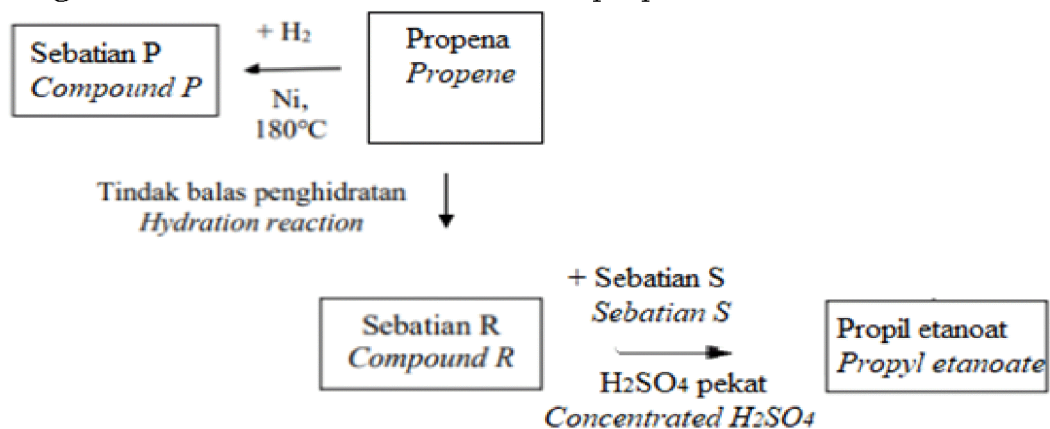
.....

.....[3M]

[Pahang2022-06]

6. Rajah 6 menunjukkan siri tindak balas bagi propena.

Diagram 6 shows series of reactions for propene.



Berdasarkan Rajah 6,/ Based on Diagram 6,

(a) (i) Nyatakan siri homolog bagi propena.[1M]
State the homologous series for propene.

(ii) Tuliskan formula molekul bagi propena.[1M]
State the molecular formula for propene.

(iii) Pembakaran propena menghasilkan lebih banyak jelaga berbanding sebatian P. Kira peratus karbon mengikut jisim bagi propena.
Combustion of propene produces more soot than compound P. Calculate the percentage of carbon by mass for propene.
[Jisim atom relatif / Relative atomic mass: C=12, H=1]

[1M]

(iv) Polipropena adalah polimer bagi propena. Pembakaran secara terbuka polipropena boleh mencemarkan alam sekitar. Jelaskan.
Polypropene is a polymer of propene. Open burning of polypropene can pollute the environment. Explain.

.....

.....[2M]

(b) Tuliskan formula am bagi sebatian P.[1M]
Write the general formula for compound P.

(c) Lukiskan dua isomer bagi sebatian R.
Draw two isomers of compound R.

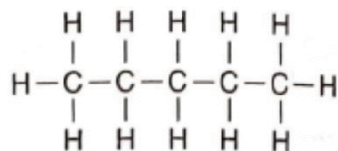
[2M]

(d) Namakan sebatian S untuk menghasilkan propil etanoat.
Name the compound S to produce propyl ethanoate.

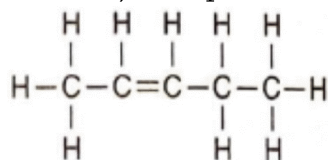
.....[1M]

[JohorPPD Tangkak 2022-06]

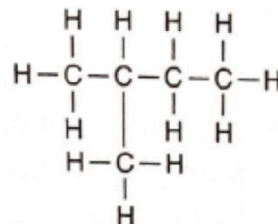
Rajah 6 menunjukkan formula struktur bagi sebatian P, Q, R dan T.
Diagram 6 shows the structural formulae of compounds P, Q, R and T.



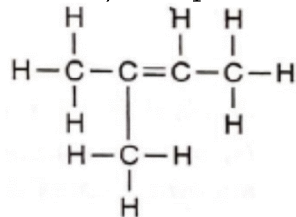
Sebatian/ compounds P



Sebatian/ compounds R



Sebatian/ compounds Q



Sebatian/ compounds T

Sebatian P dan Q merupakan isomer bagi sebatian hidrokarbon tepu manakala sebatian R dan T pula adalah isomer bagi suatu sebatian hidrokarbon tidak tepu.

Compounds P and Q are isomers of a saturated hydrocarbon compounds while compounds R and T are isomers of an unsaturated hydrocarbon compound.

Berdasarkan rajah 6,/ Based on Diagram 6,

(a) Apakah dimaksudkan dengan isomer?/ What is meant by isomer?

.....

.....[1M]

(b) Namakan sebatian T mengikut penamaan IUPAC.

Name compound T according to the IUPAC nomenclature.

.....[1M]

(c) Lukis formula struktur bagi satu isomer lain bagi sebatian karbon P dan Q.

Draw the structural formula for another isomer of carbon compounds P and Q.

[1M]

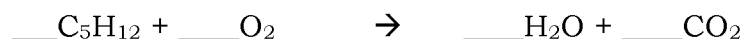
(d) Sebatian R boleh ditukar kepada sebatian P. Tuliskan persamaan kimia bagi tindak balas penambahan yang berlaku.

Compound R can be converted to compound P. Write the chemical equation for the addition reaction occur.

.....[2M]

(e) Persamaan kimia dibawah menunjukkan tindak balas pembakaran lengkap bagi 300 cm³ sebatian P.

The chemical equation below shows a complete combustion reaction of 300 cm³ of compound P.



Seimbangkan persamaan kimia tersebut dan hitung jisim gas karbon dioksida yang terbentuk.

[Jisim atom relatif: C=12, O=16, Isi padu molar = 24 dm³ mol⁻¹ pada keadaan bilik]

Balance the chemical equation and calculate the mass of carbon dioxide gas formed.

[Relative atomic mass: C=12, O=16, Molar volume = 24 dm³ mol⁻¹ at room temperature].

[4M]

Esei

[SPM2021-V2-09] (a) Rajah 8.1 menunjukkan carta alir bagi penukaran satu hidrokarbon tak tepu. Hidrokarbon tepu itu mempunyai dua atom karbon per molekul.

Diagram 8.1 shows a flow chart for the change of an unsaturated hydrocarbon. The unsaturated hydrocarbon has two carbon atoms per molecule.



(i) Nyatakan nama bagi siri homolog dan kumpulan berfungsi bagi hidrokarbon tak tepu.

Lukis formula struktur sebatian X dan nyatakan nama sebatian X.

[4 markah]

State name of the homologous series and the functional group of the unsaturated hydrocarbon.

Draw the structural formula and state the name for compound X.

[4 marks]

(ii) Kedua-dua hidrokarbon tak tepu dan hidrokarbon tepu itu boleh dibakar lengkap dalam oksigen.

Tulis persamaan kimia bagi pembakaran lengkap untuk hidrokarbon tepu.

Tentukan hidrokarbon yang akan menghasilkan jelaga yang lebih banyak.

Terangkan jawapan anda.

[Jisim atom relatif: C=12; H=1]

[6 markah]

Both the unsaturated and saturated hydrocarbon can be burned completely in oxygen.

Write the chemical equation for the complete combustion of saturated hydrocarbon. Determine the hydrocarbon that will produce more soot.

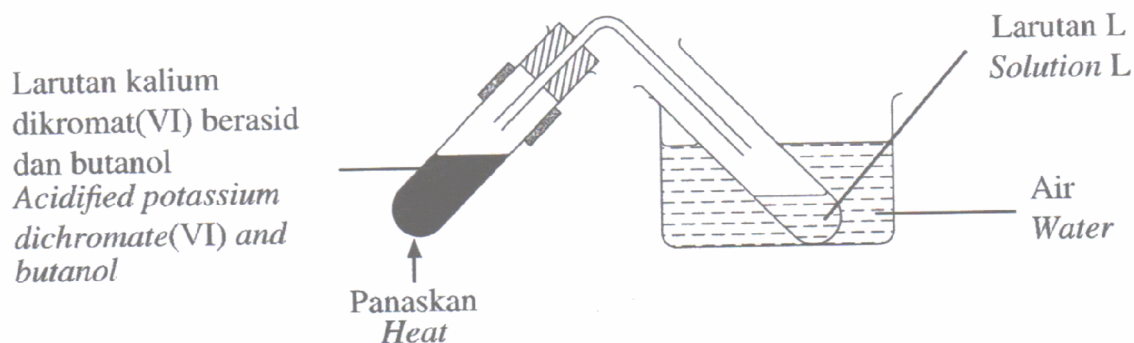
Explain your answer.

[Relative atomic mass: C=12; H=1]

[6 marks]

(b) Rajah 8.2 menunjukkan suatu susunan radas bagi tindak balas yang melibatkan butanol.

Diagram 8.2 shows the an apparatus set-up for the reaction that involved butanol.



Larutan L yang terhasil digunakan dalam tindak balas A dan tindak balas B masing-masing seperti yang ditunjukkan dalam Jadual 5.

Solution L produced is used in reaction A and reaction B respectively as shown in Table 5.

Tindak balas Reaction	Susunan radas Apparatus set-up	Pemerhatian observation
A		
B		

Berdasarkan Rajah 8.2, nyatakan nama tindak balas untuk menghasilkan L dan kenal pasti L.

Nyatakan nama tindak balas A dan B berdasarkan Jadual 5, dan terangkan mengapa terdapat perbezaan pemerhatian dalam kedua-dua tindak balas itu.

Tulis persamaan kimia bagi tindak balas A.

[10 markah]

Based on Diagram 8.2, state the name of reaction to produce L and identify L.

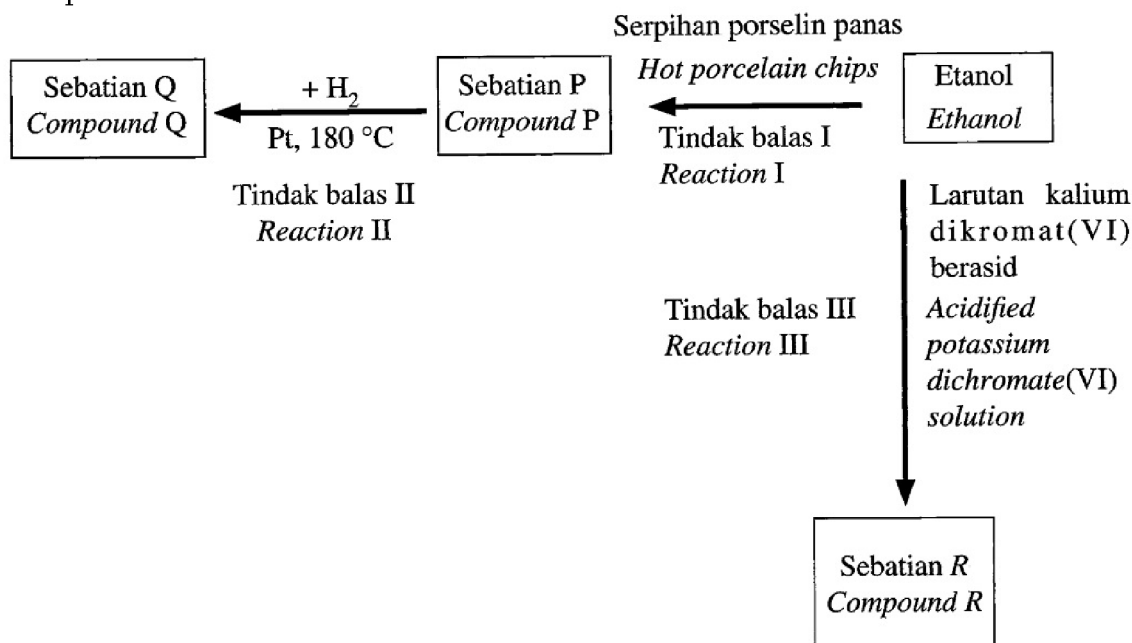
State the name of reactions A and B in Table 5 and explain why there is a difference in observation for both reactions.

Write a chemical equation for the reaction A.

[10 marks]

[SPM2021-V1-09] Rajah 6 menunjukkan carta alir pertukaran etanol kepada beberapa sebatian.

Diagram 6 shows a flow chart for the conversion of ethanol to a few compounds.



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

[1 markah] [1 mark]

(b) Kenal pasti sebatian P, Q dan R. Nyatakan siri homolog dan lukiskan formula struktur bagi sebatian P, Q dan R.
Identify compounds P, Q and R. State the homologous series and draw the structural formula of compounds P, Q and R.

[9 markah] [9 marks]

(c) Tulis persamaan kimia bagi Tindak balas II. Jika 480 cm³ sebatian P digunakan, hitung isi padu sebatian Q yang terhasil.
[1 mol gas menempati 24 dm³ pada keadaan bilik]
Write the chemical equation for Reaction II. If 480 cm³ of compound P is used, calculate the volume of compound Q produced.
[1 mol of gas occupies 24 dm³ at room temperature]

[5 markah] [5 marks]

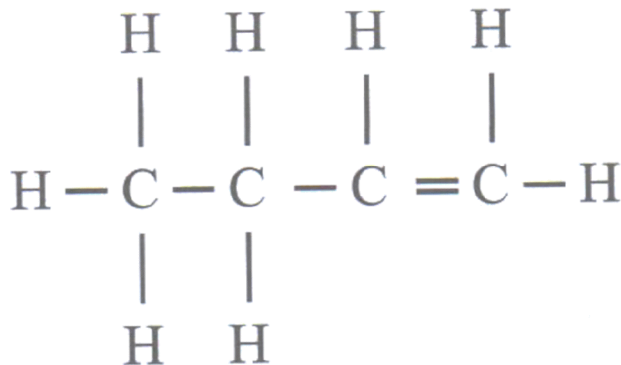
(d) Etanol boleh ditukarkan kepada sebatian R melalui Tindak balas III. Nyatakan jenis tindak balas dan kaedah yang digunakan dalam pertukaran itu serta nyatakan perubahan warna bagi larutan kalium dikromat(VI) berasid. Lukis gambarajah susunan radas bagi pertukaran etanol kepada sebatian P melalui Tindak balas I.
Ethanol can be converted into compound R through Reaction III. State the type of reaction and state the method that is used in the conversion and state the colour changes of acidified potassium dichromate (VI) solution.

Draw an apparatus set-up for the conversion of ethanol to compound P through Reaction I.

[5 markah] [5 marks]

[Selangor2022-Set02-10] [Selangor2022-Set3-10]

(a) Rajah 10.1 menunjukkan satu formula struktur bagi butena.
Diagram 10.1 shows a structural formula of butene.



(i) Nyatakan **maksud isomer**. / State the meaning of isomer.

(ii) Lukis formula struktur bagi dua lagi isomer bagi butena.
Namakan setiap isomer tersebut mengikut penamaan IUPAC.
Draw the structural formulae for another two isomers of butene.
Name each isomer according to the IUPAC nomenclature.

[4 markah] [4 marks]

(iii) Tulis persamaan kimia seimbang bagi pembakaran butena dalam oksigen yang berlebihan.
Jika 1 200 cm³ gas butena digunakan, hitungkan isi padu gas oksigen yang diperlukan untuk pembakaran tersebut.

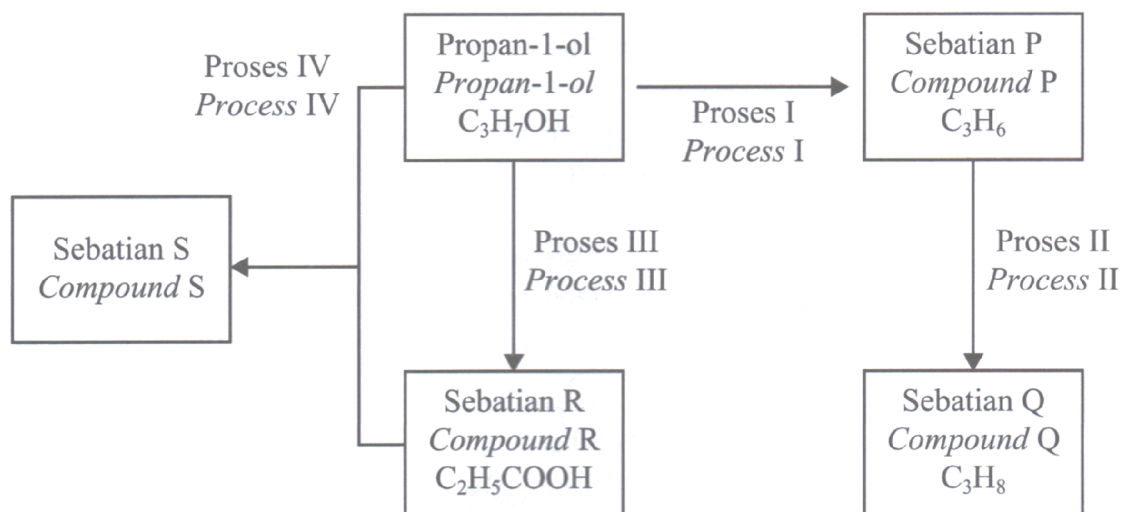
[1 mol gas menempati 24 cm³ pada keadaan bilik]

Write the balanced chemical equation for the combustion of butene in excess oxygen. If 1 200 cm³ butene gas is use, calculate the volume of oxygen gas needed for the combustion.

[1 mol of gas occupies 24 cm³ at room condition]

[5 markah] [5 marks]

(b) Rajah 10.2 menunjukkan carta alir pertukaran propan-1-ol kepada beberapa sebatian organik.
Diagram 10.2 shows a flow chart for the conversion of propan-1-ol to a few organic compounds.



Nyatakan nama bagi Proses I, Proses II, Proses III dan Proses IV.

Kenal pasti siri homolog bagi Sebatian P, Sebatian Q, Sebatian R dan Sebatian S.

Lukis formula struktur bagi Sebatian P dan Sebatian S.

State the name for Process I, Process II, Process III and Process IV.

Identify the homologous series for Compound P, Compound Q, Compound R and Compound S.

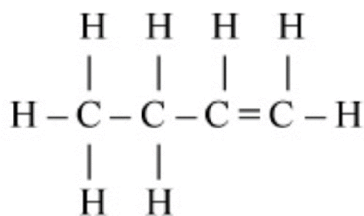
Draw the structural formula for Compound P and Compound S.

[10 markah] [10 marks]

[Selangor2022-Set01-10]

10 (a) Rajah 10.1 menunjukkan formula struktur bagi butena.

Diagram 10.1 shows a structural formula of butene.



Rajah 10.1

Diagram 10.1

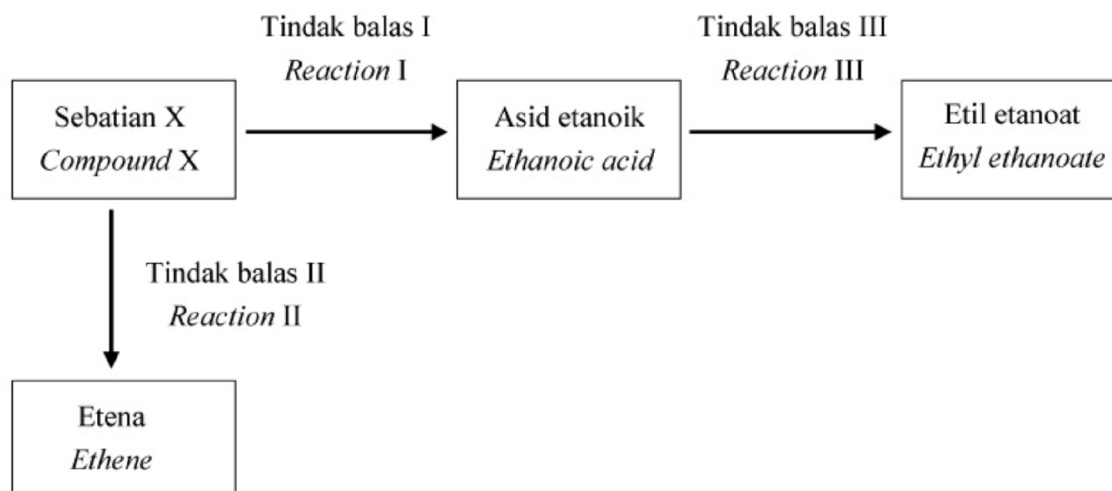
Lukis formula struktur bagi dua lagi isomer bagi butena dan namakan setiap isomernya mengikut penamaan IUPAC.

Draw the structural formulae for another two isomers of butene and name each isomer according to the IUPAC nomenclature.

[4 markah] [4 marks]

(b) Rajah 10.2 menunjukkan penukaran bagi beberapa sebatian organik.

Diagram 10.2 shows the conversions of several organic compounds.



(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 for 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 equation for Reaction I and Reaction II.

[4 markah] [4 marks]

(c) Butena terbakar lengkap dalam oksigen menghasilkan air dan gas karbon dioksida.

Tulis persamaan kimia seimbang dan hitung isi padu gas karbon dioksida yang terhasil apabila 1.12 g butena terbakar lengkap.

[Jisim atom relatif: C = 12, H = 1 dan 1 mol bagi sebarang gas menempati 24 dm³ pada keadaan bilik]

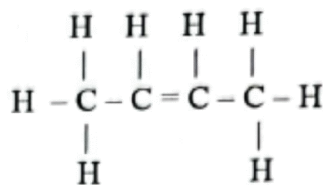
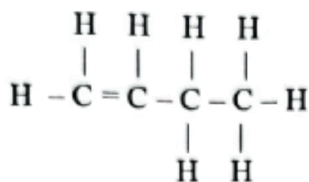
Butene burnt completely in oxygen to produce water and carbon dioxide gas.

Write a balanced chemical equation and calculate the volume of carbon dioxide gas produced when 1.12 g of butene is completely burnt.

[Relative atomic mass: C = 12, H = 1 and 1 mol of any gas occupies 24 dm³ at room conditions]

[5 markah] [5 marks]

[SBP2022-11] Rajah 11 menunjukkan dua isomer bagi sebatian V.
Diagram 11 shows two isomers for compound V.



(a) Berdasarkan Rajah 11, / Based on the Diagram 11,

Apakah yang dimaksudkan dengan keisomeran struktur?
What is meant by structural isomerism?

[1 markah/ mark]

(ii) Sebatian V mempunyai tiga isomer. Lukis formula struktur yang lain bagi isomer sebatian V dan nyatakan nama isomer itu dengan menggunakan sistem penamaan IUPAC.

Compound V has three isomers. Draw another structural formula for isomer compound V and state the name of the isomer by using IUPAC nomenclature system.

[2 markah/ marks]

(iii) Sebatian W dihasilkan melalui tindak balas penghidratan daripada sebatian V. Tulis persamaan kimia bagi tindak balas yang berlaku dan tentukan jisim sebatian W yang terhasil apabila 0.125 mol sebatian V digunakan dalam tindak balas tersebut.

Compound W is produced through hydration reaction from compound V. Write the chemical equation for the reaction that occurs and determine the mass of compound W produced when 0.125 mol of compound V is used in the reaction.

[Jisim atomrelatif/ Relative atomic mass : H = 1, C = 12, O = 16]

[4 markah/ marks]

(b) Jadual 11 menunjukkan maklumat bagi sebatian R, sebatian S dan sebatian T.

Table 11 shows the information of compounds R, S and T.

Sebatian Compound	Maklumat Information
R	• Terdiri daripada unsur karbon, hidrogen dan oksigen Consists of carbon, hydrogen and oxygen elements • Mempunyai 2 atom karbon/ Has 2 carbon atoms • Larut dalam air/ Soluble in water • Bertindak balas dengan asid etanoik menghasilkan ester U Reacts with ethanoic acid to produce ester U

S	• Terdiri daripada unsur karbon dan hidrogen sahaja Consists of carbon and hydrogen elements only • Mempunyai 3 atom karbon Has 3 carbon atoms • Tidak menyahwarnakan warna ungu larutan kalium manganat(VII) berasid. Does not decolourise the purple colour of acidified potassium manganate(VII)
T	• Terdiri daripada unsur karbon dan hidrogen sahaja Consists of carbon and hydrogen elements only • Mempunyai 3 atom karbon Has 3 carbon atoms • Menyahwarnakan warna ungu larutan kalium manganat(VII) berasid. Decolourises the purple colour of acidified potassium manganate(VII)

Berdasarkan maklumat dalam Jadual 11:

Based on the information in Table 11:

(i) Kenal pasti sebatian R, S dan T dan seterusnya terangkan perbezaan pemerhatian bagi sebatian S dan sebatian T apabila bertindak balas dengan larutan kalium manganat(VII) berasid.

Identify compounds R, S and T and then explain the difference in the observations for compounds S and T when react with acidified potassium manganate(VII) solution.

[5 markah/ marks]

(ii) Sebatian R dapat disediakan secara tindak balas kimia melalui proses penapaian glukosa. Dengan menggunakan bahan yang sesuai yang terdapat di rumah anda, terangkan bagaimana anda dapat menyediakan sebatian R di makmal sekolah. Dalam penerangan anda, terangkan bagaimana sebatian R tulen dapat dikumpulkan.

Compound R can be prepared by a chemical reaction through a fermentation process of glucose. By using suitable materials found in your home, explain how you can prepare compound R at the school laboratory. In your description, explain how pure compound R can be collected.

[8 markah/ marks]

[Putrajaya2022-11] (a) Jadual 11 menunjukkan formula molekul bagi sebatian X dan sebatian Y.

Table 11 shows the molecular formula of compound X and Y.

Sebatian Compound	Formula molekul Molecular formula
X	C_4H_{10}
Y	C_4H_8

(i) Kenal pasti hidrokarbon tepu dan hidrokarbon tak tepu.

Namakan siri homolog bagi sebatian X dan nyatakan kumpulan berfungsi bagi sebatian Y.

Identify the saturated hydrocarbon and unsaturated hydrocarbon.

Name the homologous series for compound X and state the functional group of compound Y.

[4 markah/ marks]

(ii) Sebatian X dan sebatian Y boleh dibakar lengkap dengan gas oksigen berlebihan. Tuliskan persamaan kimia bagi pembakaran lengkap untuk sebatian X atau sebatian Y. Tentukan sebatian yang akan menghasilkan jelaga yang lebih banyak. Terangkan jawapan anda.

Compound X and compound Y can be burned completely in excess oxygen gas. Write the chemical equation for the complete combustion of compound X or compound Y. Determine the compound that will produce more soot.

Explain your answer

[Jisim atom relatif/ Relative atomic mass: H = 1; C = 12]

[6 markah/ marks]

(b) Rajah 11 menunjukkan susunan radas bagi menukarkan propanol kepada sebatian R.

Diagram 11 shows an apparatus set up to convert propanol to compound R.

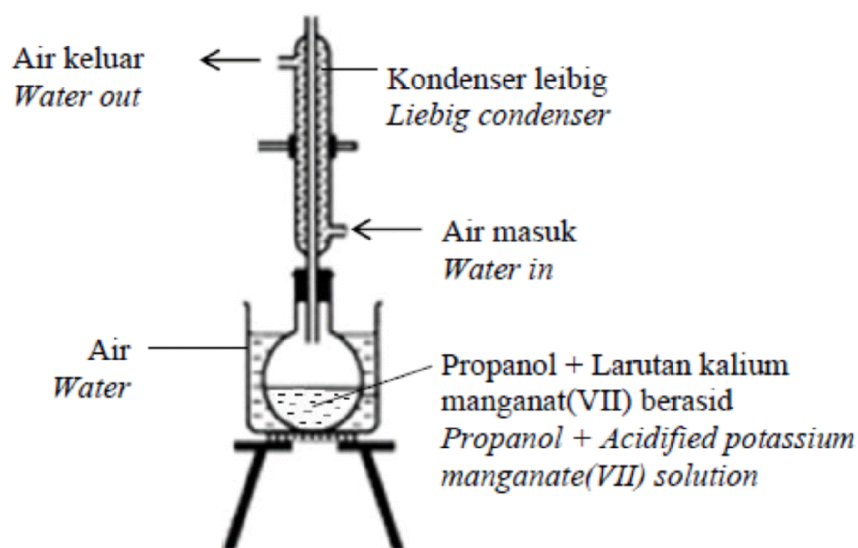


Diagram / Rajah 11

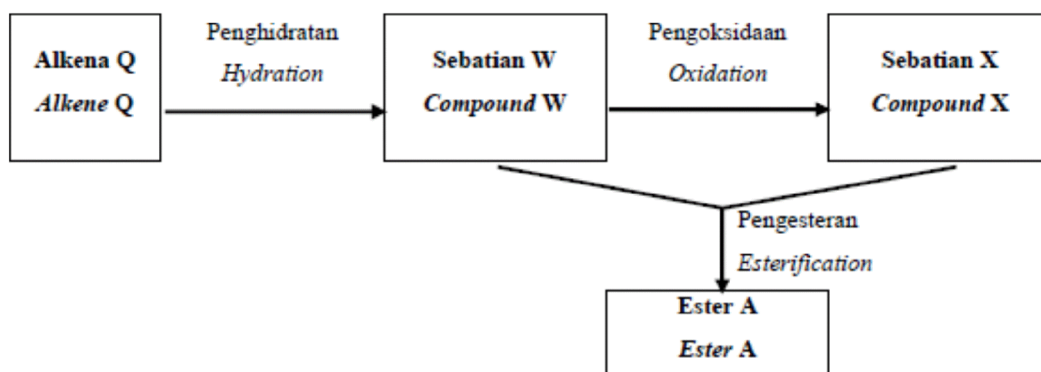
Berdasarkan Rajah 11,/ Based on Diagram 11,

(i) Nyatakan jenis tindak balas dan kaedah yang digunakan dalam pertukaran itu serta kenal pasti sebatian R yang terhasil.
Nyatakan perubahan warna bagi larutan kalium manganat(VII) berasid.
State the type of reaction and state the method used in the conversion and identify compound R produced.
State the colour changes of acidified potassium manganate(VII) solution.
[4 markah/ marks]

(ii) Sebatian R bertindak balas dengan propanol untuk menghasilkan ester dan air. Huraikan penyediaan ester di dalam makmal.
Lukiskan formula struktur bagi ester yang terhasil.
Compound R reacts with propanol to form ester and water.
Describe the preparation of the ester in the laboratory.
Draw the structural formula of the ester formed.
[6 markah/ marks]

[Perak2022-Set02-11]

(a) Rajah 10.1 menunjukkan penukaran sebatian organik daripada satu siri homolog kepada yang lain.
Diagram 10.1 shows the conversion of an organic compound from one homologous series to another.



(i) Apakah maksud siri homolog?
What is the meaning of homologous series?
[1 markah / mark]

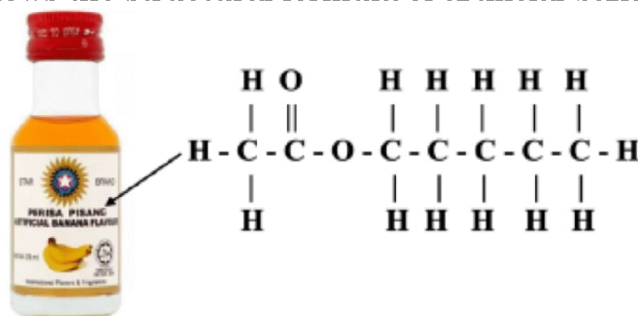
(ii) Jisim molekul relatif yang mungkin bagi alkena Q adalah 28, 42 atau 56. Dengan memilih salah satu daripada jisim molekul relatif itu, tentukan formula molekul bagi alkena itu dan nyatakan nama bagi alkena itu.
[Jisim atom relatif: H= 1; C= 12]
The possible relative molecular masses of alkene Q are 28, 42 or 56. By choosing any one of the relative molecular masses, determine the molecular formula for the alkene and state the name of the alkene.
[Relative atomic mass : H = 1, C = 12]
[3 markah / marks]

(iii) Berdasarkan Rajah 10.1 dan jawapan daripada 11(a)(ii), nyatakan nama dan lukiskan formula struktur sebatian W dan sebatian X. Tuliskan persamaan kimia untuk menunjukkan penukaran sebatian W kepada sebatian X.

Based on Diagram 10.1 and the answer from 11(a)(ii), state the names and draw the structural formulae of compound W and compound X. Write the chemical equation to show the conversion of compound W to compound X.

[6 markah / marks]

(b) Rajah 10.2 menunjukkan formula struktur bagi perisa pisang tiruan. Diagram 10.2 shows the structural formula of artificial banana flavour.



Dengan menggunakan bahan yang sesuai, terangkan secara ringkas bagaimana anda boleh menyediakan perisa pisang tersebut di dalam makmal. Jawapan anda haruslah mengandungi persamaan kimia yang terlibat.

By using suitable substances, explain briefly how you can prepare the banana flavour in the laboratory. Your answer should include the chemical equation involved.

[7 markah / marks]

(c) Rajah 10.3 menunjukkan dua jenis pembasmi kuman tangan yang mengandungi peratusan alkohol yang berbeza.

Diagram 10.3 shows two types of hand sanitisers that contains different percentage of alcohol.

	
Pembasmi kuman tangan A Kandungan alkohol : 75% Hand sanitiser A Alcohol content: 75%	Pembasmi kuman tangan B Kandungan alkohol : 55% Hand sanitiser B Alcohol content: 55%

Rajah / Diagram 10.3

Berdasarkan Rajah 10.3, pilih pembasmi kuman tangan yang akan anda gunakan. Wajarkan pilihan anda.

Based on Diagram 10.3, choose the hand sanitiser that you will use. Justify your choice.

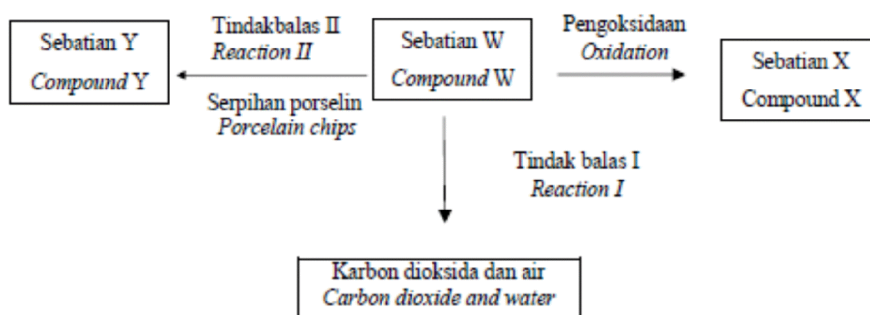
[3 markah / marks]

[Perak2022-Set01-11]

Rajah 11 menunjukkan penukaran sebatian W kepada sebatian X dan sebatian Y. Sebatian W mempunyai formula molekul $C_4H_{10}O$.

Diagram 11 shows the conversions of compound X and compound Y.

Compound W has a molecular formula of $C_4H_{10}O$.



(a) (i) Berdasarkan Rajah 11/ Based on diagram 11

- Nyatakan nama bagi sebatian W/ State the name of compound W
- Sebatian W boleh membentuk isomer. Lukis formula struktur dan namakan salah satu isomer bagi sebatian W.
Compound W can form isomers. Draw structural formula and name one of the isomer for compound W
- Nyatakan nama bagi Tindak balas II dan tulis persamaan tindak balas tersebut.
State the name of the Reaction II and write the chemical equation for the reaction

[5 markah/mark]

(ii) Hitung isi padu gas karbon dioksida terhasil apabila 7.4g sebatian W dibakar dalam oksigen berlebihan

[Jisim atom relatif; H=1; C=12; O=16]

[Isipadu molar gas = $24 \text{ dm}^3 \text{ mol}^{-1}$]

Calculate the volume of carbon dioxide gas produced when 7.4g compound W is burnt in excess oxygen

[Relative atomic mass: H=1; C=12; O=16]

[Molar volume of gas= $24 \text{ dm}^3 \text{ mol}^{-1}$]

[2 markah/marks]

(b) Seorang murid telah diberikan dua cecair tidak berwarna yang merupakan sebatian alkana dan alkene. Gurunya telah meminta beliau untuk membuat ujian pengesahan cecair. Nyatakan dan huraikan satu ujian kimia yang boleh dibuat oleh murid berkenaan untuk membezakan dua cecair tersebut.

A student was given two colourless liquids which are alkane and alkene compound. Her teacher asked him to do a confirmation test. State and describe a chemical test that can be used to distinguish between the liquids.

[5 markah / marks]

(c) Diana ingin membakar tart nanas. Dia pergi ke kedai roti untuk membeli pati nanas. Sebagai pelajar kimia, bagaimanakah anda membantunya menyediakan pati nanas (etil butanoat) di makmal dengan menamakan dua bahan yang terlibat, Tulis persamaan kimia untuk tindak balas dan prosedur penyediaan.

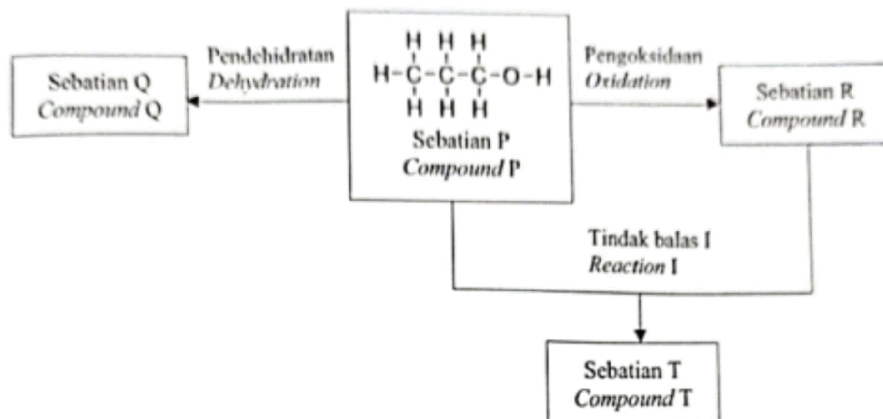
Diana wants to bake a pineapple tart. She went to bakery to buy pineapple essence. As a chemistry student how would you help her to prepare the pineapple essence (ethyl butanoate) in the laboratory by naming the two substances involve, write the chemical equation for the reaction and procedure of preparation.

[8 markah / marks]

[Negeri Sembilan 2022-09]

Rajah 9 menunjukkan penukaran sebatian P kepada sebatian O, sebatian R dan sebatian T.

Diagram 9 shows the conversion of compound P into compound Q, compound R and compound T.



(a) Nyatakan maksud isomer dan tuliskan formula am bagi alkohol.

Lukis formula struktur bagi satu isomer sebatian P dan nyatakan nama bagi isomer itu mengikut penamaan IUPAC.

State the meaning of isomer and write the general formula for alcohol.

Draw the structural formula of isomer of compound P and state the name of the isomer according to IUPAC nomenclature.

[4 markah / 4 marks]

(b) Nyatakan nama bagi tindak balas 1. Kenal pasti siri homolog, formula molekul dan formula struktur bagi sebatian Q, sebatian R dan sebatian T. State the name of reaction 1.

Identify the homologous series, molecular formula and structural formula of compound Q, R and T.

[10 markah / 10 marks]

(c) 4.2 g sebatian P terbakar dalam oksigen berlebihan menghasilkan gas karbon dioksida dan air. Tulis persamaan kimia bagi tindak balas itu dan hitung isi padu gas yang terhasil. [Jisim atom relatif: H=1, C=12, O=16]

[Isi padu molar gas pada keadaan bilik = $24 \text{ dm}^3 \text{ mol}^{-1}$]

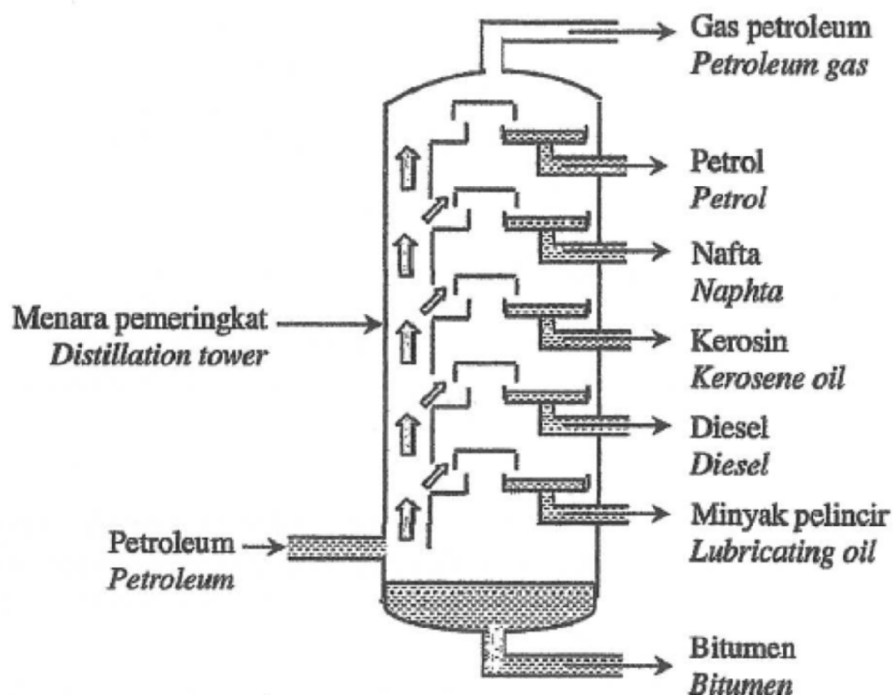
4.2 g compound P burns in excess oxygen producing carbon dioxide gas and water. Write the chemical equation and calculate the volume of gas produced. [Relative atomic mass: H=1, C=12, O=16]

[Molar volume of gas at room condition = $24 \text{ dm}^3 \text{ mol}^{-1}$]

[6 markah / 6 marks]

[MRSM2022-10] Rajah 10.1 menunjukkan proses yang digunakan untuk mengasingkan petroleum dalam penghasilan pelbagai produk dalam industri.

Diagram 10.1 shows a process used to separate petroleum into various products in industry.



(a) (i) Nyatakan kaedah dan sifat fizik yang terlibat dalam proses pengasingan petroleum seperti yang ditunjukkan dalam Rajah 10.1. State the method and physical properties involved in the separation process of petroleum as shown in Diagram 10.1.

[2 markah] [2 marks]

(ii) 2,2,4-trimetilpentana dan butana adalah basil sulingan petroleum. Lukiskan formula struktur untuk kedua-dua hasil sulingan.
2,2,4-trimethylpentane and butane are products of petroleum distillate. Draw the structural formulae for both distillates.

[2 markah] [2 marks]

(b) Nafta adalah campuran hidrokarbon yang terdiri daripada 5 hingga 10 atom karbon. Salah satu hasil sulingan adalah heksana, C_6H_{14} .
Naphtha is the mixture of hydrocarbon that consists of 5 to 10 carbon atoms. One of the distilled product is hexane, C_6H_{14} .

Tulis persamaan kimia bagi pembakaran heksana.

Hitung isi padu gas karbon dioksida, CO_2 yang dibebaskan pada keadaan bilik apabila 258 g heksana digunakan dalam pembakaran lengkap di atas.
[Jisim atom relatif : $H=1$, $C=12$; 1 mol gas menempati $24 \text{ dm}^3 \text{ mol}^{-1}$ pada keadaan bilik]

Write the chemical equation for the combustion of hexane.

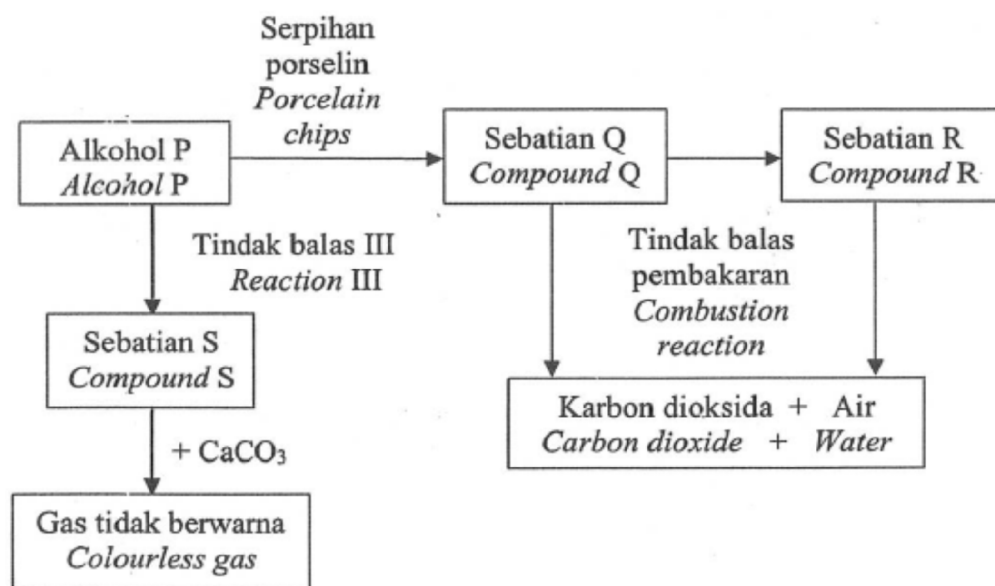
Calculate the volume of carbon dioxide, CO_2 gas released at room condition when 258 g of hexane used in the complete combustion above.

[Relative atomic mass : $H=1$, $C=12$; 1 mol of gas occupies $24 \text{ dm}^3 \text{ mol}^{-1}$ at room conditions]

[5 markah] [5 marks]

(c) Rajah 10.2 menunjukkan pertukaran sebatian organik daripada satu siri homolog kepada yang lain. Alkohol P mempunyai kurang daripada empat karbon atom dalam molekulnya. Sebatian Q boleh ditukarkan kepada R melalui tindak balas penghidrogenan.

Diagram 10.2 shows the conversion of organic compound from one homologous series to another. Alcohol P has less than four carbon atoms in its molecules. Compound Q can be converted to R through hydrogenation reaction.



(i) Cadangkan nama alkohol P, tuliskan formula molekul sebatian Q, nyatakan siri homolog bagi sebatian R dan namakan tindak balas III.
Suggest the name of alcohol P, write the molecular formula of compound Q, state the homologous series of compound R and name Reaction III.
[4 markah] [4 marks]

(ii) Bandingkan kejelagaan nyalaan bagi pembakaran sebatian Q dan sebatian R. [Jisim atom relatif: H=1, C=12]
Compare the sootiness offlames for the combustion of compound Q and compound R. [Relative atomic mass : H=1, C=12]
[4 markah] [4 marks]

(d) Rajah 10.3 menunjukkan buah-buahan tempatan yang baru dipetik.
Diagram 10.3 shows the freshly plucked local fruits.



Buah-buahan yang masak secara semula jadi akan mengeluarkan gas etena, C_2H_4 . Sesetengah buah-buahan disuntik dengan etena, C_2H_4 tiruan semasa proses pemeraman.

Wajarkan penggunaan etena tiruan semasa proses pemeraman buah.

Ethene, C_2H_4 gas is naturally released from the ripe fruits. Some fruits are injected with artificial ethene, C_2H_4 during the ripening process.

Justify the use of artificial ethene during the fruit ripening process.

[3 markah] [3 marks]

[Kelantan2022-11]

11. (a) Jadual 7 menunjukkan jadual bagi dua jenis sebatian karbon S dan T.

Table 7 shows a table for two types of carbon compounds S and T.

Sebatian Compound	Maklumat Hidrokarbon Information of hydrocarbon
S	- Hidrokarbon tepu Saturated hydrocarbon - Ahli keempat dalam siri homolognya The fourth member of its homologous series

T	- Hidrokarbon tak tepu dengan ikatan ganda dua antara atom karbon, Unsaturated hydrocarbon with double bond between carbon atoms - Ahli ketiga dalam siri homolognya The third member of its homologous series
---	---

(i) Apakah yang dimaksudkan dengan hidrokarbon tepu?

What is meant by saturated hydrocarbon?

[1 markah] [1 mark]

(ii) Cadangkan nama bagi sebatian S dan T

Suggest a name for compounds S and T

[2 markah] [2 marks]

(iii) Sebatian S dan T boleh dijadikan sebagai bahan api di rumah.

Bahan api yang manakah kurang memberi kesan pencemaran kepada alam sekitar.

Tunjukkan pengiraan peratus karbon dan terangkan alasan anda.

Compounds S and T can be used as fuel at home.

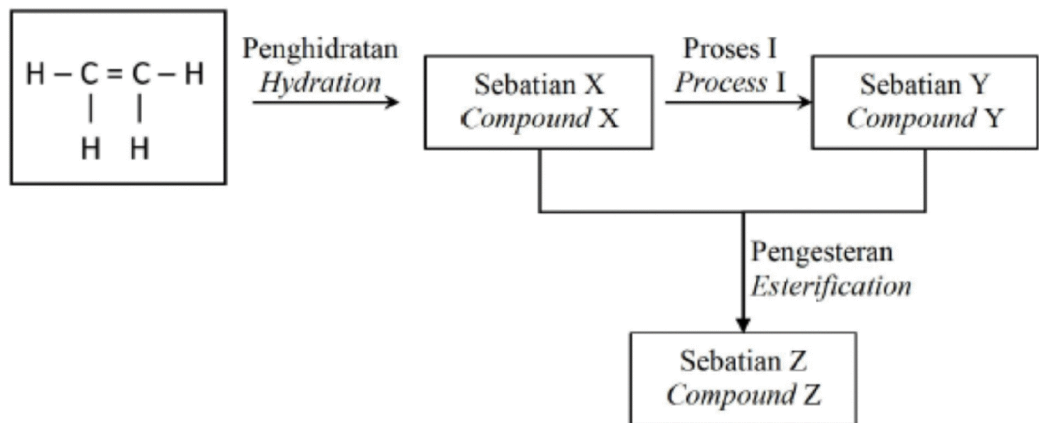
Which fuel is less polluting to the environment?

Show the calculation of percentage of carbon atom and explain your reason.

[4 markah] [4 marks]

(b) Rajah 9.1 menunjukkan penukaran bagi beberapa sebatian organik

Diagram 9.1 shows the conversion of some organic compounds



Rajah 9.1/ Diagram 9.1

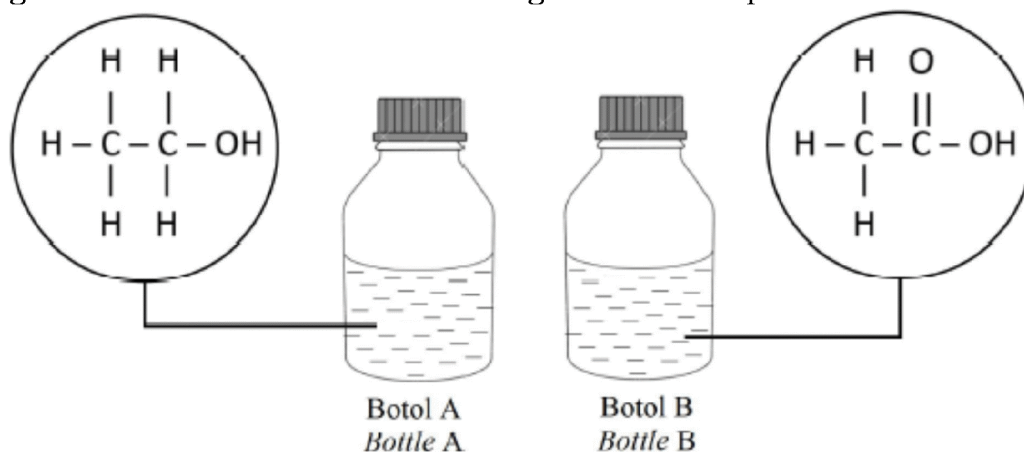
Nyatakan Proses I, siri homolog bagi sebatian X dan kumpulan berfungsi

bagi sebatian Y. Namakan dan tuliskan formula molekul bagi sebatian Z

State Process I, the homologous series of compound X and the functional group of compound Y. Name and write the molecular formula of compound Z

[5 markah] [5 marks]

(c) Rajah 9.2 menunjukkan 2 botol yang mengandungi cecair tak berwarna. Diagram 9.2 shows 2 bottles containing a colorless liquid.



Dengan menggunakan serbuk natrium bikarbonat, huraikan satu ujian kimia bagaimana untuk membezakan kedua-dua cecair tersebut. Nyatakan pemerhatian dan kelaskan bahan tersebut kepada siri homolog masing-masing.

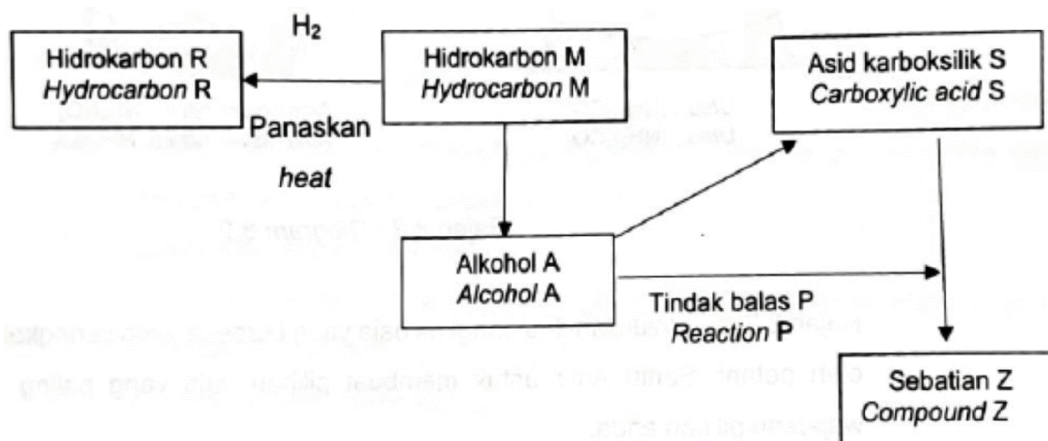
Using sodium bicarbonate powder, describe a chemical test to tell the difference between the two liquids.

State the observations and classify the substances into their respective homologous series.

[8 markah] [8 marks]

[Kedah2022-09] Rajah 9.1 menunjukkan satu siri tindak balas penukaran yang melibatkan sebatian karbon.

Diagram 9.1 shows the conversions of a carbon compound involving a series of reactions.



Berdasarkan Rajah 9.1,/ Based on Diagram 9.1,

(a) Berikan maksud sebatian hidrokarbon dan tuliskan formula am bagi Hidrokarbon R.

Define the meaning of hydrocarbon and write the general formula of Hydrocarbon R.

[2 markah/marks]

(b) Hidrokarbon M mempunyai 85.7% karbon dan 14.3% hidrogen mengikut jisim. Jisim molekul relatif bagi hidrokarbon M ialah 56. Tentukan formula molekul bagi hidrokarbon M.

Hydrocarbon M has 85.7% of carbon and 14.3% of hydrogen by mass. The relative molecular mass of Hydrocarbon M is 56. Determine the molecular formula of hydrocarbon M.

[3 markah/marks]

(c) Hidrokarbon R dan Hidrokarbon M wujud dalam berbagai isomer.

Lukiskan dua isomer bagi sebatian hidrokarbon tersebut.

Hydrocarbon R and Hydrocarbon M occur in different Isomers.

Draw two isomers of the hydrocarbons.

[2 markah/marks]

(d) Hidrokarbon R dan M terbakar dalam udara menghasilkan air, karbon dioksida dan jelaga. Terangkan perbezaan pada kuantiti jelaga yang terhasil bagi setiap hidrokarbon tersebut.

[Jisim atom relative: C=12, H=1]

Hydrocarbon R and M burn in the air produce water, carbon dioxide and soot. Explain the difference in the quantity of soot produced for each of the hydrocarbons

[Relative atomic mass: C=12, H=1]

[3 markah/marks]

(e) Tindak balas antara asid karboksilik S dan alkohol A akan menghasilkan sebatian Z. Namakan tindak balas P dan reagen yang terlibat dalam penghasilan asid karboksilik S dan sebatian Z.

Lukiskan formula struktur sebatian Z dan namakannya.

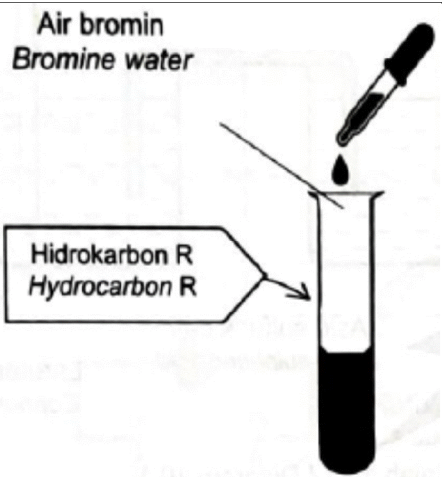
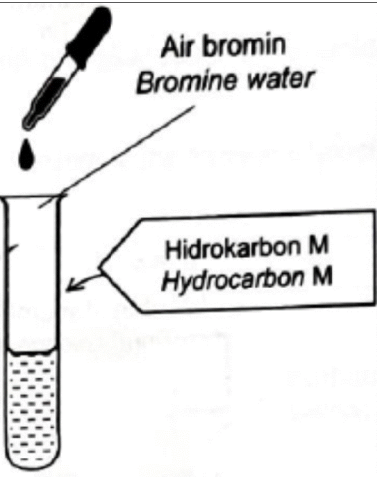
The reaction between carboxylic acid S and alcohol A will produce compound Z. Name the reaction P and the reagent involved in the production of carboxylic acid S and compound Z.

Draw the structural formula of compound Z and name it.

[6 markah/marks]

(f) Rajah 9.2 menunjukkan keputusan bagi ujian kimia untuk membezakan antara hidrokarbon R dan M.

Diagram 9.2 shows the result of two chemical test to differentiate between hydrocarbon R and M.

	
Tiada perubahan pada air bromin No change in bromine water	Warna perang air bromin menjadi tidak berwarna Brown bromine water become decolorised

Terangkan perbezaan pemerhatian.
 Explain the difference in the observations.

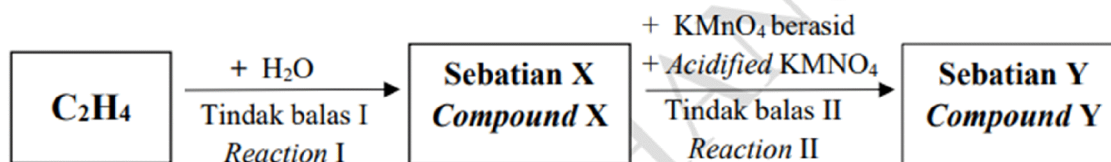
[4 markah / marks]

[JUJ2022-Set02-09](a) Hidrokarbon boleh dikelaskan kepada hidrokarbon tepu dan hidrokarbon tak tepu. Nyatakan maksud bagi hidrokarbon tak tepu dan berikan satu contoh molekul hidrokarbon tepu.

Hydrocarbon can be classified into saturated hydrocarbon and unsaturated hydrocarbon. State the meaning of unsaturated hydrocarbon and give one example of saturated hydrocarbon molecule.

[2 markah / 2 marks]

(b) Rajah 9 menunjukkan siri tindak balas bagi sebatian karbon.
 Diagram 9 shows a series of reaction of carbon compound.



Berdasarkan Rajah 9, / Based on Diagram 9,

(i) Nyatakan siri homolog dan formula am bagi C_2H_4 .
 State the homologous series and general formula for C_2H_4 .

[2 markah / 2 marks]

(ii) Kenal pasti nama bagi Tindak balas I dan Tindak balas II. Tuliskan formula molekul dan namakan sebatian X dan sebatian Y.
 Identify the name of Reaction I and Reaction II. Write the molecular formula and the names of compound X and compound Y.

[6 markah / 6 marks]

(iii) 11.5 g alkohol X terbakar dengan lengkap di dalam oksigen yang berlebihan pada suhu dan tekanan bilik. Tulis persamaan kimia bagi tindak balas tersebut dan hitung isi padu gas yang terhasil.

[Jisim atom relatif : C=12; O=16 ; H=1; 1 mol gas menempati 24 dm³ pada keadaan bilik]

11.5 g alcohol X burnt completely in excess oxygen at room temperature and pressure. Write the chemical equation for the reaction and calculate the volume of the gas produced.

[Relative atomic mass : C=12 ; O=16 ; H=1; 1 mole of gas occupies 24 dm³ at room temperature]

[6 markah / 6 marks]

(c) Jadual 9 menunjukkan sifat-sifat bagi dua sebatian karbon, P dan Q yang mempunyai empat atom karbon di dalam molekulnya.

Table 9 shows the properties for two carbon compounds, P and Q which have four carbon atoms in the molecules.

Sebatian Compound	Sifat-sifat Properties
Sebatian P Compound P	• Mengalami tindak balas penukargantian Undergoes substitution reaction. • Tidak menukarkan warna perang air bromin Does not change the brown colour of bromine water.
Sebatian Q Compound Q	• Boleh disediakan melalui tindak balas penghidratan alkena. Can be prepared through hydration reaction of alkene. • Bertindak balas dengan asid karboksilik menghasilkan sebatian berbau wangi. React with carboxylic acids to produce a compound with fragrance smell.

Berdasarkan Jadual 9, kenal pasti kumpulan berfungsi bagi sebatian P dan sebatian Q. Lukis dua formula struktur bagi isomer sebatian Q.

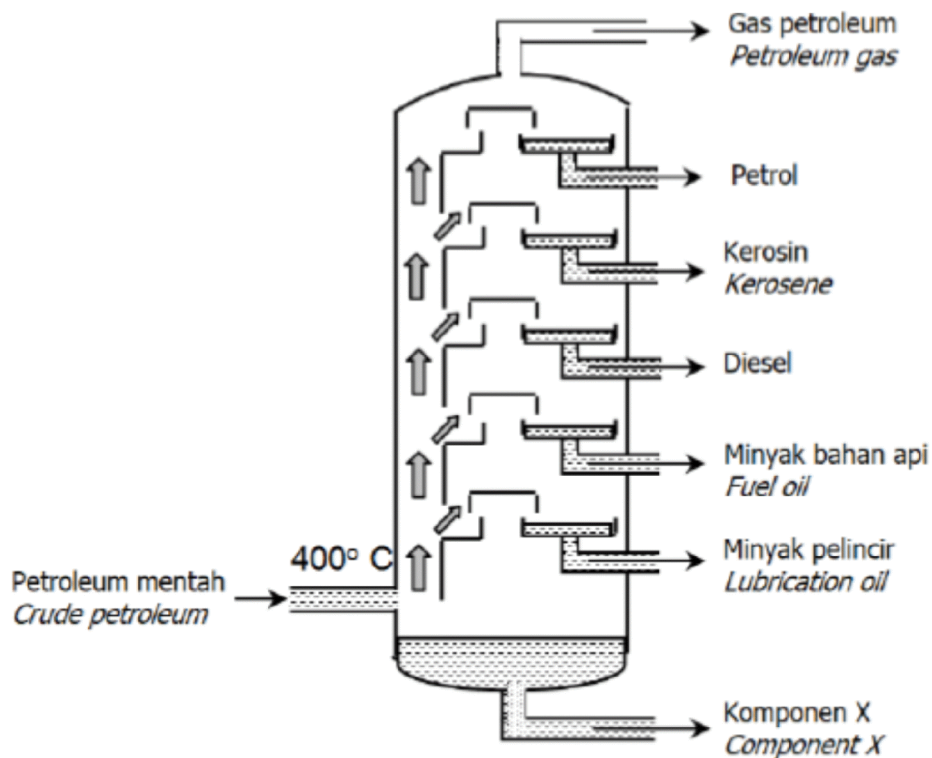
Based on Table 9, identify the functional group for compound P and compound Q.

Draw two structural formulae for isomers of compound Q.

[4 markah / 4 marks]

[Johor2022-SetB-11] (a) Petroleum ialah campuran hidrokarbon. Petroleum perlu diasingkan kepada pelbagai komponennya melalui proses penyulingan berperingkat di kilang penapisan minyak seperti yang ditunjukkan dalam Rajah 10.1.

Petroleum is a mixture of hydrocarbons. Petroleum must be separated into its various components through fractional distillation in petroleum1 process as shown in Diagram 10.1.



Apakah yang dimaksudkan dengan hidrokarbon? Terangkan mengapa petroleum dapat diasingkan kepada komponennya secara penyulingan berperingkat.

Namakan komponen X.

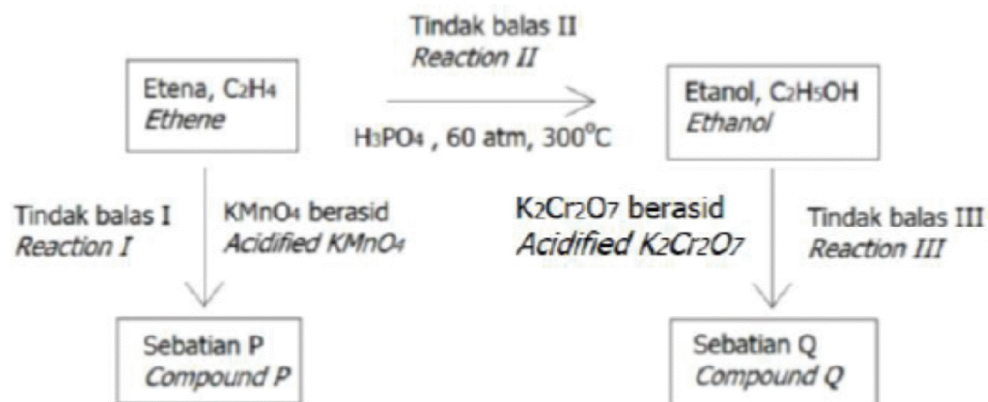
What is meant by hydrocarbon? Explain why petroleum can be separated into its components by fractional distillation.

Name component X.

[4 markah] [4 marks]

(b) Rajah 10.2 menunjukkan carta alir pertukaran etena kepada beberapa sebatian lain.

Diagram 10.2 shows a flow chart for the conversion of ethene to few other compounds.



(i) Kenal pasti sebatian P dan sebatian Q. Lukis formula struktur bagi sebatian P dan sebatian Q. Namakan tindak balas II dan tindak balas III. Tulis persamaan kimia bagi tindak balas I. Identify compound P and compound Q. Draw the structural formula for compound P and compound Q. Name reaction II and reaction III. Write a chemical equation for reaction I.

[8 markah] [8 marks]

(ii) Etena, C_2H_4 dan etanol, C_2H_5OH adalah bahan api yang boleh terbakar dengan lengkap dalam oksigen menghasilkan karbon dioksida dan air. Anda ditugaskan untuk menilai sebatian yang lebih sesuai dijadikan bahan api untuk memanaskan air di dalam makmal. Nyatakan pilihan anda dan wajarkan jawapan anda.

Ethene, C_2H_4 and ethanol, C_2H_5OH are fuels which can burn completely in oxygen to produce carbon dioxide and water. You are assigned to evaluate which compound is more suitable to be used to heat water in laboratory. State your choice and justify your answer.

[2 markah][2 marks]

(iii) Etanol, C_2H_5OH digunakan secara meluas dalam minuman beralkohol. Pengambilan minuman beralkohol melemahkan fungsi otak yang boleh menyebabkan seseorang mabuk. Pemandu mabuk mengakibatkan kemalangan jalan raya. Rajah 10.3 menunjukkan alat “breathalyzer” yang digunakan oleh pihak berkuasa untuk mengesan alkohol di dalam nafas pemandu mabuk. Tindak balas III telah digunakan secara meluas untuk mengesan kehadiran alkohol tersebut.

Ethanol, C_2H_5OH is widely used in alcoholic beverages. Consumption of alcoholic beverages weakens brain function which can cause a person to become drunk. Drunk drivers can cause traffic accidents. Figure 10.3 shows a breathalyzer which is used by the authorities to detect alcohol in the breath of drunk drivers. Reaction III has been widely used to detect the presence of alcohols.



Rajah 10.3
Diagram 10.3

Huraikan satu simulasi eksperimen makmal bagaimana tindak balas III boleh digunakan untuk mengesan kehadiran etanol (alkohol).

Describe a laboratory experiment simulation on how reaction III can be used to detect the presence of ethanol(alkohol).

[6 markah][6 marks]

Bab 3

[JohorPPD Tangkak 2022-08] Jadual 8 menunjukkan maklumat yang diperolehi dalam menentukan haba pemendakan plumbum(II) sulfat. Eksperimen dijalankan dengan mencampurkan 25 cm^3 larutan plumbum(II) nitrat 0.5 mol dm^{-3} dengan 25 cm^3 larutan kalium sulfat 0.5 mol dm^{-3} . Table 8 shows the information obtained in determining the heat of precipitation of lead(II) sulphate. The experiment was conducted by mixing 25 cm^3 of 0.5 mol dm^{-3} lead(II) nitrate solution with 25 cm^3 of 0.5 mol dm^{-3} potassium sulphate solution

Suhu awal larutan plumbum(II) nitrat Initial temperature of lead(II) nitrate solution	28.0°C
Suhu awal larutan kalium sulfat Initial temperature of potassium sulphate solution	29.0°C
Suhu tertinggi campuran The highest temperature of the mixture	33.0°C

(a) Apakah yang dimaksudkan dengan haba pemendakan bagi eksperimen tersebut.

What is meant by the heat of precipitation for the experiment.

.....

.....[1M]

(b) Tuliskan persamaan ion bagi tindak balas ini.

Write the ionic equation for this reaction.

.....[1M]

(c) Hitungkan bilangan mol ion plumbum(II) dan ion sulfat yang wujud dalam setiap larutan tersebut

Calculate the number of moles of lead(II) ions and sulphate ions present in each solution

(i) ion plumbum(II)/ lead(II) ion

(ii) ion sulfat/ sulphate ion

[2M]

(d) Hitungkan perubahan haba yang berlaku di dalam tindak balas ini.

[Muatan haba tentu = $4.2 \text{ J g}^{-1} ^\circ\text{C}^{-1}$, ketumpatan larutan = 1 g cm^{-3}]

Calculate the heat change that occurs in this reaction.

[Specific heat load = $4.2 \text{ J g}^{-1} ^\circ\text{C}^{-1}$, density of the solution = 1 g cm^{-3}]

[1M]

(e) Hitungkan haba pemendakan tindak balas ini.
Calculate the heat of precipitation of this reaction.

[1M]

(f) Lukiskan gambar rajah aras tenaga bagi tindak balas pemendakan ini.
Draw an energy level diagram for this precipitation reaction.

[2M]

(g) Semasa perlawanan bola sepak, seorang pemain mendapati lututnya bengkak selepas berlanggar dengan pemain lawan. Ahli fisioterapi telah meletakkan ketulan ais pada lutut pemain itu untuk mengurangkan kesakitan.

During a soccer match, a player found his knee swollen after colliding with an opposing player. Physiotherapists have placed ice packs on the player's knee to ease the pain.



Sebagai seorang pelajar kimia, cadangkan kaedah lain untuk membantu pemain itu meredakan kesakitan. Terangkan bagaimana?

As a chemistry student, suggest other methods to help the player to relieve the pain. Explain how?

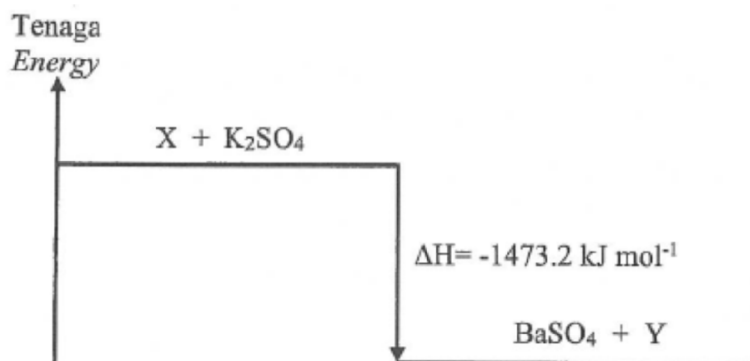
.....

.....

.....[2M]

[MRSM2022-07] Rajah 7.1 menunjukkan gambarajah aras tenaga bagi pemendakan barium sulfat, BaSO_4 .

Diagram 7.1 shows the energy level diagram for the precipitation of barium sulphate, BaSO_4 .



(a) (i) Apakah maksud haba pemendakan?
What is the meaning of heat of precipitation?

.....
.....[1M]

(ii) Nyatakan satu maklumat yang boleh diperolehi daripada gambarajah aras tenaga yang ditunjukkan dalam Rajah 7.1.
State one information that can be obtained from the energy level diagram shown in Diagram 7.1.

.....[1M]

(iii) Namakan larutan X.[1M]
Name solution X.

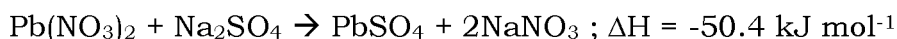
(iv) Berdasarkan jawapan anda di 7(a)(iii), tulis persamaan ion bagi tindak balas ini.

Based on your answer in 7(a)(iii), write the ionic equation for this reaction.

.....[1M]

(b) (i) Persamaan termokimia di bawah mewakili tindak balas antara larutan plumbum(II) nitrat dengan larutan natrium sulfat.

The thermochemical equation below represents the reaction between lead(II) nitrate solution and sodium sulphate solution.



Hitungkan kenaikan suhu apabila 25 cm^3 larutan plumbum(II) nitrat 1.0 mol dm^{-3} ditambah kepada 25 cm^3 larutan natrium sulfat 1 mol dm^{-3} .

[Muatan haba tentu larutan = $4.2 \text{ J g}^{-1} \text{ }^\circ\text{C}^{-1}$, ketumpatan larutan = 1 g cm^{-3}]

Calculate the increase in temperature when 25 cm^3 of 1 mol dm^{-3} Lead(II) nitrate solution is added to 25 cm^3 of 1 mol dm^{-3} sodium sulphate solution.
 [Specific heat capacity of solution = $4.2 \text{ J g}^{-1} \text{ }^\circ\text{C}^{-1}$, density of solution = 1 g cm^{-3}]

[3M]

(ii) Eksperimen diulang dengan menggunakan isi padu larutan yang sama seperti dalam 7(b)(i) dan perubahan suhu, θ yang didapati berkurang kepada separuh. Cadangkan bagaimana anda boleh mendapatkan perubahan suhu baharu, θ tersebut.

Experiment is repeated by using the same volume of solution as in 7(b)(i) and the temperature change, θ obtained is reduced by half Suggest how you can obtain the new temperature change, θ .

.....

.....[1M]

(c) Jadual 7 menunjukkan nilai bahan api metana dan oktana.
 Table 7 shows fuel value of methane and octane.

Jenis bahan api Type of fuel	Metana Methane	Oktana Octane
Nilai bahan api (kJ g^{-1}) / Fuel value (kJ g^{-1})	27.0	89.0
Takat didih ($^\circ\text{C}$) / Boiling point ($^\circ\text{C}$)	-161.6	125.6
Keadaan fizik pada suhu bilik Physical state at room temperature	Gas Gas	Cecair Liquid
Harga per liter (RM) / Price per litre (RM)	2.05	4.84

Bahan api manakah yang anda pilih untuk memasak dan wajarkan pilihan anda.

Which fuel would you choose for cooking and justify your choice.

.....

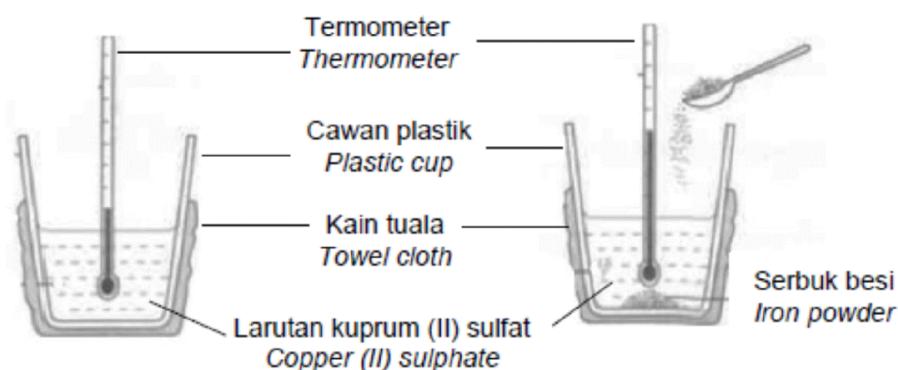
.....[2M]

[PPinang2022-Set01-06] Rajah 6 menunjukkan satu eksperimen yang dijalankan untuk menentukan haba penyesaran bagi tindak balas antara larutan kuprum (II) nitrat dan serbuk besi. 50 cm³ larutan kuprum (II) nitrat 1.0 mol dm⁻³ dituang ke dalam cawan plastik dan suhu awal direkodkan. Serbuk besi yang berlebihan ditambah ke dalam cawan plastik yang sama. Campuran dikacau perlahan-lahan, dan suhu tertinggi direkodkan.

Diagram 6 shows an experiment conducted to determine the heat of displacement for reaction between copper (II) nitrate solution and iron powder. 50 cm³ of 1.0 mol dm⁻³ copper (II) nitrate solution is poured into a plastic cup and the initial temperature is recorded. The excess iron powder is added to the same plastic cup. The mixture is stirred slowly, and the highest temperature is recorded.

Suhu awal/ Initial temperature = 29.0°C

Suhu tertinggi campuran/ Highest temperature of mixture = 33.0°C



(a) Apakah maksud haba penyesaran eksperimen itu?

What is the meaning of heat of displacement of the experiment?

.....
[1M]

(b) Mengapakah besi dalam bentuk serbuk digunakan dalam eksperimen ini?

Why does iron in the form of powder is used in this experiment?

.....[1M]

(c) Mengapakah cawan plastik digunakan dalam eksperimen ini?

Why is plastic cup used in this experiment?

.....[1M]

(d) Nyatakan satu pemerhatian dalam eksperimen ini.

State one observation in this experiment.

.....[1M]

(e) Lengkapkan persamaan ion berikut untuk tindak balas dalam eksperimen ini.

Complete the following ionic equation for the reaction in this experiment.



(f) Berdasarkan eksperimen, hitung/ Based on the experiment, calculate

(i) jumlah haba yang dibebaskan.
the total heat released.

[Muatan haba tentu larutan: $4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$, Ketumpatan air : 1 g cm^{-3}]

Specific heat capacity of solution: $4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$]

[2M]

(ii) Bilangan mol kuprum(II) nitrat yang telah bertindak balas

The number of moles of copper (II) nitrate that has reacted.

[1M]

(iii) haba penyesaran dalam tindak balas ini
the heat of displacement in this reaction.

[1M]

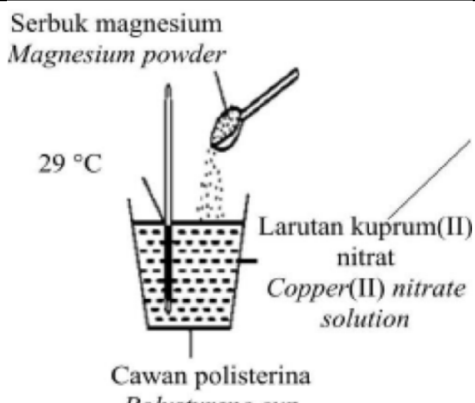
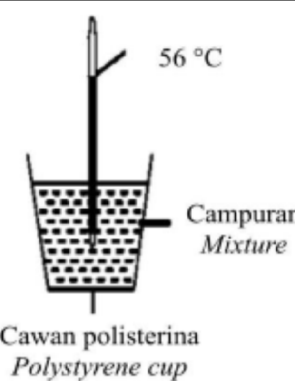
[Perlis2022-04] Rajah 3 menunjukkan eksperimen untuk menentukan haba penyesaran. Serbuk magnesium berlebihan ditambah kepada 50 cm^3 larutan kuprum(II) nitrat 0.5 mol dm^{-3} dalam satu cawan polistirena.

[Muatan haba tentu, $c = 4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$; Ketumpatan larutan = 1.0 g cm^{-3}]

Diagram 3 shows an experiment to determine the heat of precipitation.

Excess magnesium powder is added into 50 cm^3 of 0.5 mol dm^{-3} copper(II) nitrate solution in a polystyrene cup.

[Specific heat capacity, $c = 4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$; Density of the solution = 1.0 g cm^{-3}]

Sebelum eksperimen Before experiment	Selepas eksperimen After experiment
 Serbuk magnesium Magnesium powder 29 °C Larutan kuprum(II) nitrat Copper(II) nitrate solution Cawan polisterina Polystyrene cup	 56 °C Campuran Mixture Cawan polisterina Polystyrene cup

(a)(i) Nyatakan maksud haba penyesaran.
State the meaning of heat of displacement.

.....
.....[1M]

(ii) Berdasarkan pada rajah, nyatakan suhu awal larutan kuprum(II) nitrat dan suhu tertinggi campuran.
Based on the diagram, state the initial temperature of copper(II) nitrate solution and the highest temperature of the mixture.

Suhu awal larutan kuprum(II) nitrat :
Initial temperature of copper(II) nitrate solution :

Suhu tertinggi campuran :
Highest temperature of the mixture : [2M]

(b) (i) Tuliskan persamaan ion untuk tindak balas yang berlaku.
Write the ionic equation for the reaction that occurred.

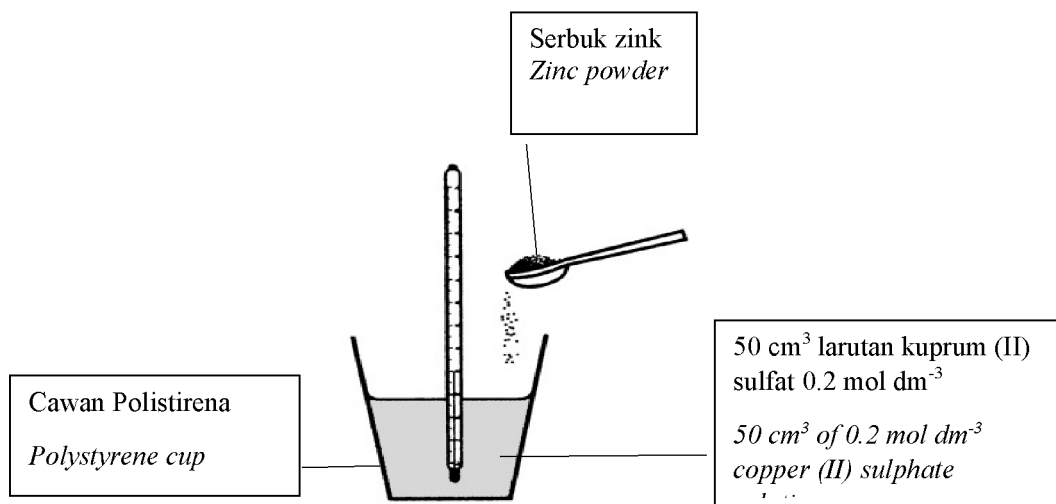
.....[1M]

(ii) Hitungkan haba penyesaran dalam eksperimen ini.
Calculate the heat of precipitation in this experiment.

[3M]

[JohorPPD BatuPahat 2022-06] Rajah 5 menunjukkan radas yang disediakan untuk menentukan haba penyesaran kuprum daripada larutan garamnya oleh zink. 50 cm³ larutan kuprum (II) sulfat berkepekatan 0.2 mol dm⁻³ disukat ke dalam satu bikar.

Diagram 5 shows the apparatus set up to determine the heat of displacement of copper from a solution of its salt by zinc. 50 cm³ of 0.2 mol dm⁻³ copper (II) sulphate solution is measured into a beaker.



Suhu awal larutan kuprum (II) sulfat direkodkan ialah 28.2°C. Kira-kira 4 g serbuk zink ditambahkan ke dalam larutan kuprum (II) sulfat di dalam cawan polistirena. Campuran itu dikacaukan. Suhu akhir yang disukat sebaik sahaja serbuk zink dilarutkan ialah 38.2°C.

The initial temperature of the copper (II) sulphate solution is recorded as 28.2°C. About 4 g of zinc powder is added into the copper (II) sulphate solution in the polystyrene cup. The mixture is stirred. The final temperature which is measured as soon as the zinc powder has dissolved is 38.2°C.

[Jisim atom relatif: Zn = 65; ketumpatan larutan: 1.0 g cm⁻³, muatan haba tentu larutan akueus: 4.2 J g⁻¹ °C⁻¹]

[Relative atomic mass: Zn = 65; density of solution: 1.0 g cm⁻³, specific heat of capacity aqueous solutions: 4.2 J g⁻¹ °C⁻¹]

a) Apakah yang dimaksudkan dengan haba penyesaran bagi eksperimen ini?

What is meant by heat of displacement of the experiment?

.....[1M]

b) Tuliskan persamaan ion bagi tindak balas yang berlaku dalam eksperimen ini.

Write the ionic equation for the reaction in this experiment.

.....[1M]

c) Hitungkan perubahan haba untuk tindak balas ini
Calculate the heat change for this reaction.

[1M]

d) (i) Hitungkan bilangan mol ion kuprum.
Calculate the number of mole of copper ions.

[1M]

(ii) Hitungkan haba penyesaran kuprum daripada larutan kuprum (II) sulfat oleh zink.
Calculate the heat of displacement of copper from copper (II) sulphate solution by zinc.

[1M]

e) Lukiskan gambar rajah aras tenaga untuk tindak balas ini
Draw the energy level diagram for this reaction.

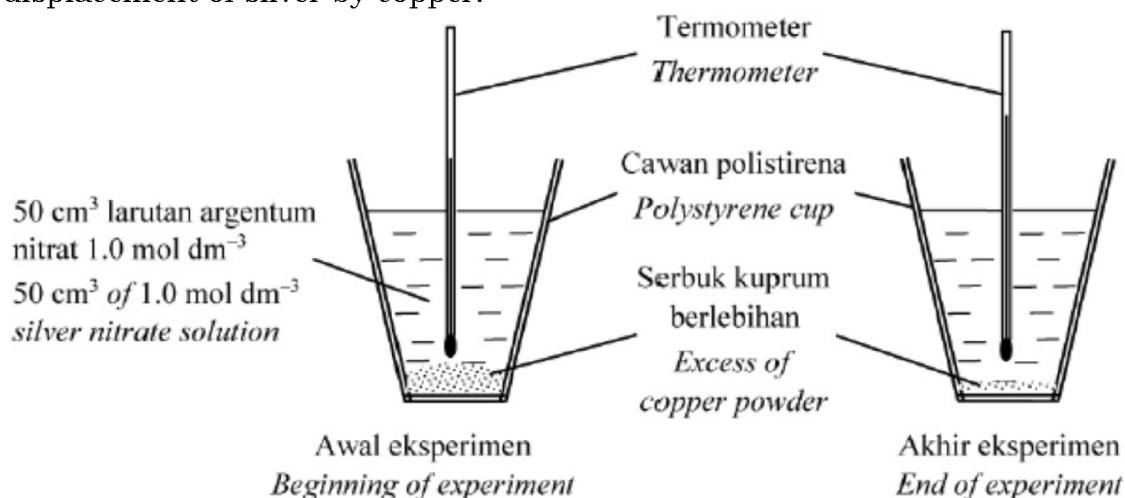
[2M]

f) Ramalkan nilai haba penyesaran, jika eksperimen diulangi dengan menggunakan serbuk magnesium? Terangkan mengapa.
Predict the value of heat displacement if the experiment is repeated using magnesium powder? Explain why.

.....

.....[2M]

[Selangor2022-Set02-07] Rajah 7 menunjukkan susunan radas eksperimen untuk menentukan haba penyesaran argentum oleh kuprum. Diagram 7 shows the apparatus set-up of experiment to determine heat of displacement of silver by copper.



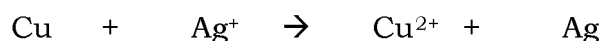
Jadual 7 menunjukkan keputusan eksperimen ini.
Table 7 shows the results of this experiment.

Penerangan Description	Suhu (°C) Temperature (°C)
Suhu awal larutan argentum nitrat Initial temperature of silver nitrate solution	29.0
Suhu tertinggi campuran Highest temperature of the mixture	35.0

(a) Berdasarkan eksperimen, nyatakan maksud haba penyesaran.
Based on the experiment, state the meaning of heat of displacement.

.....
.....[1M]

(b) Seimbangkan persamaan ion bagi eksperimen dalam Rajah 7.
Balance the ionic equation for experiment in Diagram 7.



[1M]

(c) Hitungkan:
Calculate:

(i) haba yang dibebaskan semasa tindak balas.
[Muatan haba tentu larutan, $c = 4.2 \text{ J g}^{-1} \text{ } ^\circ\text{C}^{-1}$,
ketumpatan larutan = 1 g cm^{-3}]

the heat released during the reaction.

[Specific heat capacity of solution, $c = 4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$,
density of solution = 1 g cm^3]

[1M]

(ii) bilangan mol larutan argentum nitrat.
the number of moles of silver nitrate solution.

[1M]

(iii) haba penyesaran argentum.
the heat of displacement of silver.

[2M]

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

[2M]

(e) (i) Ramalkan nilai haba penyesaran argentum jika kuprum digantikan dengan zink.

Predict the value of heat of displacement of silver if copper is replaced by zinc.

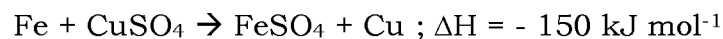
.....[1M]

(ii) Terangkan jawapan anda dalam 7(e)(i).

Explain your answer in 7(e)(i).

.....[1M]

[Kedah2022-06] (a) Persamaan termokimia bagi tindak balas penyesaran antara ferum dan kuprum(II) sulfat diberikan di bawah.
The thermochemical equation for the displacement reaction between iron and copper(II) sulphate solution is given below.



(i) Nyatakan maksud haba penyesaran
State the meaning of heat of displacement

.....
.....[1M]

(ii) Berdasarkan persamaan termokimia yang diberi, nyatakan satu pemerhatian apabila serbuk ferum berlebihan ditambah kepada larutan kuprum(II) sulfat.
Based on the given thermochemical equation, state one observation when excess iron powder is added to copper(II) sulphate solution.

.....
.....[1M]

(iii) Dalam eksperimen ini, ferum berlebihan ditambahkan kepada 100 cm³ larutan kuprum(II) sulfat 0.5 mol dm⁻³. Diberi muatan haba tentu larutan 4.2 J g⁻¹ °C⁻¹ dan ketumpatan larutan ialah 1.0 g cm⁻³.
Hitungkan perubahan suhu dalam eksperimen ini.
In this experiment, excess iron is added to 100 cm³ of 0.5 mol dm⁻³ copper(II) sulphate solution. Given that the specific heat capacity of the solution is 4.2 J g⁻¹ °C⁻¹ and the density of the solution is 1.0 g cm⁻³.
Calculate the temperature change in this experiment.

[3M]

(b) Jadual 6 menunjukkan haba pembakaran tiga jenis alkohol.
Table 6 shows the heat of combustion of three types of alcohol.

Nama alkohol Name of alcohol	Formula molekul Molecular Formula	Haba pembakaran/ kJ mol ⁻¹ Heat of combustion / kJ mol ⁻¹
Metanol Methanol	CH ₃ OH	725
Etanol Ethanol	C ₂ H ₅ OH	1 376
Propanol Propanol	C ₃ H ₇ OH	2 015

Berdasarkan maklumat dalam Jadual 6, terangkan mengapa nilai haba pembakaran berbeza.

Based on information in Table 6, explain why there is a difference in the values of the heat of combustion.

.....

[4M]

[Kelantan2022-07] (a) Jadual 4.1 menunjukkan maklumat eksperimen tindak balas peneutralan antara asid X dan alkali Y yang menghasilkan garam natrium klorida dan air.

Table 4.1 shows the experimental information of the neutralization reaction between acid X and alkali Y that produces sodium chloride salt and water.

Bahan tindak balas Reactants	25 cm ³ asid X 1.0 mol dm ⁻³ + 25 cm ³ alkali Y 1.0 mol dm ⁻³ 25 cm ³ 1.0 mol dm ⁻³ acid X + 25 cm ³ 1.0 mol dm ⁻³ alkali Y
Suhu awal bahan tindak balas / °C Initial temperature of reactants / °C	29.0
Suhu maksimum campuran / °C Maximum temperature of mixture / °C	35.0

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

.....
[1M]

(ii) Namakan/ Name

Asid X/ Acid X :

Alkali Y/ Alkali Y :[2M]

(iii) Hitungkan haba peneutralan bagi tindak balas dalam Jadual 4.1

Calculate the heat of neutralisation for the reaction in Table 4.1

[Muatan haba tentu larutan, $c = 4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$; ketumpatan larutan = 1 g cm^{-3}][Specific heat capacity of solution, $c=4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$; density of solution = 1 g cm^{-3}]

[3M]

(iv) Lukis gambar rajah aras tenaga bagi tindak balas tersebut.

Draw an energy level diagram for the reaction.

[2M]

(b) Jadual 4.2 menunjukkan haba tindak balas bagi dua tindak balas kimia.
Diagram 4.2 shows heat of reaction for two chemical reactions.

Tindak balas Reaction	Persamaan Ion Ionic equation	Haba tindak balas, Heat of reaction, (kJ mol^{-1})
I	$\text{NH}_4\text{Cl} \rightarrow \text{NH}_4^+ + \text{Cl}^-$	+ 15.1
II	$\text{NH}_4\text{NO}_3 \rightarrow \text{NH}_4^+ + \text{NO}_3^-$	+25.7

Tindak balas yang manakah sesuai dijadikan sebagai bahan dalam pek sejuk untuk meredakan kesakitan otot. Terangkan jawapan anda.

Which reaction is suitable as an ingredient in a cold pack to relieve muscle pain? Explain your answer.

.....

.....

.....[2M]

[Selangor2022-Set01-07] Jadual 7 menunjukkan persamaan termokimia bagi Eksperimen I dan Eksperimen II.

Table 1 shows the thermochemical equations of Experiment I and Experiment II.

Eksperimen Experiment	Persamaan Termokimia Thermochemical equation
I	$\text{NaOH} + \text{X} \rightarrow \text{NaX} + \text{H}_2\text{O}; \Delta H = -57.3 \text{ kJ mol}^{-1}$
II	$\text{NaOH} + \text{Y} \rightarrow \text{NaY} + \text{H}_2\text{O}; \Delta H = -51.5 \text{ kJ mol}^{-1}$

(a) Berdasarkan Jadual 7, cadangkan asid X dan asid Y.

Based on Table 7, suggest acid X and acid Y.

Asid X/ Acid X :

Asid Y/ Acid Y :[2M]

(b) Haba peneutralan bagi Eksperimen 1 adalah lebih tinggi berbanding dengan Eksperimen II, terangkan perbezaan nilai haba peneutralan untuk dua eksperimen ini.

Heat of neutralisation of Experiment I is higher than Experiment II, explain the difference in the value of heat of neutralisation of these two experiments.

.....

.....[2M]

(c) Dalam Eksperimen I, 50 cm^3 larutan natrium hidroksida 1.0 mol dm^{-3} ditambahkan kepada 50 cm^3 asid X 1.0 mol dm^{-3} .

In Experiment I, 50 cm^3 of 1.0 mol dm^{-3} sodium hydroxide solution is added into 50 cm^3 of 1.0 mol dm^{-3} acid X.

(i) Hitung haba yang dibebaskan dalam tindak balas itu.

Calculate the heat released in the reaction.

[1M]

(ii) Hitung perubahan suhu bagi tindak balas.

[Muatan haba tentu larutan = $4.2 \text{ J g}^{-1} \text{ }^\circ\text{C}^{-1}$, ketumpatan larutan = 1 g cm^{-3}]

Calculate the temperature change of the reaction.

[Specific heat capacity of solution = $4.2 \text{ J g}^{-1} \text{ }^\circ\text{C}^{-1}$, density of solution = 1 g cm^{-3}]

[1M]

(iii) Eksperimen I diulang dengan menambahkan 100 cm^3 larutan natrium hidroksida 1.0 mol dm^{-3} kepada 100 cm^3 asid X 1.0 mol dm^{-3} .

Apakah perubahan suhu untuk tindak balas itu?

Experiment I is repeated by adding 100 cm^3 of 1.0 mol dm^{-3} sodium hydroxide solution to 100 cm^3 of 1.0 mol dm^{-3} acid X.

What is the temperature change of the reaction?

.....[1M]

(d) Lukis gambar rajah aras tenaga bagi tindak balas dalam Eksperimen II.

Draw an energy level diagram for the reaction in Experiment II.

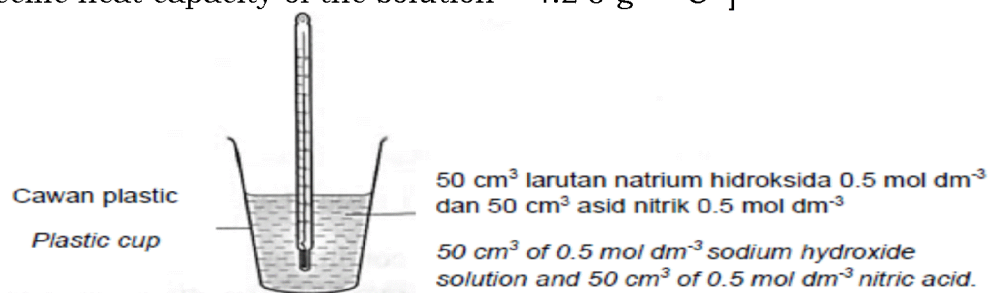
[2M]

[PPinang2022-Set02-08] Eksperimen dijalankan untuk menentukan haba penutralan antara asid kuat dengan alkali kuat. 50 cm^3 larutan natrium hidroksida 0.5 mol dm^{-3} dituangkan dalam cawan plastik dan suhu awal dicatat. 50 cm^3 asid nitrik 0.5 mol dm^{-3} dituangkan ke dalam cawan mengandungi larutan natrium hidroksida. Campuran tindak balas dikacau. Suhu meningkat sebanyak 3°C .

[Muatan haba tentu larutan = $4.2 \text{ J g}^{-1} ^\circ\text{C}^{-1}$]

Experiment is carried out to determine the heat of neutralisation between strong acid and strong alkali. 50 cm^3 of 0.5 mol dm^{-3} sodium hydroxide solution is poured into a plastic cup and the initial temperature is recorded. 50 cm^3 of 0.5 mol dm^{-3} nitric acid is then poured into the cup containing the sodium hydroxide solution. The mixture is stirred. The temperature raises by 3°C .

[Specific heat capacity of the solution = $4.2 \text{ J g}^{-1} ^\circ\text{C}^{-1}$]



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

.....
.....[1M]

(b) Hitungkan/ Calculate

(i) Bilangan mol natrium hidroksida yang telah bertindak balas dengan asid nitrik
The number of moles of sodium hydroxide that react with nitric acid

[1M]

(ii) haba yang dibebaskan dalam eksperimen itu.
The heat released in the experiment

[1M]

(iii) haba peneutralan dalam tindak balas ini
the heat of neutralisation in this reaction.

[1M]

(c) Tulis persamaan termokimia bagi tindak balas dalam eksperimen.
Write the thermochemical equation for the reaction in the experiment.

.....[2M]

(d) Bina gambar rajah aras tenaga bagi tindak balas tersebut.
Construct energy level diagram for the reaction

[2M]

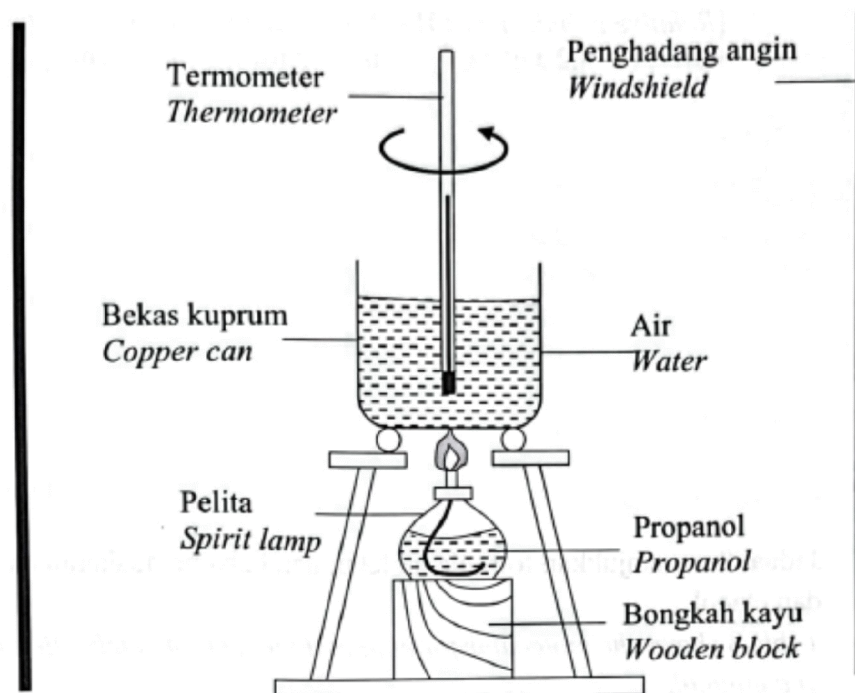
(e) Nyatakan dua maklumat tentang tindak balas yang boleh didapati dari gambar rajah aras tenaga di atas.

State two information about the reaction which can be obtained from the above energy level diagram

.....
[2M]

[SBP2022-08] (a) Rajah 8 menunjukkan susunan radas bagi suatu eksperimen yang dijalankan untuk mengkaji haba pembakaran propanol, C_3H_7OH .

Diagram 8 shows the apparatus set-up of an experiment carried out to study the heat of combustion of propanol, C_3H_7OH .



Dalam eksperimen ini, 200 cm^3 air dalam bekas kuprum mengalami peningkatan suhu sebanyak $30.0\text{ }^\circ\text{C}$. Jisim bagi propanol, C_3H_7OH dalam pelita berkurang sebanyak 3.0 g .

In this experiment, 200 cm^3 of water in the copper can experienced an increase in temperature by $30.0\text{ }^\circ\text{C}$. The mass of propanol, C_3H_7OH in the spirit lamp decreased by 3.0 g .

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

.....[1M]

(ii) Berikan sebab mengapa bahagian bawah bekas kuprum menjadi hitam setelah dipanaskan.

Give a reason why does the bottom of the copper can turn black after being heated.

.....[1M]

(iii) Hitungkan haba pembakaran bagi propanol, C_3H_7OH .

Calculate the heat of combustion of propanol, C_3H_7OH .

[Jisim atom relatif: $H = 1$, $C = 12$, $O = 16$;

Muatan haba tentu air, $c = 4.2 \text{ J g}^{-1} \text{ } ^\circ\text{C}^{-1}$; Ketumpatan air = 1.0 g cm^{-3}]

[Relative atomic mass: $H = 1$, $C = 12$, $O = 16$; Specific heat capacity of water, $c = 4.2 \text{ J g}^{-1} \text{ } ^\circ\text{C}^{-1}$; Density of water = 1.0 g cm^{-3}]

[3M]

(b) Jadual 8 menunjukkan formula molekul dan haba pembakaran bagi metanol dan etanol.

Table 8 shows the molecular formula and the heat of combustion for methanol and ethanol.

Alkohol Alcohol	Formula molekul Molecular formula	Haba pembakaran (kJ mol^{-1}) Heat of combustion (kJ mol^{-1})
Metanol Methanol	CH_3OH	-723
Etanol Ethanol	$\text{C}_2\text{H}_5\text{OH}$	-1360

Berdasarkan maklumat dalam Jadual 8, bandingkan haba pembakaran antara metanol dan etanol. Terangkan mengapa terdapat perbezaan antara nilai haba pembakaran bagi alkohol itu.

Based on the information in Table 8, compare the heat of combustion between methanol and ethanol. Explain why there is a difference in the values of the heat of combustion between the alcohols.

.....

.....

.....[2M]

(c) Alex mengikuti perkhemahan di hutan. Selain dari makanan dan minuman dalam tin, berikut adalah bahan dan peralatan yang dibawa bersama:

Alex went for a camping in the jungle. Besides food and canned beverage, the following materials and equipment are brought together:

- Air/ Water
- Besen kecil / Small basin
- Serbuk ammonium nitrat / Ammonium nitrate powder
- Serbuk kalsium oksida / Calcium oxide powder

Alex ingin menyejukkan minuman di dalam tin. Dengan memilih bahan-bahan yang sesuai, huraikan bagaimana Alex dapat menyejukkan minuman itu?

Alex wants to cool the beverage in the can. By choosing suitable materials, describe how Alex can cool the beverage?

[3 markah/ marks]

.....

.....

.....

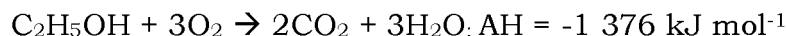
.....

.....

.....[3M]

[Selangor2022-Set3-07] Pembakaran etanol dalam udara diwakili oleh persamaan berikut:

Combustion of ethanol in air is represented by the equation below.



(a) Lukis gambar rajah berlabel menunjukkan susunan radas bagi menentukan haba pembakaran etanol dalam makmal.

Draw a labelled diagram showing the set-up of apparatus to determine the heat of combustion of ethanol in a laboratory.

[2M]

(b) Amin menjalankan satu eksperimen untuk menentukan haba pembakaran etanol. Dia mendapati 1.15 g etanol digunakan untuk meningkatkan suhu bagi 200 cm³ air daripada 28.0 °C kepada 62.0 °C. Amin carried out an experiment to determine the heat of combustion of ethanol. He found that 1.15 g of ethanol is used to increase the temperature of 200 cm³ of water from 28.0 °C to 62.0 °C.

Hitungkan:/ Calculate:

(i) Haba yang dibebaskan daripada pembakaran etanol.

[Muatan haba tentu larutan = 4.2 J g⁻¹°C⁻¹ ketumpatan larutan = 1 g cm⁻³]

The heat released from the combustion of ethanol.

[Specific heat capacity of solution = 4.2 J g⁻¹ °C⁻¹, density of solution = 1 g cm⁻³]

[1M]

(ii) Bilangan mol etanol yang digunakan.

Number of moles of ethanol used.

[Jisim atom relatif/ Relative atomic mass: H = 1, C = 12, O=16]

[1M]

(iii) Haba pembakaran etanol./ Heat of combustion of ethanol.

[1M]

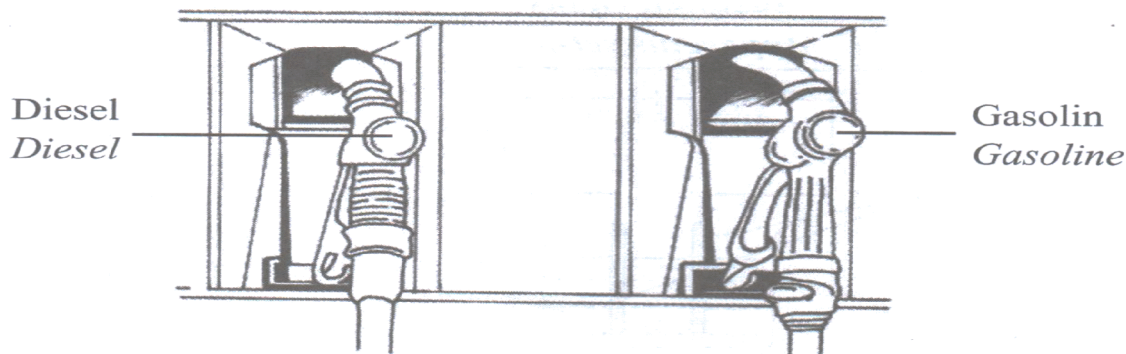
(iv) Mengapakah nilai haba pembakaran yang didapati dalam eksperimen makmal lebih rendah daripada nilai teori?

Why is the value of heat of combustion obtained in laboratory experiment is lower than the theoretical value?

.....[1M]

Rajah 7 menunjukkan dua bahan api berlainan yang boleh diperolehi dengan mudah di stesen petrol.

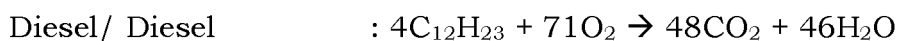
Diagram 1 shows two different fuels that can easily be obtained in petrol station.



Rajah 7/ Diagram 7

Persamaan kimia berikut menunjukkan pembakaran lengkap gasolin, C_8H_{18} dan diesel, $C_{12}H_{23}$.

The following chemical equation shows the complete combustion of gasoline, C_8H_{18} and diesel, $C_{12}H_{23}$.



(i) Bandingkan nilai haba pembakaran bagi gasolin dan diesel.
Compare the value of heat of combustion of gasoline and diesel.

.....[1M]

(ii) Terangkan jawapan anda di 7(c)(i)./ Explain your answer in 7(c)(i).

.....

.....

.....[3M]

[Pahang2022-07] Jadual 7 menunjukkan haba pembakaran bagi bahan api A dan bahan api B.

Table 7 shows the heat of combustion for fuel A and fuel B.

Bahan api Fuel	Formula molekul Molecular formulae	Haba pembakaran, kJ mol^{-1} Heat of combustion, kJ mol^{-1}
A	C_8H_{18}	-5013
B	$C_{12}H_{23}$	-10124

(a) Apakah yang dimaksudkan dengan haba pembakaran?
What is meant by heat of combustion?

.....

.....[1M]

(b) Berdasarkan Jadual 7,/ Based on Table 7,

(i) Hitung nilai bahan api bagi bahan api A dan bahan api B.

Calculate the fuel value for fuel A and fuel B.

[Jisim atom relatif/ Relative atomic mass: C=12, H=1]

[2M]

(ii) Ahmad merupakan seorang pemandu lori. Pilih bahan api A atau bahan api B yang lebih sesuai digunakan sebagai bahan api untuk lorinya.

Wajarkan jawapan anda.

Ahmad is a lorry driver. Choose fuel A or fuel B which is more suitable to be used as fuel for his lorry. Justify your answer.

.....

.....

.....[2M]

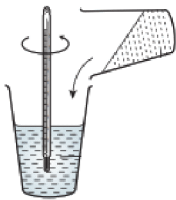
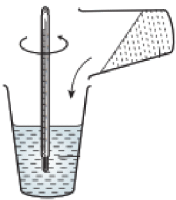
(iii) Hitung haba yang terbebas jika 0.5 mol bahan api A terbakar dengan lengkap dalam oksigen berlebihan.

Calculate the heat released if 0.5 mol of fuel A burnt completely in excess oxygen.

[1M]

(c) Rajah 7 menunjukkan bacaan suhu bagi dua set eksperimen untuk mengkaji haba penutralan asid sulfurik dan asid hidroklorik.

Diagram 7 shows the temperature readings for two sets of experiments to study the heat of neutralisation of sulphuric acid and hydrochloric acid.

Set I	Set II
 50 cm³ asid sulfurik 2.0 mol dm⁻³ 50 cm³ 2.0 mol dm⁻³ sulphuric acid 50 cm³ natrium hidroksida 2.0 mol dm⁻³ 50 cm³ 2.0 mol dm⁻³ sodium hydroxide	 50 cm³ asid hidroklorik 2.0 mol dm⁻³ 50 cm³ 2.0 mol dm⁻³ hydrochloric acid 50 cm³ natrium hidroksida 2.0 mol dm⁻³ 50 cm³ 2.0 mol dm⁻³ sodium hydroxide
Suhu awal/ Initial temperature = 28.0 °C Suhu tertinggi / Highest temperature = 54.0 °C	Suhu awal/ Initial temperature = 28.0 °C Suhu tertinggi / Highest temperature = 41.0 °C

Berdasarkan pemerhatian bagi Set I dan Set II dalam Rajah 7,
Based on observations for Set I and Set II in Diagram 7,

(i) Bandingkan perubahan suhu dan terangkan jawapan anda.
Compare the changes in temperature and explain your answer.

.....
.....
.....
.....[3M]

(ii) Ramalkan perubahan suhu jika asid hidroklorik dalam Set II digantikan dengan asid etanoik dengan isi padu dan kepekatan yang sama.
Predict the change in temperature if hydrochloric acid in Set II is replaced by ethanoic acid of the same volume and concentration.

.....[1M]

[JUU2022-Set01-07] (a) Jadual 7.1 menunjukkan haba pembakaran bagi empat jenis alkohol.

Table 7.1 shows the heat of combustion for four types of alcohols.

Alkohol Alcohol	Haba pembakaran (kJ mol^{-1}) Heat of combustion (kJ mol^{-1})
Metanol Methanol	-726
Etanol Ethanol	- 1376
Propanol Propanol	X
Butanol Butanol	- 2679

Berdasarkan Jadual 7.1,/ Based on Table 7.1,

(i) Nyatakan definisi bagi haba pembakaran.
State the definition for heat of combustion.

.....
.....[1M]

(ii) Ramalkan nilai X.[1M]
Predict the value of X.

(iii) Terangkan mengapa terdapat perbezaan antara nilai haba pembakaran metanol dan etanol.

Explain why there is a difference in the values of heat of combustion between methanol and ethanol

.....

[1M]

(iv) 0.05 mol butanol bertindak balas dengan lengkap dalam oksigen berlebihan. Hitung haba yang dibebaskan kemudian lukis gambarajah aras tenaga bagi eksperimen ini.

0.05 mol butanol react completely in excess oxygen. Calculate the heat released and draw the energy level diagram for this experiment.

[3M]

(b) Jadual 7.2 menunjukkan nilai bahan api bagi beberapa jenis bahan api.
 Table 7.2 shows the fuel values of various fuels.

Bahan api Fuel	Nilai bahan api (kJ g^{-1}) Fuel value (kJ g^{-1})
Metanol/ Methanol	30
Petrol/ Petrol	34
Gas asli/ Natural gas	50
Gas hidrogen/ Hydrogen gas	143

Jadual 7.2/ Table 7.2

Petrol digunakan sebagai bahan api secara meluas dalam kenderaan.
 Bahan api manakah sesuai untuk menggantikan petrol dalam kenderaan?
 Wajarkan pilihan anda.

Petrol is widely used as fuel in vehicles. Which fuel is suitable to replace petrol in vehicles? Justify your choice.

.....
[2M]

Esei

[Pahang PPD Jerantut 2022-11] Artikel di bawah merujuk kepada trem pertama di dunia yang menggunakan bahan api hydrogen.

The article below refers to the first tram in the world using hydrogen fuel.



TREM BERKUASA HIDROGEN DIBANGUNKAN DI CHINA

Dalam usaha untuk mengurangkan pembebasan gas rumah hijau yang banyak dan berbahaya, syarikat SIFANG telah mencipta trem berkuasa hidrogen pertama di China. Trem tersebut beroperasi sepenuhnya dengan sel bahan api hidrogen. Apabila 1 mol hidrogen dibakar, haba terbebas ialah 282 kJ. Kelajuan yang tertinggi hanyalah 70 kilometer sejam dan digunakan di kawasan bandar sahaja. Trem ini direka untuk membawa 380 penumpang.

HYDROGEN POWERED TRAMS DEVELOPED IN CHINA

In order to reduce the abundant emissions of dangerous greenhouse gases in China, a Chinese company SIFANG has invented the first hydrogen-powered tram in the world. The trams will be operated entirely by hydrogen fuel cells. When 1 mole of hydrogen is burnt, the heat released is 282 kJ. The highest speed is only 70 kilometers per hour and it will operate in urban areas only. Each tram is designed to carry 380 passengers.

(Sumber: <http://www.altemative-energy-news.info/hydrogen-powered-tram>)

Berdasarkan artikel:/ Based on the article above:

(a) (i) Adakah tindak balas tersebut tindak balas endotermik atau eksotermik? Jelaskan jawapan anda.

Is the reaction endothermic or exothermic? Explain your answer.

[2 marks]

(ii) Tuliskan persamaan termokimia bagi pembakaran hidrogen, dan lukis gambar rajah aras tenaga untuk pembakaran hidrogen.

Write the thermochemical equation for the combustion of hydrogen and construct an energy level diagram for the combustion of hydrogen.

[5 marks]

(b) Dalam satu eksperimen, 100 g cecair hidrogen dibakar dalam oksigen berlebihan. Hitung jumlah tenaga yang dibebaskan apabila 100 g hidrogen dibakar. [Jisim atom relatif: H = 1].

In an experiment, 100 g of hydrogen liquid is burnt in excess oxygen.

Calculate the total energy released when 100 g of hydrogen is burnt.

[Relative atomic mass: H = 1].

[3 marks]

(c) Wajarkan penggunaan hidrogen sebagai bahan api fosil.
Justify the use of hydrogen as a fossil fuel.

[3 marks]

(d) Dalam satu eksperimen 50cm³ asid kuat monoprotik dicampurkan dengan 50cm³ larutan natrium hidroksida, NaOH di dalam cawan polistirena. Kepekatan asid dan alkali adalah sama. Suhu campuran itu bertambah sebanyak 6.5 °C. Tulis persamaan kimia seimbang bagi tindak balas itu. Hitungkan nilai haba yang dibebaskan dalam eksperimen itu. Bandingkan jumlah haba yang dibebaskan jika eksperimen diulang dengan menggunakan asid etanoik. Jelaskan.

[Muatan haba tentu larutan, $c = 4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$; ketumpatan larutan = 1 g cm^{-3}]

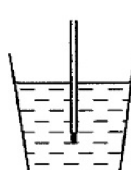
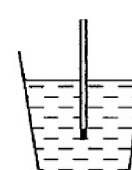
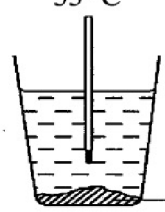
In an experiment, 50 cm³ of strong monoprotic acid is mixed with 50 cm³ of sodium hydroxide, NaOH solution in a polystyrene cup. The concentrations of the acid and alkali are the same. The temperature of the mixture increases by 6.5 °C. Write a balanced chemical reaction for the reaction. Calculate the heat released in the experiment.

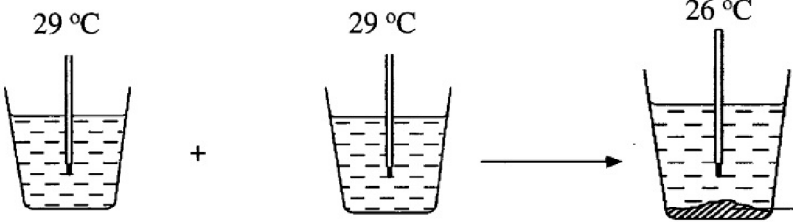
Compare the total heat released if the experiment is repeated with ethanoic acid. Explain.

[Specific heat capacity of solution, $c = 4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$; density of solution = 1 g cm^{-3}]

[7 marks]

[SPM2021-V1-10] (a) Rajah 7 menunjukkan dua set eksperimen yang dijalankan oleh seorang pelajar untuk mengkaji haba pemendakan bagi kuprum(II) karbonat dan bahan Y. Diagram 7 shows two sets of experiments carried out by a student to investigate the heat of precipitation of copper(II) carbonate and substance Y.

Set	Susunan radas/ Apparatus set-up
I	29 °C  100 cm³ larutan kuprum(II) sulfat 0.1 mol dm⁻³ 100 cm³ of 0.1 mol dm⁻³ copper(II) sulphate solution + 29 °C  100 cm³ larutan X karbonat 0.1 mol dm⁻³ 100 cm³ of 0.1 mol dm⁻³ X carbonate solution → 33 °C  Kuprum(II) karbonat Copper(II) carbonate Suhu tertinggi yang dicapai The highest temperature reached

II		29 °C 29 °C 26 °C Bahan Y Substance Y 100 cm³ larutan Natrium karbonat 0.1 mol dm⁻³ 100 cm³ of 0.1 mol dm⁻³ Sodium carbonate 100 cm³ larutan magnesium nitrat 0.1 mol dm⁻³ 100 cm³ of 0.1 mol dm⁻³ magnesium nitrate solution Suhu terendah yang dicapai The lowest temperature reached
----	--	--

Berdasarkan Rajah 7,/ Based on Diagram 7,

(I) nyatakan definisi bagi haba pemendakan dan warna bagi kuprum(II) karbonat yang terhasil
state the definition of heat of precipitation and the colour of copper(II) carbonate formed

[2 markah] [2 marks]

(ii) cadangkan larutan X karbonat dan bahan Y
suggest X carbonate solution and substance Y

[2 markah] [2 marks]

(iii) hitung haba pemendakan bagi tindak balas dalam Set I dan Set II
[Diberi muatan haba tentu bagi larutan ialah $C = 4.2 \text{ Jg}^{-1} \text{ } ^\circ\text{C}^{-1}$; ketumpatan larutan = 1 g cm^{-3}]
calculate the heat of precipitation of the reaction in Set I and Set II
[Given the specific heat capacity of solution is $C = 4.2 \text{ Jg}^{-1} \text{ } ^\circ\text{C}^{-1}$; density of solution = 1 g cm^{-3}]
[6 markah] [6 marks]

(iv) nyatakan jenis tindak balas yang berlaku dalam Set I dan Set II.
Bandingkan perbezaan jenis tindak balas bagi Set I dan Set II dari segi perubahan suhu, perbezaan kandungan tenaga bahan tindak balas dan hasil tindak balas serta perubahan tenaga sewaktu pemecahan ikatan dan pembentukan ikatan. Lukis gambar rajah aras tenaga bagi Set I atau Set II.
state the type of reaction that occurs in Set I and Set II. Compare the difference in the type of reaction for Set I and Set II in terms of the change in temperature, difference in energy content of reactants and products and energy changes during bond breaking and bond formation. Draw the energy level diagram for Set I or Set II.

[7 markah] [7 marks]

(b) Jadual 6 menunjukkan haba peneutralan bagi larutan natrium hidroksida dan dua jenis asid iaitu asid P dan asid Q.

Table 6 shows heat of neutralisation of sodium hydroxide solution and two types of acids which are acid P and acid Q.

Set	Eksperimen Experiment	Haba peneutralan (kJ mol ⁻¹) Heat of neutralisation
I	50 cm ³ asid P 0.1 mol dm ⁻³ + 50 cm ³ larutan natrium hidroksida 0.1 mol dm ⁻³ 50 cm ³ 0.1 mol dm ⁻³ acid P + 50 cm ³ 0.1 mol dm ⁻³ sodium hydroxide solution	-57.5
II	50 cm ³ asid Q 0.1 mol dm ⁻³ + 50 cm ³ larutan natrium hidroksida 0.1 mol dm ⁻³ 50 cm ³ 0.1 mol dm ⁻³ acid Q + 50 cm ³ 0.1 mol dm ⁻³ sodium hydroxide solution	-54.5

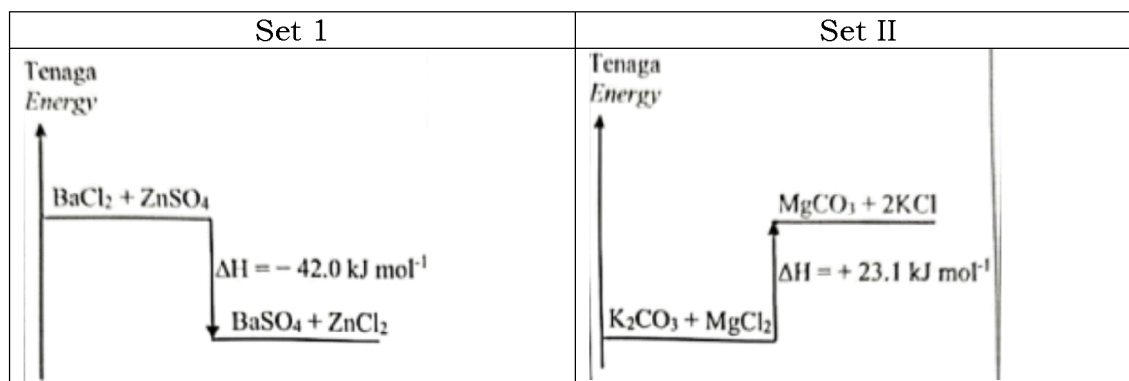
Berdasarkan maklumat Jadual 6, terangkan mengapa terdapat perbezaan haba peneutralan antara Set I dan Set II.

Based on the information in Table 6, explain why there is a difference in heat of neutralisation between Set I and set II.

[3 markah] [3 marks]

[Negeri Sembilan 2022-10] (a) Jadual 2.1 menunjukkan gambar rajah aras tenaga bagi dua tindak balas pemendakan.

Table 2.1 shows energy level diagram for two different precipitation reactions.



(i) Apakah maksud haba pemendakan? Nyatakan warna barium sulfat.
What is the meaning of heat of precipitation? State the colour of barium sulphate.

[2 markah / 2 marks]

(ii) Tuliskan persamaan termokimia bagi tindak balas yang berlaku di Set I.
Write a thermochemical equation for the reaction takes place in Set I.

[2 markah / 2 marks]

(iii) Jika 50 cm^3 larutan barium klorida 1.0 mol dm^{-3} ditambah kepada 50 cm^3 larutan zink sulfat 1.0 mol dm^{-3} , hitungkan kenaikan suhu campuran tersebut.

[Ketumpatan air = 1.0 g cm^{-3}] [Muatan haba tentu air, $c = 4.2 \text{ J g}^{-1} \text{ }^\circ\text{C}^{-1}$]

If 50 cm^3 of 1.0 mol dm^{-3} barium chloride solution is added into 50 cm^3 of 1.0 mol dm^{-3} zinc sulphate solution, calculate the rise in temperature of the mixture.

[Density of water = 1.0 g cm^{-3}] [Specific heat capacity of water, $c = 4.2 \text{ J g}^{-1} \text{ }^\circ\text{C}^{-1}$]

[3 markah / 3 marks]

(iv) Terangkan perbezaan haba pemendakan bagi Set I dan Set II.

Penerangan anda mesti merangkumi:

- Jenis tindak balas
- Perubahan Suhu
- Jumlah kandungan tenaga
- Perubahan tenaga haba semasa pemecahan ikatan dan pembentukan ikatan

Explain the difference in heat of precipitation for Set I and Set II.

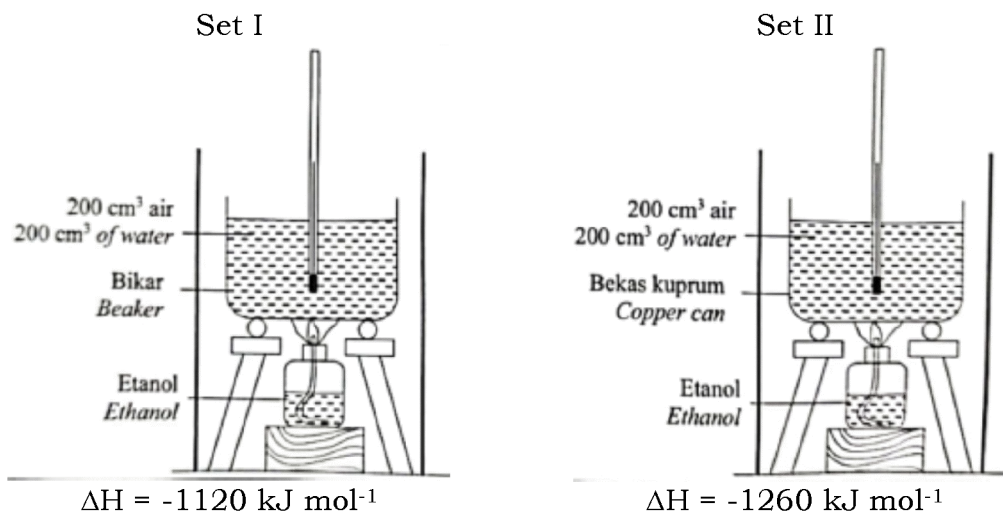
Your explanation must include:

- type of reaction
- change in temperature
- total energy content
- Heat energy change during bond breaking and bond formation

[4 markah / 4 marks]

(b) Jadual 2.2 menunjukkan susunan radas untuk menentukan haba pembakaran etanol.

Table 2.2 shows the apparatus set-up to determine the heat of combustion of ethanol.



(i) Terangkan perbezaan haba pembakaran Set I dan Set II.

Explain the difference of heat of combustion in Set I and Set II.

[3 markah / 3 marks]

(ii) Dalam Set II, suhu air meningkat sebanyak 30°C.

Hitungkan jisim etanol yang digunakan.

In Set II, water temperature increased by 30 °C.

Calculate the mass of ethanol used.

[Ketumpatan air = 1.0 g cm⁻³] [Muatan haba tentu air, c = 4.2 J g⁻¹ °C⁻¹]

[Jisim molar etanol: 46 g mol⁻¹]

[Density of water = 1.0 g cm⁻³] [Molar mass of ethanol = 46 g mol⁻¹]

[Specific heat capacity of water, c = 4.2 J g⁻¹ °C⁻¹]

[3 markah / 3 marks]

(iii) Eksperimen Set II diulangi dengan menggantikan etanol dengan propanol. Haba pembakaran yang diperolehi ialah -1890 kJ mol⁻¹.

Bandingkan nilai haba pembakaran antara etanol dan propanol.

Terangkan perbezaannya.

The experiment in Set II is repeated by replacing ethanol with propanol. The heat of combustion obtained is -1890 kJ mol⁻¹.

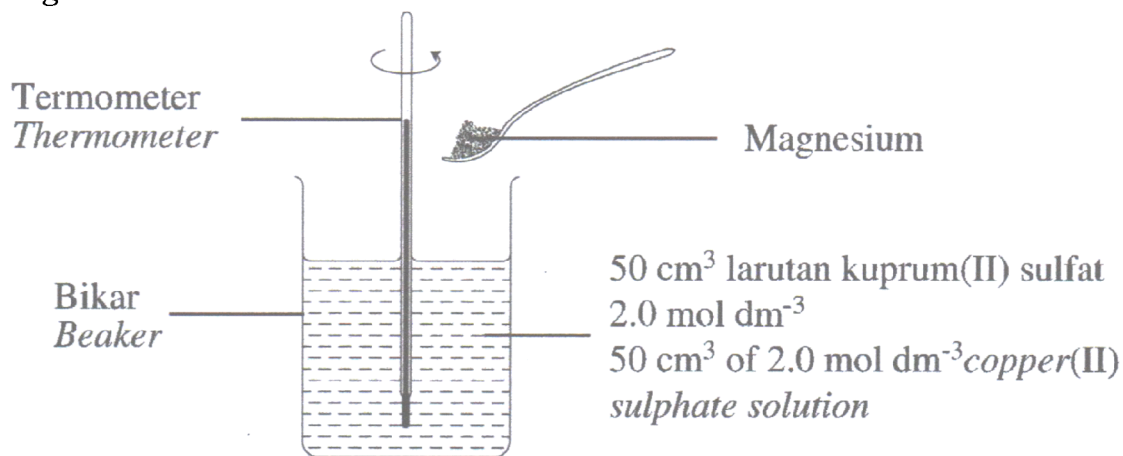
Compare the value of heat of combustion between ethanol and propanol.

Explain the difference.

[3 markah / 3 marks]

[SPM2021-V2-11] (a) Rajah 10.1 menunjukkan susunan radas bagi satu eksperimen untuk mengkaji haba penyesaran kuprum daripada larutan kuprum(II) sulfat oleh magnesium.

Diagram 10.1 shows the apparatus set-up for an experiment to study the heat of displacement of copper from copper(II) sulphate solution by magnesium.



Berdasarkan Rajah 10.1, / Based on Diagram 10.1,

(i) Nyatakan satu pemerhatian daripada eksperimen itu dan cadangkan satu pengubahsuaian yang boleh dilakukan ke atas susunan radas untuk mendapatkan perubahan suhu yang lebih tepat. Terangkan jawapan anda.

[3 markah]

State one observation from the experiment, and suggest one modification that can be made to the apparatus set-up to obtain more accurate temperature changes. Explain your answer.

[3 marks]

(ii) Tulis satu persamaan kimia bagi tindak balas itu dan hitung haba penyesaran kuprum jika suhu meningkat dari 28.0 °C kepada 44.5 °C

[Muatan haba tentu larutan, $C = 4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$;

Ketumpatan larutan = 1 g m^{-3}]

Write a chemical equation for the reaction and calculate the heat of displacement of copper from its salt solution if the temperature increases from 28 °C to 44.5 °C.

[Specific heat capacity of solution, $C = 4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$;

Density of solution = 1 g m^{-3}]

[4 marks]

(b) Rajah 10.2 menunjukkan pek panas dan pek sejuk yang mengaplikasikan konsep termokimia dalam kehidupan harian. Diagram 10.2 shows a hot pack and a cold pack that apply the thermochemistry concept in daily life.



Rajah 10.2
Diagram 10.2

(i) Berdasarkan Rajah 10.2, bandingkan tindak balas yang berlaku dalam pek panas dan pek sejuk dari segi:

Based on Diagram 10.2, compare the reactions that occur in the hot pack and cold pack in terms of.

- Jenis tindak balas/ Type of reaction
- Perubahan haba/ Heat change
- Perubahan suhu / Temperature change
- Jumlah kandungan tenaga bahan tindak balas dan hasil tindak balas
Total energy content of reactant and products
- Perubahan haba semasa pemecahan dan pembentukan ikatan
Heat change during the breaking and formation of bonds

[5 markah] [5 marks]

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

- Ammonium nitrat / Ammonium nitrate
- Kalium nitrat / Potassium nitrate
- Pelet natrium hidroksida / Sodium hydroxide pellets
- Air suling / Distilled water

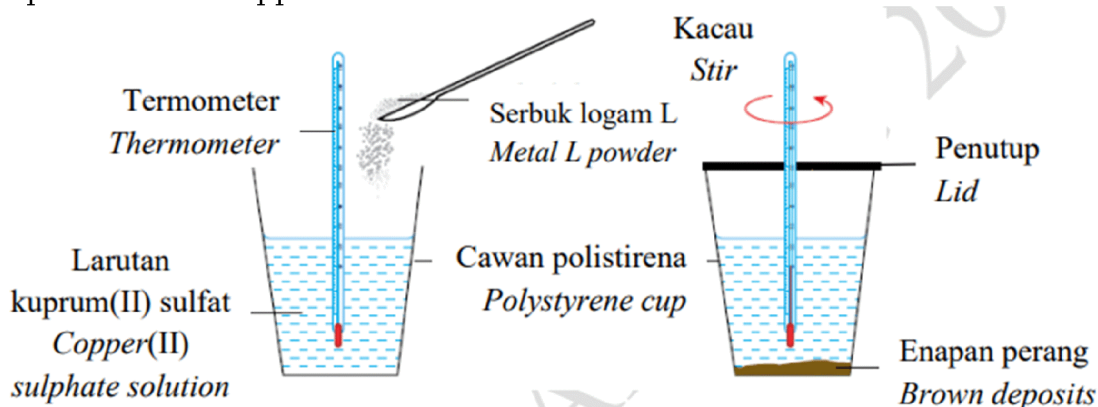
Huraikan satu eksperimen untuk menentukan perubahan suhu apabila bahan dilarutkan dalam air suling. Kelaskan bahan-bahan itu kepada bahan yang membebaskan haba ke persekitaran dan bahan yang menyerap haba dari persekitaran.

Describe an experiment to determine the temperature change when the substances are dissolved in distilled water. Classify the substances into substances that release heat to the surrounding and substances that absorb heat from the surrounding.

[8 marks]

[JUU2022-Set02-11] (a) Rajah 11.1 menunjukkan susunan radas untuk menentukan haba penyesaran bagi kuprum.

Diagram 11.1 shows the apparatus set-up to determine the heat of displacement of copper.



Berdasarkan Rajah 11.1,/ Based on Diagram 11.1,

(i) nyatakan maksud bagi haba penyesaran dalam tindak balas ini. Apabila serbuk logam L ditambahkan ke dalam larutan kuprum(II) sulfat, pepejal perang terenal. Cadangkan serbuk logam L yang sesuai dan namakan enapan perang yang terbentuk.

state the meaning of heat of displacement in this experiment. When metal L powder is added into copper(II) sulphate solution, brown solid deposited. Suggest a suitable metal L powder and name the brown deposits formed.

[3 markah / 3 marks]

(ii) Apabila 100 cm³ larutan kuprum(II) sulfat 0.5 mol dm⁻³ digunakan, suhu larutan meningkat daripada 29.0 °C ke 32.0 °C. Hitung haba penyesaran bagi tindak balas tersebut.

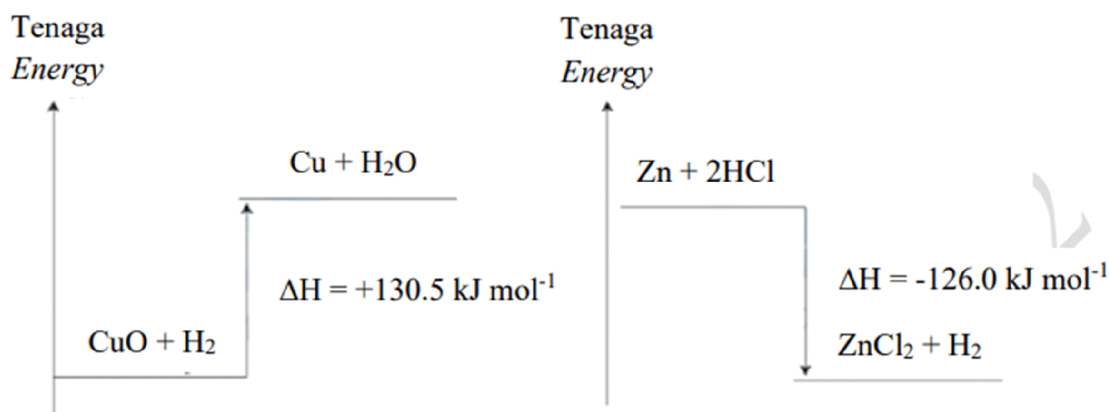
[Diberi muatan haba tentu bagi larutan ialah, $c = 4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$; ketumpatan larutan = 1 g cm⁻³]

When 100 cm³ of 0.5 mol dm⁻³ copper(II) sulphate solution is used, the temperature of the solution increases from 29.0 °C to 32.0 °C. Calculate the heat of displacement for the reaction.

[Given the specific heat capacity of solution is $c = 4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$; density of solution = 1 g cm⁻³]

(b) Rajah 11.2 menunjukkan gambarajah aras tenaga bagi Tindak balas I dan Tindak balas II yang telah dijalankan di sebuah makmal.

Diagram 11.2 shows energy level diagram for Reaction I and Reaction II which has been carried out in the laboratory.



Rajah 11.2 / Diagram 11.2

Berdasarkan Rajah 11.2, bandingkan Tindak balas I dan Tindak balas II dari segi :

- ΔH
- Jenis tindak balas
- Perubahan suhu
- Perubahan tenaga haba semasa pemutusan dan pembentukan ikatan
- Perubahan jumlah kandungan tenaga bahan tindak balas dan hasil tindak balas.

Based on Diagram 11.2, compare Reaction I and Reaction II in terms of:

- ΔH
- Types of reaction
- Temperature changes
- Heat energy changes during bond breaking and bond formation
- Changes in the total energy content of the reactants and products of the reaction.

[5 markah / 5 marks]

(c) Rajah 11.3 menunjukkan dua botol reagen yang mengandungi alkohol yang berbeza yang sesuai sebagai bahan bakar.
Diagram 11.3 shows two reagent bottles that contain different alcohols that are suitable as fuel.



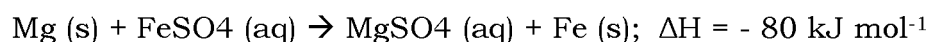
Berdasarkan Rajah 11.3, pilih satu alkohol yang dapat menghasilkan nilai haba pembakaran yang tinggi dan huraikan eksperimen untuk menentukan haba pembakaran alkohol yang dipilih.

Based on Diagram 11.3, choose one alcohol that can produce higher heat of combustion and describe the experiment to determine the heat of combustion of the chosen alcohol.

[8 markah / 8 marks]

[Johor2022-SetB-09] (a) Persamaan termokimia berikut mewakili tindak balas penyesaran antara magnesium dan larutan ferum (II) sulfat.

The reaction between magnesium and iron (II) sulphate solution is represented by the following thermochemical equation.



(i) Apakah maksud haba penyesaran?

What is the meaning of heat of displacement?

[1 markah][1 mark]

(ii) Nyatakan jenis tindak balas di atas.

State the type of reaction.

[1 markah][1 mark]

(iii) Lukis gambar rajah aras tenaga untuk tindak balas di atas.

Draw an energy level diagram for the above reaction.

[2 markah][2 marks]

(iv) Apakah akan berlaku pada nilai ΔH apabila logam magnesium digantikan dengan logam zink. Jelaskan jawapan anda.

What will happen to ΔH value when magnesium metal is replaced with zinc metal. Explain your answer.

[3 markah][3 marks]

(b) 50 cm³ larutan argentum nitrat 2.0 mol dm⁻³ dicampurkan dengan 50 cm³ larutan natrium klorida 2.0 mol dm⁻³ untuk membentuk mendakan putih argentum klorida, AgCl. Sebanyak 65.5 kJ tenaga haba dibebaskan apabila 1 mol argentum klorida termendak.

50 cm³ of 2.0 mol dm⁻³ silver nitrate solution is mixed with 50 cm³ of 2.0 mol dm⁻³ sodium chloride solution to form a white precipitate of silver chloride, AgCl. About 65.5 kJ heat energy is given out when 1 mol of silver chloride precipitated.

(i) Kira tenaga haba yang dibebaskan dalam tindak balas ini.

Calculate the heat given out in the reaction.

[3 markah][3 mark]

(ii)Apakah perubahan suhu dalam campuran ini?

[Muatan haba tentu larutan = 4.2 J g⁻¹ °C⁻¹; ketumpatan larutan: 1 g cm⁻³]

What is the temperature change in the mixture?

[Specific heat capacity of solution = 4.2 J g⁻¹ °C⁻¹; density of solution: 1 g cm⁻³]

[3 markah][3 marks]

(c) Satu lagi tindak balas dijalankan antara larutan magnesium nitrat, Mg(NO₃)₂ dan larutan natrium karbonat, Na₂CO₃ menghasilkan mendakan putih magnesium karbonat, MgCO₃

Another reaction is taken place between magnesium nitrate solution, Mg(NO₃)₂ and sodium carbonate solution, Na₂CO₃ to produce a white precipitate of magnesium carbonate, MgCO₃.

Persamaan termokimia untuk tindak balas itu ialah:

Thermochemical equation of the reaction is:



(i) Nyatakan perbezaan antara jumlah kandungan tenaga hasil tindak balas dan jumlah kandungan tenaga bahan tindak balas untuk tindak balas di atas.

State the difference between total energy content of the products and total energy content of reactants for the above reaction.

[1 markah] [1 mark]

(ii) Apakah yang membezakan tindak balas (b) dan tindak balas (c)?

Terangkan jawapan anda.

What is the difference between reaction in (b) and reaction in (c)? Explain your answer.

[3 markah] [3 marks]

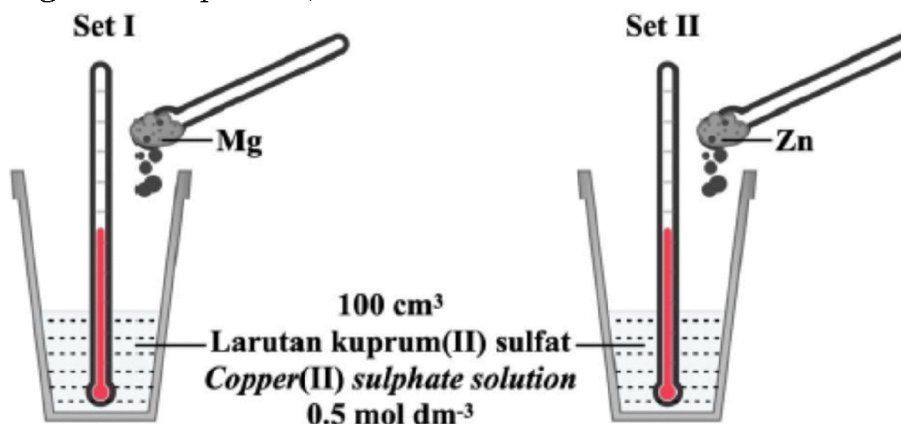
(d) Nilai haba yang terbebas semasa tindak balas penyesaran logam dan pemendakan selalunya lebih rendah daripada nilai teori. Mengapakah ini berlaku dan nyatakan langkah berjaga-jaga yang perlu diambil semasa menjalankan eksperimen ini.

The value of heat release during displacement of metal reaction and precipitation reaction always lower than theoretical value. Why it happened and state the precautionary steps to be taken during the experiment.

[3 markah][3 marks]

[Perak2022-Set01-10] (a) Rajah 10 menunjukkan susunan radas bagi membandingkan haba penyesaran kuprum daripada larutan kuprum(II) sulfat oleh serbuk magnesium, Mg dan serbuk zink, Zn.

Diagram 10 shows the apparatus set up to compare the heat of displacement of copper from copper(II) sulphate solution by magnesium powder, Mg and zinc powder, Zn.



Rajah / Diagram 10

Jadual 10.1 menunjukkan keputusan eksperimen itu.

Table 10.1 shows the results of the experiment.

Suhu (°C) Temperature (°C)	Set I	Set II
Awal, θ_i Initial, θ_i	27.0	27.0
Tertinggi, θ_f Highest, θ_f	32.0	31.0

(i) Dengan memilih sama ada Set I atau Set II, jawab soalan berikut :
By choosing either Set I or Set II, answer the following questions :

- maksud haba penyesaran.
the meaning of heat of displacement.

- satu langkah berjaga-jaga semasa menjalankan eksperimen ini.
one precautionary step while conducting the experiment.

- Nyatakan satu pemerhatian selain daripada perubahan suhu.
State another observation, other than change in temperature

- Tuliskan inferens bagi pemerhatian tersebut
Write the inference for the observation.

[4 markah / marks]

- (ii) Hitung haba penyesaran bagi kedua-dua set eksperimen dan terangkan mengapa terdapat perbezaan pada nilai haba penyesaran itu.

[Diberi muatan haba tentu bagi larutan ialah $c = 4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$, ketumpatan larutan = 1 g cm^{-3}]

Calculate the heat of displacement of both sets of experiment and explain why there is a difference in the value of the heat of displacement.

[Given that the heat capacity of solution is $c = 4.2 \text{ J g}^{-1} \text{ }^{\circ}\text{C}^{-1}$, density of solution = 1 g cm^{-3}]

[6 markah / marks]

- (b) Jadual 10.2 menunjukkan bilangan atom karbon per molekul alkohol dan haba pembakaran bagi metanol, etanol, propanol dan butanol.

Table 10.2 shows the number of carbon atoms per alcohol molecule and the heat of combustion of methanol, ethanol, propanol and butanol.

Alkohol Alcohol	Bilangan atom karbon per molekul alkohol Number of carbon atoms per alcohol molecule	Haba pembakaran Heat of combustion (kJ mol^{-1})
Metanol / <i>Methanol</i>	1	-720
Etanol / <i>Ethanol</i>	2	-1350
Propanol / <i>Propanol</i>	3	
Butanol / <i>Butanol</i>	4	-2680

Jadual / Table 10.2

- (i) Dengan menggunakan data pada Jadual 10.2 lukis satu graf bagi haba pembakaran melawan bilangan atom karbon per molekul alkohol di halaman 19.

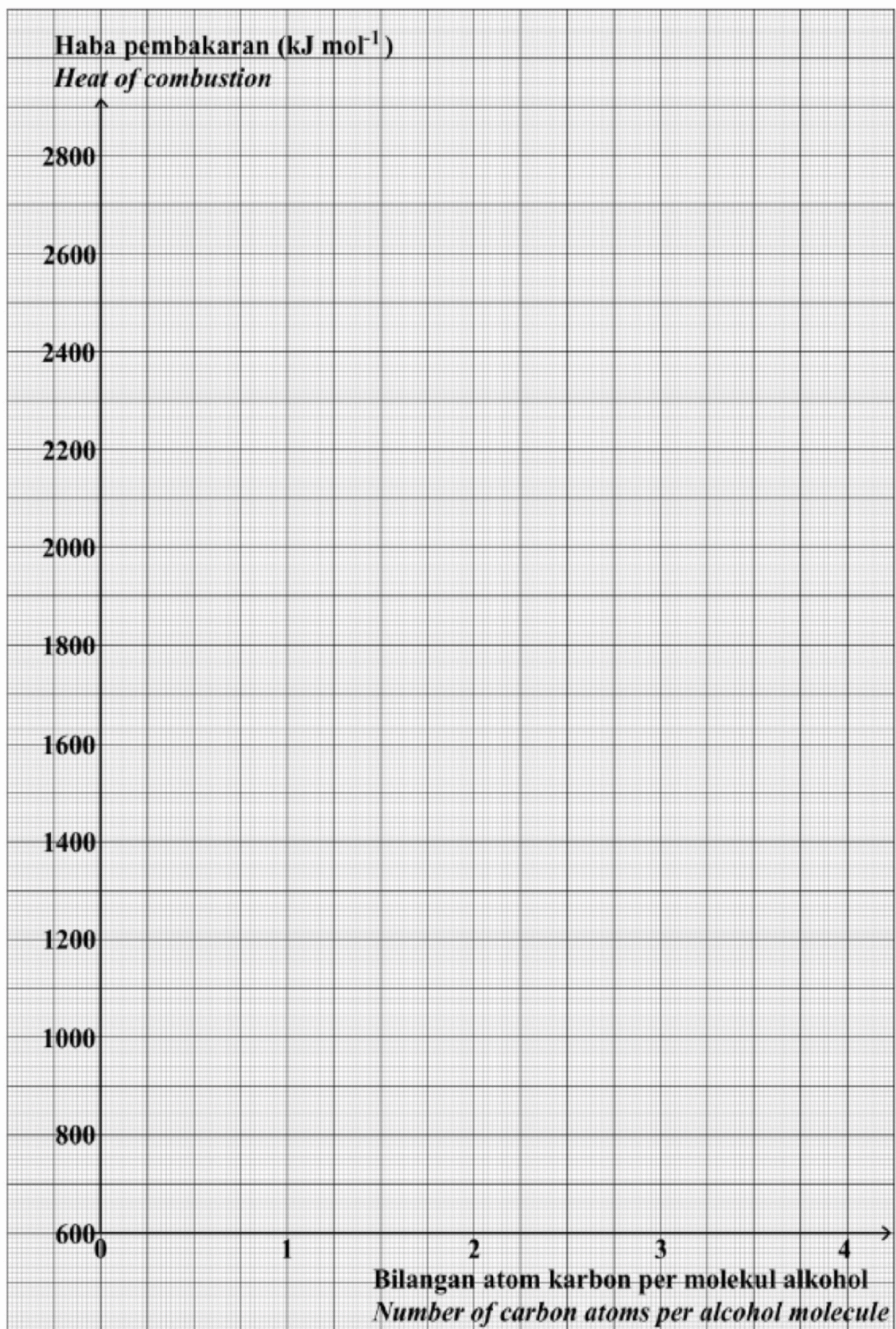
Daripada graf yang dilukis, tentukan nilai haba pembakaran bagi propanol.
By using data in Table 10.2 draw a graph of combustion against the number of carbon atoms per alcohol molecule on 19. From the graph plotted, determine the value of the heat of combustion of propanol.

[3 markah / marks]

- (ii) Terangkan mengapa haba pembakaran bagi propanol dan butanol berbeza. Sertakan persamaan kimia bagi pembakaran lengkap propanol dan butanol untuk membantu penerangan anda.

Explain why the heat of combustion of propanol and butanol are different. Include the chemical equations for the complete combustion of propanol and butanol to aid your explanation.

[5 markah / marks]



(c) Jadual 10.3 menunjukkan perbandingan haba pembakaran bagi dua bahan api.

Table 10.3 shows the comparison of the heat of combustion of two fuels.

Bahan api <i>Fuel</i>	Haba pembakaran (kJ mol⁻¹) <i>Heat of combustion</i>
Metana <i>Methane</i>	-880
Metanol <i>Methanol</i>	-720

Yusuf telah mencipta suatu mesin untuk membantu mempercepatkan kerjanya di bengkel. Berdasarkan Jadual 10.3 pilih bahan api yang paling sesuai digunakan dalam mesin tersebut, berdasarkan faktor nilai bahan api atau kesan ke atas alam sekitar. Wajarkan pilihan anda.

[Jisim atom relatif : H = 1, C = 12, O = 16]

Yusuf created a machine to help speed up his work at the workshop. Based on Table 10.3, choose the most suitable fuel for the machine, based on either the fuel value or the effects of the fuel on the environment. Justify your choice.

[Relative atomic mass : H = 1, C = 12, O = 16]

[2 markah / marks]

[Melaka2022-11] (a) Jadual 6.1 menunjukkan persamaan kimia dan haba peneutralan bagi dua set eksperimen; Set I dan Set II.

Table 6.1 shows the equations and heat of neutralisation for two sets of experiment; Set I and Set II.

Set	Persamaan kimia Chemical equation	Haba peneutralan Heat of neutralisation (kJ mol ⁻¹)
I	$\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$	-57.3
II	$\text{NaOH} + \text{CH}_3\text{COOH} \rightarrow \text{CH}_3\text{COONa} + \text{H}_2\text{O}$	-54.5

(i) Apakah yang dimaksudkan dengan haba peneutralan dan nyatakan jenis asid yang digunakan dalam Set I dan Set II.

What is meant by heat of neutralisation and state the type of acid used in Set I and Set II.

[3 markah/ marks]

(ii) Dalam Set I, 50 cm³ larutan natrium hidroksida 1.0 mol dm⁻³ bertindak balas dengan 50 cm³ asid hidroklorik 1.0 mol dm⁻³. Hitung suhu tertinggi dicapai sekiranya purata suhu awal ialah 28.5 °C.

In Set I, 50 cm³ of 1.0 moldm⁻³ sodium hydroxide solution reacted with 50 cm³ of 1.0 moldm⁻³ of hydrochloric acid. Calculate the highest temperature reached if the average initial temperature is 28.5 °C.

[Muatan haba tentu larutan: 4.2 J g⁻¹ °C⁻¹; ketumpatan larutan: 1.0 gcm⁻³]

[Specific heat capacity: 4.2 J g⁻¹ °C⁻¹; density of solution= 1.0 gcm⁻³]

[4 markah/ marks]

(b) Jadual 6.2 menunjukkan gambar rajah aras tenaga bagi dua jenis tindak balas, Tindak Balas I dan Tindak Balas II.

Diagram 6.2 shows the energy profile diagram for two types of reactions, Reactions I and Reactions II.

Tindak Balas Reaction	Gambar rajah aras tenaga Energy profile diagram
I	Tenaga Energy $\text{AgNO}_3 (\text{ak}) + \text{NaCl} (\text{ak})$ $\text{AgNO}_3 (\text{aq}) + \text{NaCl} (\text{aq})$ $\Delta H = -65.5 \text{ kJ mol}^{-1}$ $\text{AgCl} (\text{p}) + \text{NaNO}_3 (\text{ak})$ $\text{AgCl} (\text{s}) + \text{NaNO}_3 (\text{aq})$
II	Tenaga Energy $\text{N}_2 (\text{g}) + \text{O}_2 (\text{g})$ $2\text{NO} (\text{g})$ $\Delta H = +180 \text{ kJ mol}^{-1}$

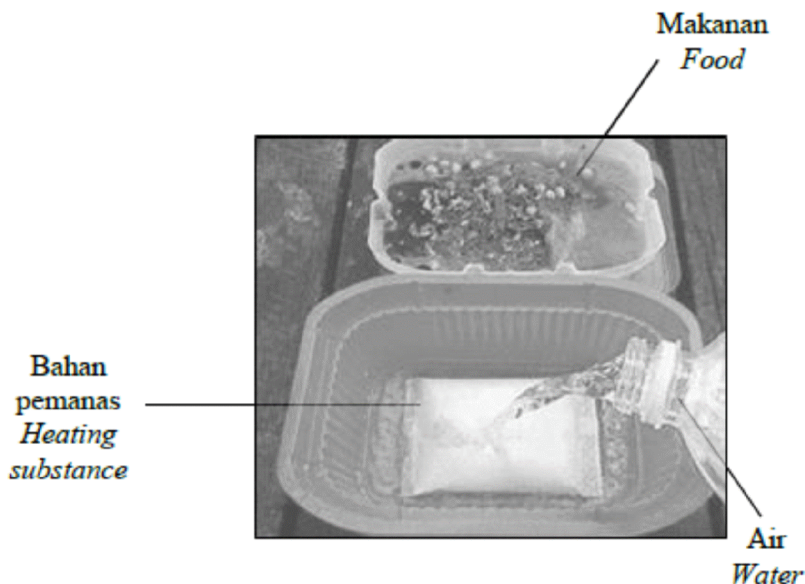
Berdasarkan Jadual 11.2, bandingkan Tindak balas I dan II dari segi jenis tindak balas, perubahan haba sewaktu tindak balas, perubahan suhu, jumlah kandungan tenaga bahan tindak balas dan hasil tindak balas dan perubahan tenaga haba sewaktu pemutusan dan pembentukan ikatan.

Based on Table 11.2, compare Reactions I and II based on the type of reactions, heat change during reactions, temperature change during reactions, total energy content of reactants and products, and change of heat energy during the breaking and formation of bonds.

(5 markah/ marks)

(c) Rajah 9 menunjukkan satu bekas pemanasan sendiri untuk memanaskan makanan. Bekas ini biasanya diisi dengan serbuk kalsium klorida, CaCl_2 dan dibekalkan bersama dengan air.

Diagram 9 shows a self-heating container to heat food. The pack is filled with calcium chloride powder, CaCl_2 and packed together with water.



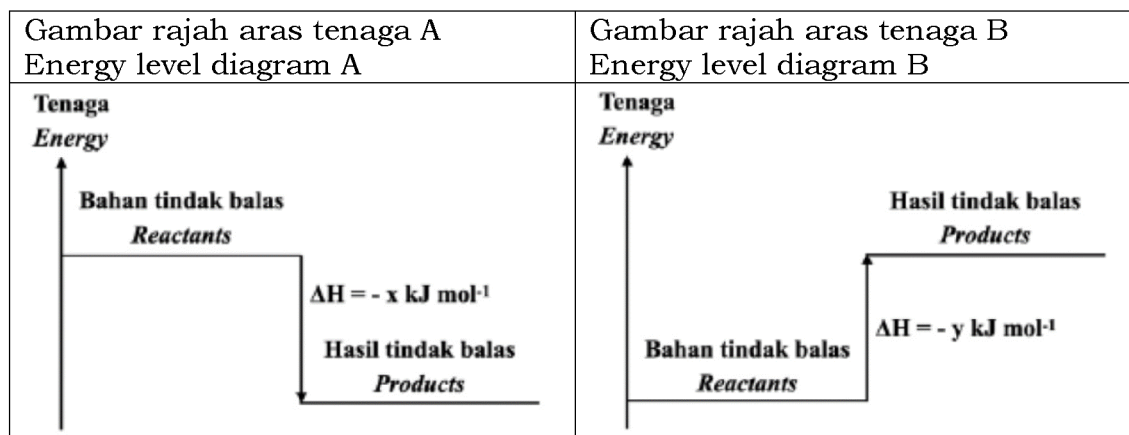
Anda dibekalkan dengan beberapa bahan kimia lain seperti magnesium nitrat, kalsium oksida dan ammonium nitrat yang boleh mungkin menggantikan serbuk kalsium klorida itu. Rancangkan satu kaedah yang boleh dilakukan dalam makmal untuk memilih bahan yang manakah yang boleh digunakan untuk menggantikan kapur tohor itu. Nyatakan bagaimana anda memilih bahan yang sesuai untuk menggantikan serbuk kalsium klorida itu.

You are supplied with a few chemical substances like magnesium nitrate, calcium oxide and ammonium nitrate that may be used to replace the calcium chloride powder. Plan a method that could be done in the lab to choose which substance that can be used to replace the calcium chloride powder. State how you choose which substance is suitable to replace the calcium chloride powder.

(8 markah/ marks)

[Perak2022-Set02-10] (a) Rajah 9 menunjukkan dua gambar rajah aras tenaga bagi tindak balas berlainan.

Diagram 9 shows two energy level diagrams for different reactions.



Berdasarkan Rajah 9, nyatakan jenis tindak balas yang berlaku dalam gambar rajah aras tenaga A dan B. Bandingkan jenis tindak balas bagi A dan B dari segi perubahan suhu, perbezaan kandungan tenaga bahan tindak balas dan hasil tindak balas, perubahan tenaga sewaktu pemecahan ikatan dan pembentukan ikatan dan berikan satu contoh bagi setiap tindak balas.

Based on Diagram 9, state the type of reaction that occurs in energy level diagrams A and B. Compare the type of reactions for A and B in terms of the change in temperature, difference in energy content of reactants and products, energy changes during bond breaking and bond formation and give one example for each reaction.

[7 markah / marks]

(b) Satu eksperimen dijalankan untuk mengkaji haba peneutralan antara 50 cm³ larutan natrium hidroksida 1.0 mol dm⁻³ dengan 50 cm³ asid hidroklorik 1.0 mol dm⁻³. Suhu campuran meningkat daripada 29.0°C kepada 35.5°C.

[Diberi muatan haba tentu larutan = 4.2 J g⁻¹ °C⁻¹, ketumpatan larutan = 1 g cm⁻³]

An experiment is conducted to study the heat of neutralisation between 50 cm³ of 1.0 mol dm⁻³ sodium hydroxide solution with 50 cm³ of 1.0 mol dm⁻³ hydrochloric acid. The temperature of the mixture increases from 29.0 °C to 35.5 °C.

[Given the specific heat capacity of solution = 4.2 J g⁻¹ °C⁻¹, density of solution = 1 g cm⁻³]

(i) Nyatakan definisi bagi haba peneutralan.
State the definition of heat of neutralisation.

[1 markah / mark]

(ii) Hitung haba peneutralan.
Calculate the heat of neutralisation.

[6 markah / marks]

(iii) Nilai haba peneutralan yang diperoleh di makmal adalah lebih rendah daripada nilai teorinya. Beri sebab mengapa hal ini terjadi.

The heat of neutralisation obtained in laboratory is less than its theoretical value. Give a reason why this happened.

[1 markah / mark]

(iv) Bina gambar rajah aras tenaga bagi tindak balas itu.
Construct an energy level diagram for the reaction.

[2 markah / marks]

(v) Ramalkan haba peneutralan apabila larutan natrium hidroksida diganti dengan larutan ammonia. Terangkan jawapan anda.

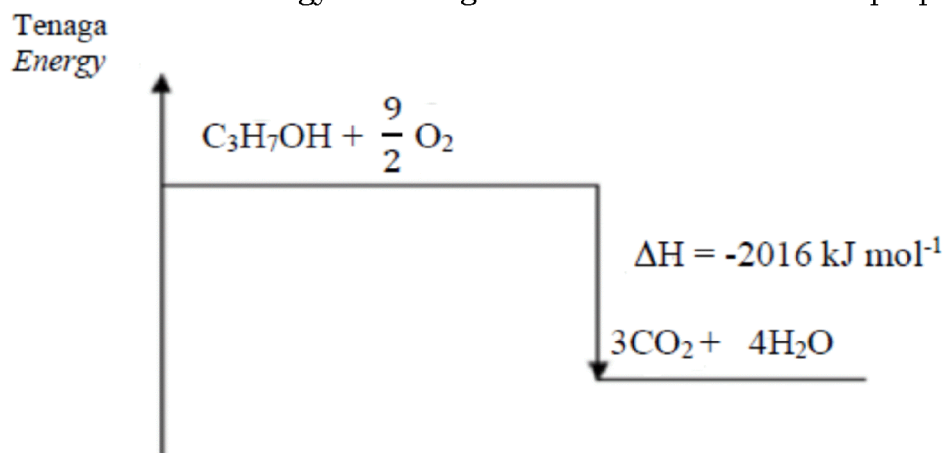
Predict the heat of neutralisation when sodium hydroxide solution is replaced by ammonia solution.

Explain your answer.

[3 markah / marks]

[Putrajaya2022-09] Rajah 9 menunjukkan gambar rajah aras tenaga bagi pembakaran propanol.

Diagram 9 shows the energy level diagram for the combustion of propanol.



Berdasarkan rajah 9,/ Based on Diagram 9,

(a) (i) Nyatakan maksud haba pembakaran bagi tindak balas di atas.

State the meaning of heat of combustion for the reaction above.

[1 markah/ mark]

(ii) Nyatakan empat maklumat yang boleh diperolehi daripada gambar rajah aras tenaga

State four information's that can be obtained from the energy level diagram.

[4 markah/ marks]

(iii) Lukiskan gambar rajah susunan radas yang berlabel bagi menentukan haba pembakaran propanol.

Draw a labelled diagram of the setup of apparatus to determine the heat of combustion of propanol.

[3 markah/ marks]

(b) (i) Haba yang terbebas daripada pembakaran lengkap 1.5 g propanol digunakan untuk memanaskan 250 cm³ air.

Hitungkan perubahan suhu dalam tindak balas ini.

[Jisim atom relatif : H= 1, C= 12, O= 16]

[Muatan haba tentu air = 4.2 J g⁻¹ °C⁻¹]

Heat energy released from the complete combustion of 1.5 g propanol is used to heat 250 cm³ of water.

Calculate the temperature change in the reaction.

[Relative atomic mass = H= 1, C= 12, O= 16]

[Heat capacity of water = 4.2 J g⁻¹ °C⁻¹]

[4 markah/ marks]

(ii) Eksperimen ini diulang dengan menggantikan propanol dengan metanol. Haba pembakaran yang diperolehi daripada eksperimen itu adalah -728 kJ mol^{-1} .

Bandingkan dan terangkan mengapa terdapat perbezaan nilai haba pembakaran antara metanol dan propanol.

The experiment is repeated by replacing propanol with methanol. Heat of combustion obtained from the experiment is -728 kJ mol^{-1} .

Compare and explain why there is a difference in value of heat of combustion between methanol and propanol.

[4 markah/ marks]

(c) Jadual 9 menunjukkan nilai haba pembakaran bagi dua jenis bahan api. Table 9 shows the values of heat of combustion for two types of fuels.

Bahan api Fuel	Haba pembakaran (kJ g^{-1}) Heat of combustion (kJ g^{-1})
Etanol Ethanol	-1380
Gas hidrogen Hydrogen gas	-286

Jadual 9
Table 9

(i) Hitungkan nilai bahan api bagi etanol dan gas hidrogen.

[Jisim molar: Gas hidrogen = 2 g mol^{-1} , Etanol = 46 g mol^{-1}]

Calculate the fuel value of ethanol and hydrogen gas.

[Molar mass: Hydrogen gas = 2 g mol^{-1} , Ethanol = 46 g mol^{-1}]

[2 markah/ marks]

(ii) Berdasarkan nilai bahan api yang diperolehi di 9 (c)(i), bahan api yang manakah yang sesuai untuk menggantikan petrol dalam kenderaan?

Wajarkan pilihan anda.

Based on the fuel value obtained in 9 (c)(i), which fuel value is the most suitable to replaced petrol in vehicles?

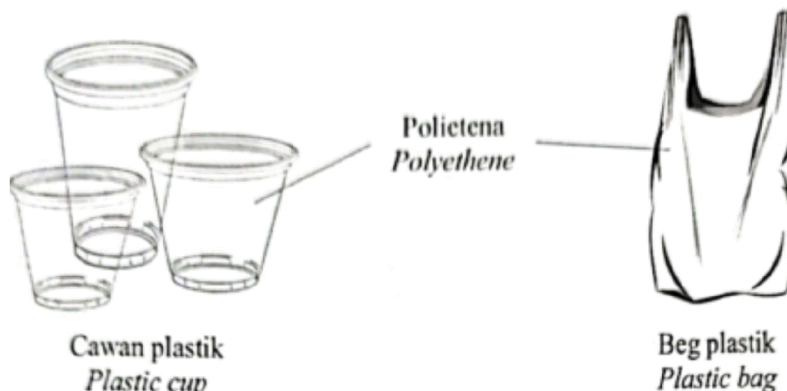
Justify your choice.

[2 markah/ marks]

Bab 4

[Negeri Sembilan 2022-01] (a) Rajah 1 menunjukkan barangan yang diperbuat daripada satu polimer sintetik.

Diagram 1 shows the products that are made from a synthetic polymer.



(i) Apakah yang dimaksudkan dengan polimer?

What is meant by polymer?

.....

.....[1M]

(ii) Nyatakan nama monomer bagi polimer dalam Rajah 1.

State the name of the monomer for the polymer in Diagram 1.

.....[1M]

(iii) lukis formula struktur bagi monomer yang dinyatakan dalam 1(a)(ii).

Draw the structural formula for the monomer stated in 1(a)(ii).

.....[1M]

(b) Nyatakan dua masalah pencemaran alam sekitar yang disebabkan oleh polimer sintetik.

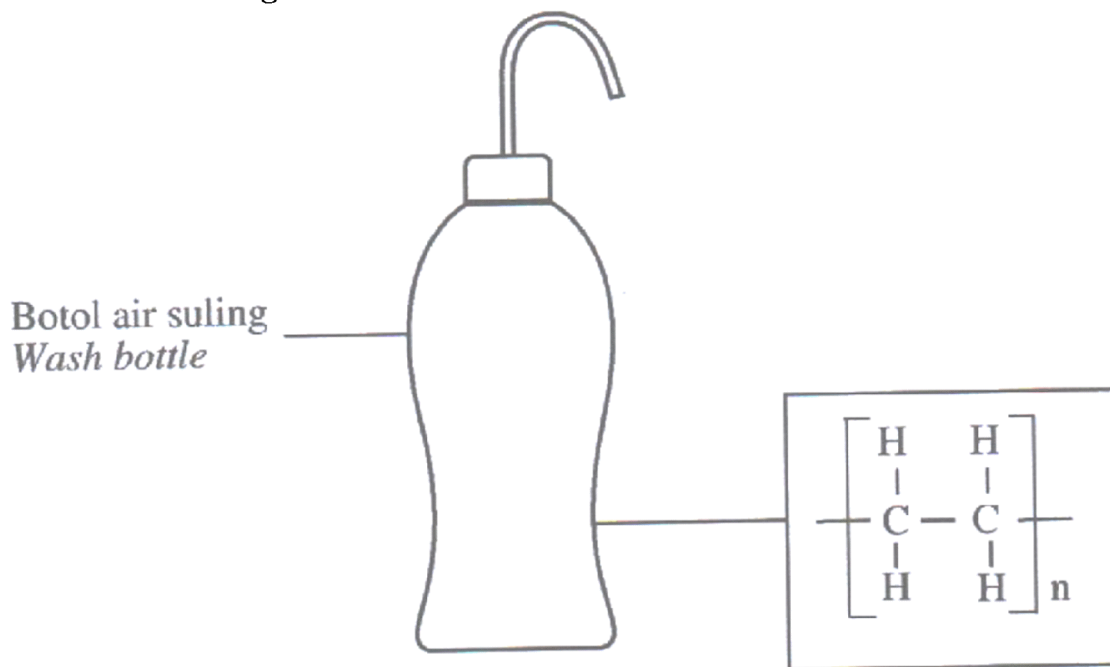
State two environmental pollution problems caused by synthetic polymer

.....

.....

.....[2M]

[SPM2021-V2-05] Botol air suling diperbuat daripada polimer X dan formula struktur bagi polimer X ditunjukkan dalam Rajah 4.1.
Wash bottle is made from polymer X and the structural formula of polymer X is shown in Diagram 4.1.



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

.....
.....[1M]

(b) Lukis formula struktur monomer bagi polimer X.
Draw the structural formula of monomer for polymer X.

[1M]

(c) Tuliskan persamaan kimia bagi pembentukan polimer dalam Rajah 4.1.
Write the chemical equation for the formation of the polymer in Diagram 4.1.

.....[2M]

(d) Pembuangan botol plastik secara tidak terkawal mengakibatkan pencemaran alam sekitar.

Cadangkan dua langkah yang boleh dilaksanakan untuk mengatasi masalah tersebut.

Uncontrolled plastic bottle disposal causes environmental pollution.

Suggest two ways that can be implemented to solve the problem.

.....

.....[2M]

(e) Rajah 4.2 menunjukkan contoh tindak balas pempolimeran penambahan dan pempolimeran kondensasi.

Diagram 4.2 shows the examples of additional polymerisation and condensation polymerisation.

Jenis pempolimeran Type of polymerisation	Contoh tindak balas Example of reaction
Penambahan Addition	$n \begin{array}{c} \text{CH}_3 \\ \\ \text{C} = \text{C} \\ \\ \text{H} \end{array} \begin{array}{c} \text{CH}_3 \\ \\ \text{C} \\ \\ \text{H} \end{array} \longrightarrow \left[\begin{array}{cc} \text{CH}_3 & \text{CH}_3 \\ & \\ -\text{C} & - & \text{C}- \\ & \\ \text{H} & \text{H} \end{array} \right]_n$
Kondensasi Condensation	$n \begin{array}{c} \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \\ & & & & & & & \\ \text{N} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{N} \\ & & & & & & & \\ \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \end{array} + n \begin{array}{c} \text{O} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{O} \\ & & & & & & & & \\ \text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & \text{C} \\ & & & & & & & & \\ \text{Cl} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{Cl} \end{array}$ $\downarrow$ $\left[\begin{array}{cccccccccccccccc} \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{O} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{O} \\ & & & & & & & & & & & & & & & & \\ -\text{N} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{N} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C}- \\ & & & & & & & & & & & & & & & & \\ \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \end{array} \right]_n + n \text{HCl}$

Banding dan bezakan kedua-dua tindak balas pempolimeran itu.

Compare and contrast both polymerisation reaction.

.....

.....[2M]

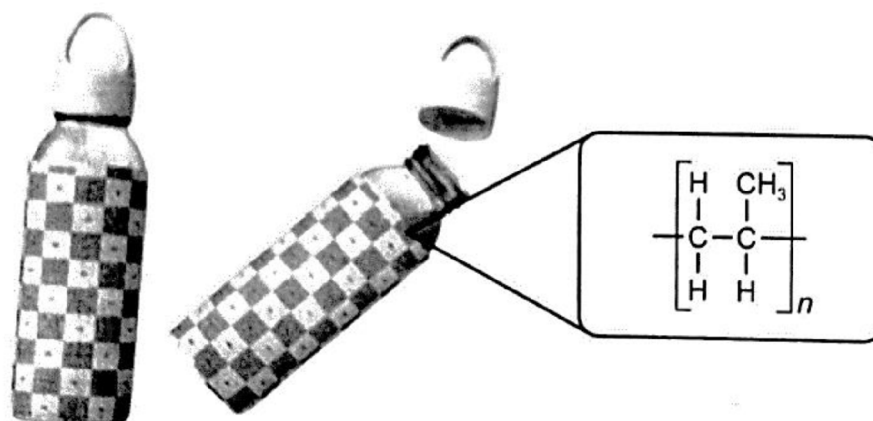
[PPinang2022-Set02-03]

3. Botol minuman biasanya diperbuat daripada sejenis polimer sintetik Z.

Rajah 3 menunjukkan formula struktur polimer Z.

Drink bottles are usually made of a type of synthetic polymer Z.

Diagram 3 shows the structural formula of polymer Z.



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

.....
[1M]

(b) Lukis dan namakan formula struktur unit asas yang membentuk polimer Z.

Draw and name the structural formula of the basic unit that forms polymer Z.

[2M]

(c) Namakan jenis pempolimeran yang menghasilkan polimer Z.

Name the type of polymerisation that produces polymer Z.

.....[1M]

(d) Sisa buangan daripada polimer Z dapat dikitar semula dengan mudah.

The waste from polymer Z can be easily recyclable.

(i) Namakan jenis polimer Z.[1M]

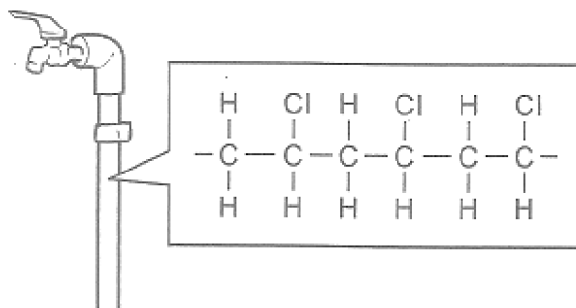
Name the type of polymer Z.

(ii) Nyatakan satu ciri polimer Z yang menjadikannya mudah dikitar semula.

State one property of polymer Z that makes it easily recyclable.

.....[1M]

[JohorPPD BatuPahat 2022-04] a) Encik Afiq ialah seorang tukang paip. Dia menggunakan paip PVC bagi menggantikan paip logam. Rajah 3 menunjukkan struktur molekul polimer polivinilklorida dalam paip PVC. Mr Afiq is a plumber. He used PVC pipes to replace metal pipes. Diagram 3 shows the molecular structure of polyvinylchloride polymer in PVC pipes.



(i) Nyatakan maksud polimer. / State the meaning of polymer.

.....
[1M]

(ii) Nyatakan nama bagi monomer PVC.[1M]
 State the name for the monomer of PVC.

(iii) Lukiskan formula struktur bagi monomer tersebut.
 Draw the structural formula of the monomer.

[1M]

b) Paip PVC atau paip logam boleh digunakan untuk membuat paip air. Nyatakan kelebihan paip PVC berbanding paip logam.
 PVC pipe or metal pipe can be used to make water pipes.
 State the advantage of PVC pipes compared to metal pipes.

.....
[1M]

c) Politen a dan polivinilklorida (PVC) ialah contoh-contoh polimer sintetik. Pembuangan dan pembakaran bahan polimer sintetik terpakai menyebabkan masalah pencemaran alam sekitar.

Apakah langkah-langkah yang boleh diambil untuk mengatasi masalah pencemaran alam sekitar yang disebabkan oleh pembuangan polimer sintetik secara tidak wajar.

Polythene and polyvinyl chloride (PVC) are examples of synthetic polymer. The disposal and burning of used synthetic polymers cause environmental pollutions. What are the steps can be taken to overcome the environmental pollutions caused by improper disposal of synthetics polymers.

.....

.....[2M]

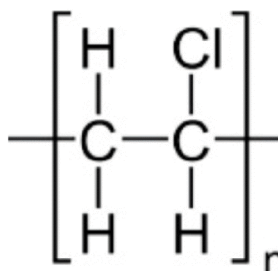
d) Berikan satu sebab mengapa polimer sintetik tidak boleh dilupuskan melalui pembakaran terbuka.

State one reason why synthetic polymer may not be disposed by open burning.

.....[1M]

[Selangor2022-Set01-05] Rajah 5.1 menunjukkan satu produk yang dihasilkan daripada polimer X dan formula strukturnya.

Diagram 5.1 shows a product made of polymer X and its structural formula.



polimer X / polymer X

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

.....

.....[1M]

(b) Lukis formula struktur bagi monomer yang membentuk polimer X.
Draw the structural formula of the monomer that forms polymer X.

[1M]

(c) Nyatakan satu cara polimer X menyebabkan pencemaran alam sekitar.
State one way polymer X causes environmental pollution.

.....[1M]

(d) Rajah 5.2 menunjukkan lateks didedahkan dalam udara untuk suatu jangka masa yang lama.
Diagram 5.2 shows latex is exposed in air for a long period of time.



(i) Apakah yang akan berlaku pada lateks? Terangkan jawapan anda.
What will happen to latex? Explain your answer.

.....
.....
.....
.....
.....[4M]

(ii) Namakan bahan kimia yang digunakan untuk mencegah proses di 5(d)(i).

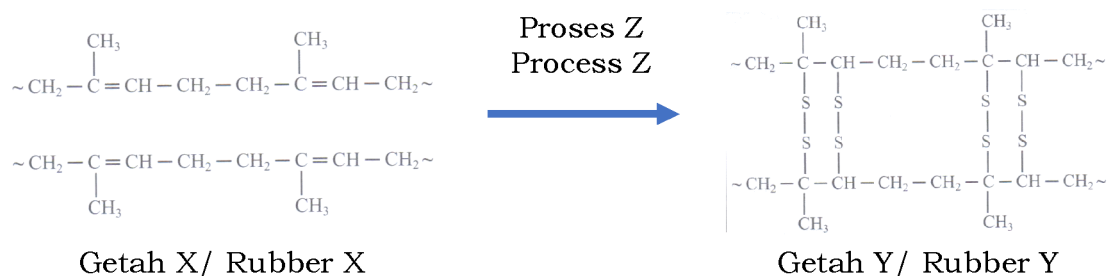
Name the chemical used to prevent the process in 5(d)(i).

.....[1M]

[Selangor2022-Set02-05] [Selangor2022-Set3-05]

5. Rajah 5.1 menunjukkan formula struktur bagi dua jenis getah yang berbeza.

Diagram 5.1 shows the structural formula of two different types of rubber.



(a) (i) Nyatakan jenis Getah X dan Getah Y.

State the types of Rubber X and Rubber Y.

X :

Y : [2M]

(ii) Getah Y dapat dihasilkan daripada Getah X melalui satu Proses Z. Namakan Proses Z dan huraikan dengan ringkas bagaimana Proses Z dijalankan.

Rubber Y can be produced from Rubber X through Process Z.

Name the Process Z and describe briefly how Process Z is carried out.

.....

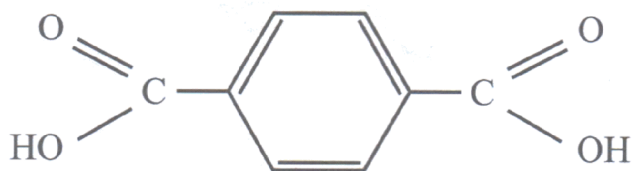
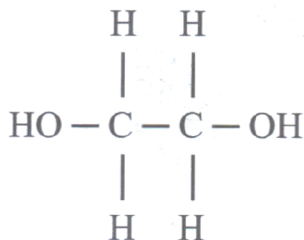
.....[2M]

(iii) Nyatakan satu perbezaan sifat bagi Getah X dan Getah Y.

State one different characteristic between Rubber X and Rubber Y.

.....[1M]

(b) Rajah 5.2 menunjukkan monomer bagi terilena.
Diagram 5.2 shows the monomers for terylene.



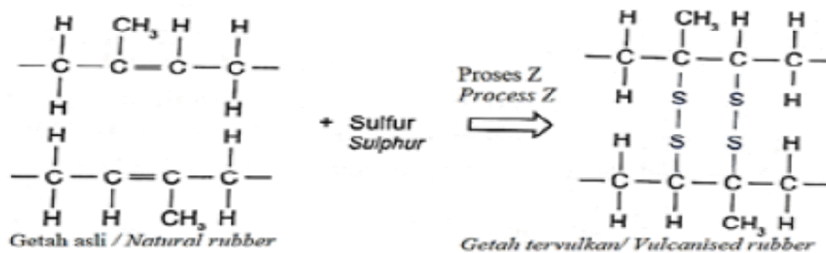
(i) Apakah jenis pempolimeran bagi terilena?
What is the type of polymerisation for terylene?

.....
.....[1M]

(ii) Lukis formula struktur bagi polimer terilena.
Draw the structural formula for terylene polymer.

[2M]

[Perak2022-Set01-07] (a) Rajah 7 menunjukkan bagaimana Proses Z menukarkan getah asli ke getah tervulkan
Diagram 7 shows how Process Z convert natural rubber into vulcanised rubber



Rajah 7 / Diagram 7

Berdasarkan Rajah 7/ Based on Diagram 7

(i) Apakah nama proses Z?[1M]
What is the name of process Z?

(ii) Terangkan bagaimana getah tervulkan dihasilkan.
Explain how vulcanised rubber is produced.

.....
.....[1M]

(iii) Getah yang manakah lebih elastik? Terangkan jawapan anda
Which rubber is more elastic? Explain your answer.

.....
.....
.....
.....[3M]

(b) Penggunaan getah sintetik yang tidak terkawal membawa kepada
masalah pencemaran alam
Uncontrolled usage of synthetic rubber leads to environmental pollution
problems.

(i) Cadangkan 2 cara untuk mengatasi masalah akibat penggunaan getah
sintetik yang berleluasa.
Suggest 2 ways to overcome the problems resulting from the widespread
usage of synthetic rubber.

.....
.....[2M]

(ii) Apakah 3 kelebihan sarung tangan yang di buat daripada getah sintetik
berbanding dengan getah asli?
What are 3 advantages of gloves made form synthetic rubber as compared to
natural rubber?

.....
.....
.....[1M]

[Putrajaya2022-06] Getah asli ialah polimer semula jadi.
Natural rubber is a natural polymer.

(a) Nyatakan dua contoh polimer semula jadi selain daripada getah asli.
State two examples of natural polymer besides natural rubber.

.....
.....[2M]

(b) Lukiskan formula struktur dan tuliskan nama IUPAC bagi monomer getah asli.
Draw the structural formula and write IUPAC name for the monomer of natural rubber.

(c) Tayar kapal terbang diperbuat daripada getah tervulkan. [2M]
The tyres of aircrafts are made from vulcanised rubber.

(i) Apakah pemvulkanan getah? /What is vulcanisation of rubber?

.....
.....[1M]

(ii) Terangkan mengapa getah tervulkan adalah lebih kenyal daripada getah tak tervulkan.
Explain why vulcanised rubber is more elastic than unvulcanised rubber.

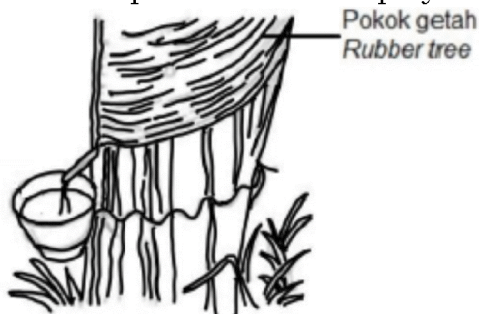
.....
.....
.....[3M]

(iii) Tuliskan satu kaedah alternatif pemvulkanan getah tanpa penggunaan sulfur.
Write one alternative method of vulcanisation of rubber without the use of sulphur.

.....[1M]

[Johor2022-SetB-03] Rajah 3.1 menunjukkan pokok mengeluarkan sejenis polimer semula jadi.

Diagram 3.1 shows a tree that produce natural polymer.



(a) (i) Nyatakan maksud polimer./ State the meaning of polymer.

.....

.....[1M]

(ii) Isoprena adalah monomer bagi getah asli. Lukis formula struktur monomer tersebut.

Isoprene is the monomer for natural rubber. Draw the structural formula for the monomer.

[1M]

(iii) Kirakan jisim molekul relatif isoprena.

Calculate relative molecular mass of isoprene.

[Jisim atom relatif: H = 1; C = 12]

[Relatif atomic mass: H = 1; C = 12]

[1M]

(b) Rajah 3.2 menunjukkan produk daripada getah asli yang telah mengalami proses X.

Diagram 3.2 shows product from natural rubber that undergoes process X.

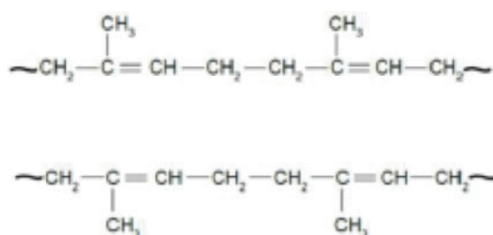


(i) Namakan proses X. / Name process X.

.....[1M]

(ii) Lukis dan label formula struktur getah yang telah menjalani proses di b(i).

Draw and label the structural formula of rubber that has undergone the process in b(i).



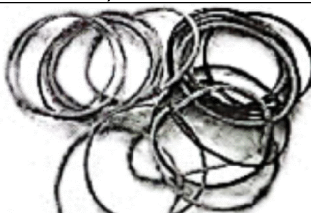
+ 4S $\Rightarrow$



[2M]

[SBP2022-02] Jadual 2 menunjukkan dua jenis produk yang diperbuat daripada dua jenis getah yang berbeza.

Table 2 shows two types of products made up from two different types of rubber.

Jenis getah/ Type of rubber	Produk/ Product
Getah tak tervulkan Unvulcanised rubber	 A
Getah tervulkan Vulcanised rubber	 B

(a) Getah adalah sejenis polimer. Apakah yang dimaksudkan dengan polimer?

Rubber is a type of polymer. What is meant by polymer?

.....
.....[1M]

(b) Nyatakan nama monomer bagi getah asli.

State the name of the monomer for natural rubber.

.....[1M]

(c) (i) Produk B lebih kuat berbanding produk A. Terangkan jawapan anda.
Product B is stronger than product A. Explain your answer.

.....[2M]

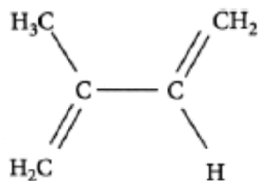
(ii) Nyatakan satu ciri lain produk B selain daripada di 2c(i).

State one other characteristic of product B other than that in 2c(i).

.....[1M]

[PPinang2022-Set01-02] (a) Rajah 2.1 menunjukkan formula struktur bagi monomer getah asli.

Diagram 2.1 shows the structural formula of the monomer of natural rubber.



(i) Berdasarkan Rajah 2.1, namakan struktur formula getah asli tersebut mengikut sistem penamaan IUPAC.

Based on the Diagram 2.1, name the structural formula of natural rubber based on the IUPAC nomenclature.

.....[1M]

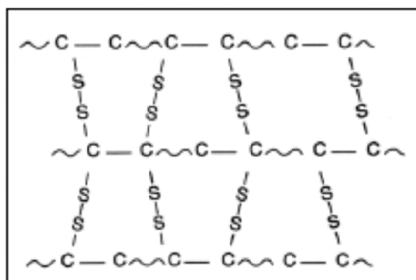
(ii) Lukiskan struktur molekul bagi getah asli.

Draw the molecular structure of natural rubber.

[1M]

(b) Rajah 2.2 menunjukkan struktur molekul getah asli selepas mengalami suatu proses untuk menambahbaik sifat-sifatnya.

Diagram 2.2 shows the molecular structure of natural rubber after undergoing a process to enhance its properties.



(i) Namakan proses yang berlaku. / Name the process that occurred.

.....[1M]

(ii) Terangkan bagaimana proses yang terlibat di (b)(i) meningkatkan sifat kekenyalan getah asli.

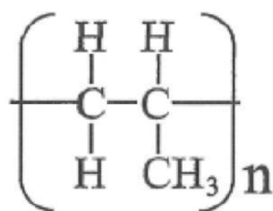
Explain how the process involved in (b)(i) improved the elasticity properties of natural rubber.

.....

.....[2M]

[MRSM2022-05] Rajah 5.1 menunjukkan formula struktur bagi satu polimer.

Diagram 5.1 shows structural formula of a polymer.



(a) Apakah yang dimaksudkan dengan polimer?

What is meant by polymer?

.....

.....[1M]

(b) Berdasarkan Rajah 5.1,

Based on Diagram 5.1,

(i) Lukiskan formula struktur monomernya.
Draw the structural formula of the monomer.

[1M]
(ii) Namakan jenis tindak balas pempolimeran dalam penghasilan polimer tersebut.
Name the type of polymerization reaction in the production of the polymer.

.....[1M]

(iii) Nyatakan satu kegunaan polimer tersebut.
State one of the uses of the polymer.

.....[1M]

(c) Rajah 5.2 menunjukkan kasut sukan yang digunakan oleh seorang pemain badminton.
Diagram 5.2 shows sport shoes used by a badminton player.



(i) Getah asli dan getah sintetik boleh digunakan sebagai bahan pembuatan tapak kasut sukan. Pilih jenis getah yang boleh digunakan sebagai bahan pembuatan tapak kasut sukan dan wajarkan pilihan anda.
Natural rubber and synthetic rubber can be used as the materials for the sport shoe sole. Choose the type of rubber that can be used as the material and justify your choice.

.....
.....
.....
.....[3M]

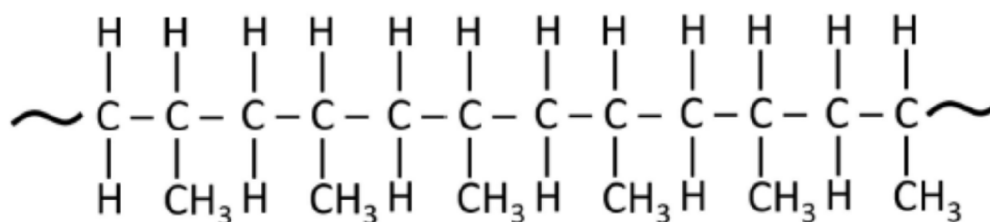
(ii) Pembuangan getah sintetik yang tidak terkawal boleh menyebabkan masalah pencemaran alam sekitar. Cadangkan satu cara untuk mengatasi isu ini.

Uncontrolled disposal of synthetic rubber leads to an environmental pollution. Suggest one way to overcome this issue.

.....[1M]

[Kelantan2022-04] (a) Rajah 3 menunjukkan sebahagian formula struktur bagi polimer X.

Diagram 3 shows part of the structural formula for polymer X.



Berdasarkan Rajah 3/ Based on Diagram 3

(i) Kenal pasti polimer X.....[1M]

Identify the polymer X

(ii) Tuliskan persamaan kimia bagi menghasilkan polimer X

Write the chemical equation to produce polymer X.

.....[2M]

(b) Jadual 2 menunjukkan sifat bagi dua jenis getah Y dan Z.

Table 2 shows the properties of two type of rubber Y and Z.

Jenis getah Type of rubber	Sifat Properties
Y	• Kekuatan adalah tinggi/ More strength • Lebih tahan terhadap pengoksidaan More resistant towards oxidation • Setelah diregangkan, getah Y dapat kembali semula kepada bentuk asal After stretched, rubber Y able to get back to its original position
Z	• Kekuatan adalah rendah/ Low strength • Lebih mudah teroksida/ Easier to be oxidised • Setelah diregangkan, getah Z lebih panjang daripada panjang asal After stretched, rubber Z is longer than its original position

Berdasarkan Jadual 2/ Based on Table 2

(i) Kenal pasti getah Y dan getah Z. Identify rubber Y and Z.

.....
[2M]

(ii) Bandingkan kekenyalan getah Y dan getah Z. Terangkan jawapan anda.
 Compare the elasticity of rubber Y and Z. Explain your answer

.....

[2M]

[JUJ2022-Set02-02] (a) Lateks merupakan cecair berwarna putih yang diperoleh daripada pokok getah apabila kulit pokok getah ditoreh. Ianya merupakan polimer semula jadi yang berkembang menjadi komoditi penting negara sehingga kini.

Latex is a white fluid obtained from the rubber trees when the tree bark is tapped. It is a natural polymer that has grown to become an important commodity of the country until now.

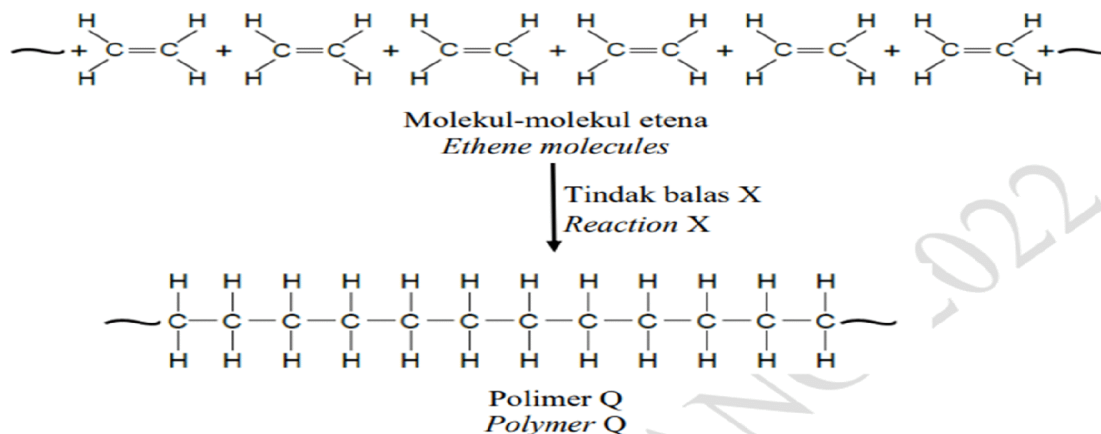
(i) Apakah yang dimaksudkan dengan polimer?/ What is meant by polymer?

.....
[1M]

(ii) Nyatakan nama lain bagi lateks.[1M]
 State the other name for latex.

(b) Rajah 2 menunjukkan tindak balas yang berlaku terhadap molekul-molekul etena.

Diagram 2 shows a reaction that occurs on the ethene molecules.



(i) Namakan polimer Q.[1M]
Name polymer Q.

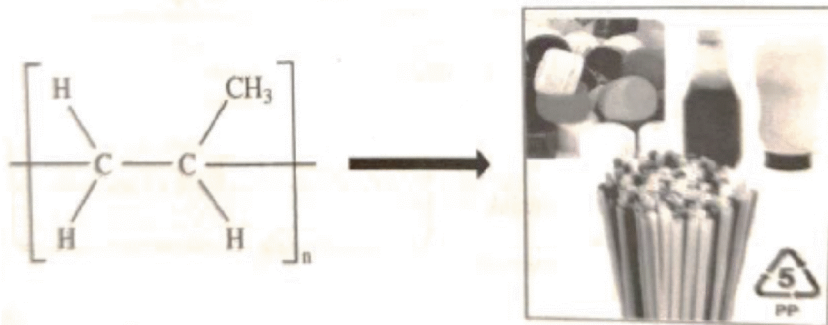
(ii) Namakan tindak balas X.[1M]
Name reaction X.

(iii) Tuliskan persamaan kimia bagi tindak balas X.
Write a chemical equation for reaction X.

.....[1M]

[JohorPPD Tangkak 2022-02] Rajah 2 menunjukkan formula struktur bagi polipropena, iaitu polimer yang digunakan dalam beberapa jenis barangan plastik.

Diagram 2 shows the structural formula of polypropene, a polymer used in some type of plastic products



(a) Lukis dan namakan monomer bagi polipropena.
Draw and name the monomer of polypropene

[2M]

(b) Nama tindak balas pempolimeran yang menghasilkan polipropena?
Name the type of polymerisation reaction that produces polypropene?

.....[1M]

(c) Salah satu kegunaan polipropena adalah dalam bidang tekstil. Nyatakan dua pencapaian bidang tekstil yang dapat dicapai dalam bidang teknologi nano?

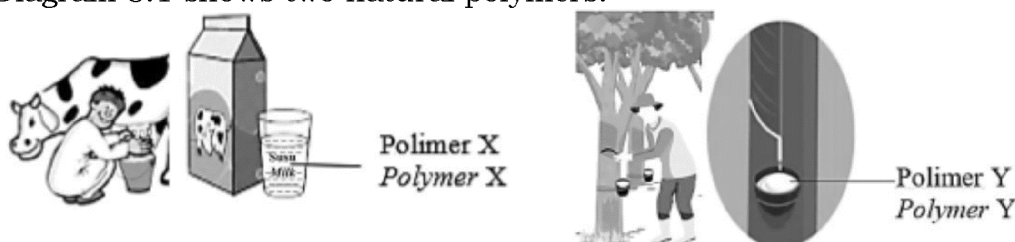
One of the uses of polypropylene is in the textiles industry. State two achievement of nano technology in textile industry?

.....
.....[2M]

Esei

[Perlis2022-09] Rajah 8.1 menunjukkan dua polimer semula jadi.

Diagram 8.1 shows two natural polymers.



(a) (i) Nyatakan maksud polimer.

State the meaning of polymer.

[1 markah] [1 mark]

(ii) Nyatakan monomer bagi polimer X dan polimer Y.

State the monomer for polymer X and polymer Y.

[2 markah] [2 marks]

(iii) Proses pempolimeran antara monomer dalam polimer X menghasilkan polimer X dan air. Nyatakan jenis pempolimeran yang terlibat.

Polymerisation process between monomers in polymer X produces polymer X and water. State the type of polymerisation involved.

[1 markah][1 mark]

b) Rajah 8.2 menunjukkan maklumat bagi dua jenis pinggan.
Diagram 8.2 shows information for two types of plates.

Pinggan A Plates A	Pinggan B Plates B
	
- diperbuat dari kanji jagung, tepung gandum, tepung kacang soya dan air. made from corn starch, wheat flour, soybean flour and water. - terbiodegradasi. biodegradable.	- diperbuat dari polimer termoset. made from thermoset polymer. - tak terbiodegradasi. non-biodegradable.

(i) Pilih pinggan yang boleh menyebabkan pencemaran alam sekitar.
Terangkan jawapan anda.

Choose the plate that can cause environmental pollution. Explain your answer.

[3 markah][3 marks]

(ii) Polimer sintetik digunakan secara meluas dalam kehidupan seharian.
Pada pendapat anda, nyatakan tiga ciri barangan plastik yang menggalakkan penggunaan yang sangat meluas.

Synthetic polymers are widely used in our daily lives.

In your opinion, state three characteristics of plastics that encourage their wide usage.

[3 markah][3 marks]

(c) Lateks dikumpulkan dalam bentuk cecair untuk diproses atau boleh dibiarkan menggumpal dan dipungut sehari selepas penorehan.

Lukiskan gambar rajah berlabel zarah getah dan terangkan bagaimana lateks menggumpal apabila asid ditambah.

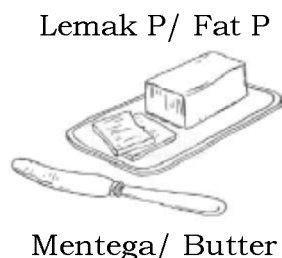
Latex is collected in liquid form for processing or it can be left to coagulate and to be collected a day after it was tapped.

Draw a labelled diagram of rubber particles and explain how latex clumps when acid is added to it.

[10 markah][10 marks]

Bab 5

[Johor2022-SetB-04] Rajah 4.1 menunjukkan dua contoh lemak.
Diagram 4.1 shows two examples of fats.



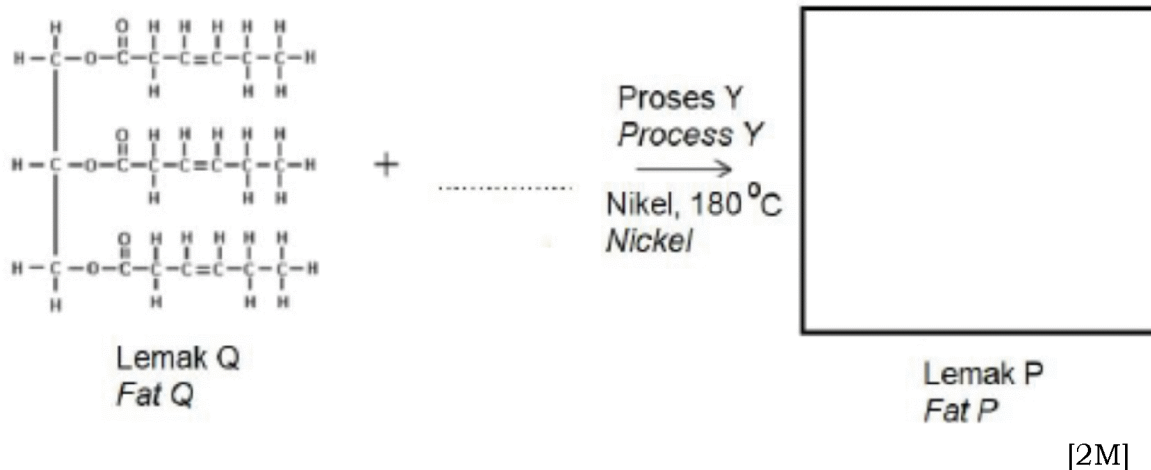
(a) (i) Nyatakan maksud lemak tak tepu.
State the meaning of unsaturated fat.

.....
.....[1M]

(b) Lemak Q boleh ditukar kepada lemak P melalui proses Y.
Fat Q can be changed to fat P through process Y.

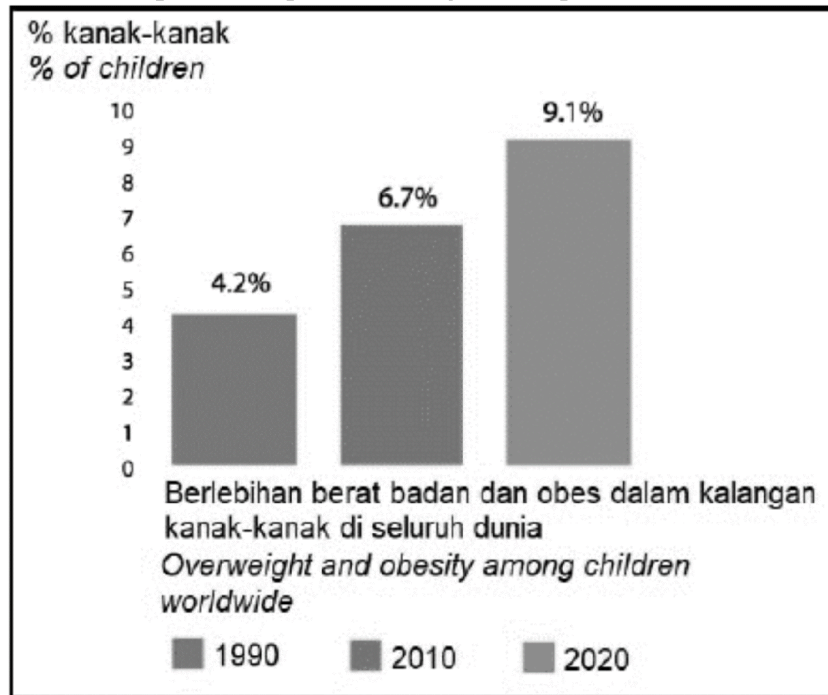
(i) Namakan proses Y.[1M]
Name the process Y.

(ii) Lengkapkan persamaan struktur berikut.
Complete the following structural equation.



(c) Rajah 4.2 menunjukkan peratus obesiti dalam kalangan kanak-kanak di seluruh dunia.

Diagram 4.2 shows percentage of obesity among children worldwide.



Pada pandangan anda, nyatakan peratus kanak-kanak yang mungkin mengalami berlebihan berat badan dan obesiti pada tahun 2030.

Cadangkan dua langkah untuk mengatasi masalah itu.

In your opinion, state the percentage of children that might experience overweight and obesity in year 2030. Suggest two ways to overcome the problem.

.....

[3M]

[Kelantan2022-05] Rajah 4 menunjukkan dua bahan utama yang digunakan dalam pembuatan sabun.

Figure 4 shows the two main ingredients used in soap making.



(a) (i) Namakan proses pembuatan sabun.....[1M]
Name the soap making process

(iii) Cadangkan satu bahan lain yang boleh menggantikan larutan natrium hidroksida pekat.

Suggest other substance that can be used to replace concentrated sodium hydroxide solution.

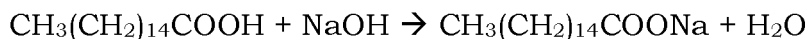
.....[1M]

(b)(i) Asid palmitik dari minyak sawit dicampurkan dengan larutan natrium hidroksida pekat untuk menghasilkan sabun X, $\text{CH}_3(\text{CH}_2)_{14}\text{COONa}$.

Persamaan berikut mewakili tindak balas yang berlaku.

Palmitic acid from palm oil is mixed with concentrated sodium hydroxide solution to produce soap X, $\text{CH}_3(\text{CH}_2)_{14}\text{COONa}$.

The following equation represents the reaction that occurs.



Sekiranya 0.2 mol asid palmitik digunakan dalam tindak balas ini.

Hitungkan jisim sabun yang terhasil

If 0.2 moles of palmitic acid were used in this reaction.

Calculate the mass of soap is produced

[Jisim molar/Molar mass of $\text{CH}_3(\text{CH}_2)_{14}\text{COONa} = 278 \text{ g mol}^{-1}$]

[2M]

(ii) Namakan sabun X.....[1M]

Name the soap X

(c) Semasa menyertai perkhemahan di pantai, Rafiq mendapati bajunya kotor kerana tertumpah kuah kari semasa makan tengah hari. Rafiq cuba mencuci bajunya dengan sabun di pantai tersebut. Adakah kesan kotoran pada baju Rafiq boleh dibersihkan? Terangkan jawapan anda.

While participating in the camping on the beach, Rafiq found his shirt dirty because he spilled curry sauce during lunch. Rafiq tried to wash his clothes with soap on the beach. Can the stains on Rafiq's shirt be cleaned? Explain your answer.

.....

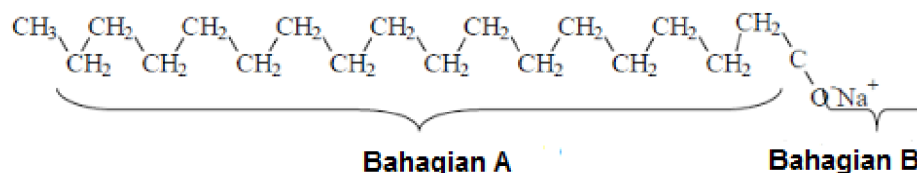
.....

.....[3M]

[JohorPPD BatuPahat 2022-07]

Rajah 6 menunjukkan formula struktur bagi suatu sabun.

Diagram 6 shows the structural of a soap.



(a) (i) Nyatakan nama bagi tindak balas yang digunakan dalam penyediaan sabun.

State the name of the reaction used in the preparation of soap.

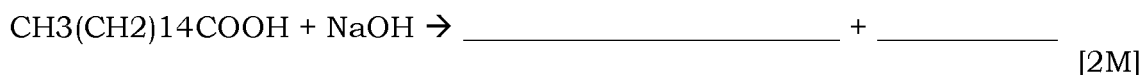
.....[1M]

(ii) Berdasarkan Rajah 6 di atas, nyatakan bahagian yang larut dalam minyak dan gris.

Based on diagram 6 above, state part that is soluble in oil and grease.

.....[1M]

(iii) Semasa penyediaan sabun, minyak sawit dihidrolisiskan kepada asid palmitik dan gliserol. Kemudian, asid palmitik bertindak balas dengan natrium hidroksida seperti ditunjukkan dalam persamaan di bawah. Lengkapkan persamaan kimia untuk menunjukkan pembentukan sabun. During preparation of soap, palm oil is hydrolysed to palmitic acid and glycerol. Then, palmitic acid reacts with sodium hydroxide as shown in equation below. Complete the chemical equation to show the formation of soap.



(iv) Nyatakan bahan yang boleh digunakan untuk menggantikan natrium hidroksida dan minyak sawit dalam penyediaan sabun di makmal. State the materials that can be used to replace sodium hydroxide and palm oil in the preparation of soap in a laboratory.

Cadangan bahan untuk;/ Suggestion materials for;

Menggantikan natrium hidroksida dengan:

Replace sodium hydroxide with:

.....[1M]

Menggantikan minyak kelapa sawit dengan:

Replace palm oil with

.....[1M]

b) Jadual 2 menunjukkan dua set eksperimen untuk membandingkan keberkesanan tindakan pencucian sabun dan detergen dalam air liat. Table 2 shows two sets of experiment to compare the effectiveness for the cleansing action of soap and detergent in hard water.

Set	Bahan/ Material
I	50 cm ³ larutan sabun + 20 cm ³ air liat + kain bertompok minyak <i>50 cm³ of soap solution + 20 cm³ of hard water + cloth with oil stain</i>
II	50 cm ³ larutan detergen + 20 cm ³ air liat + kain bertompok minyak <i>50 cm³ of detergent solution + 20 cm³ of hard water + cloth with oil stain</i>

Nyatakan pemerhatian bagi Set 1 dan Set II.

State the observation of Set I and Set II.

Set I :

Set II : [2M]

c) Mary mencuci kain yang berminyak dengan sabun di dalam air berasid. Bolehkah kotoran berminyak itu ditanggalkan? Berikan sebab anda.

Mary washed the oily stain with soap in acidic water. Can the oily stain be removed? Give your reason.

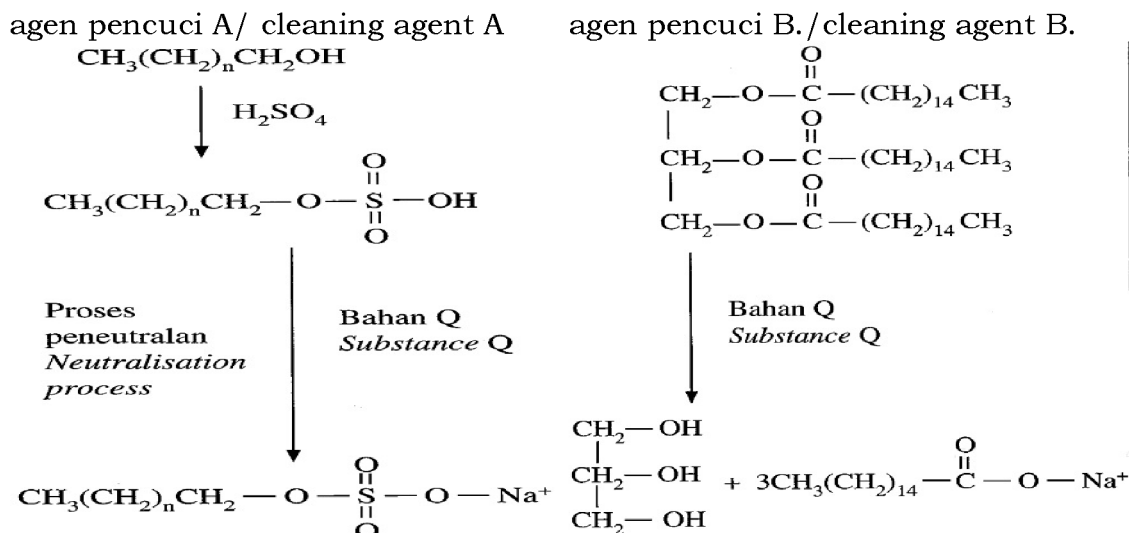
.....

.....

.....[2M]

[SPM2021-V1-07] (a) Jadual 4 menunjukkan persamaan kimia bagi penyediaan agen pencuci A dan agen pencuci B.

Table 4 shows the chemical equation in the preparation of cleaning agent A and cleaning agent B.



(i) Apakah maksud sabun?/ What is the meaning of soap?

.....
.....[1M]

(ii) Nyatakan nama bagi bahan Q.[1M]
State the name of substance Q.

(iii) Ahmad telah menyertai satu perkhemahan di pantai Tanjung Bidara. Bajunya diselaputi lumpur dan dia telah mencuci bajunya dengan sejenis pencuci. Didapati kesan lumpur pada bajunya masih ada. Cadangkan agen pencuci A atau agen pencuci B yang sesuai untuk digunakan bagi menghilangkan kotoran tersebut. Berikan alasan anda. Ahmad participated a camping at a beach in Tanjung Bidara. His shirt was stained with mud and he washed his shirt with a type of cleaning agent. It was found that the mud stain on his shirt remained. Suggest cleaning agent A or cleaning agent B which is more suitable to be used to remove the stain. Give your reasons.

.....
.....
.....
.....[3M]

(b) (i) En. M merupakan seorang pesakit yang mengalami gangguan pemikiran seperti mendengar suara dan melihat sesuatu yang tidak nyata. Cadangkan satu jenis ubat moden berserta dengan contohnya bagi merawat masalah kesihatan En. M. Bagaimana ubat tersebut dapat meredakan masalah yang dialaminya?

Mr. M is a patient who suffers from thought disorder such as hearing voices and seeing things that are not real.

Suggest one type of modern medicine and its example to treat Mr. M's health problem. How the medicine can reduce the problem that he faced?

.....
.....
.....
.....[3M]

(ii) Batuk dapat dikurangkan dengan menggunakan ubat tradisional iaitu jus asam jawa atau menggunakan ubat moden iaitu kodeina.

Wajarkan penggunaan dua jenis ubat itu.

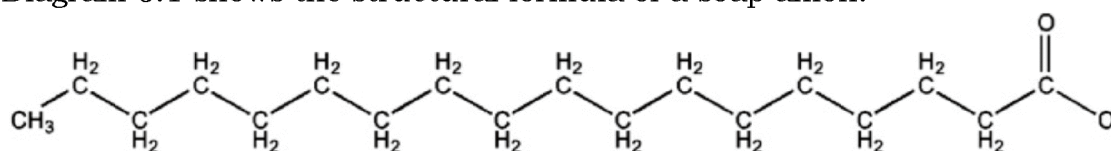
Cough can be reduced by using traditional remedies such as tamarind juice or modern medicine such as codeine.

Justify the uses of these two medicines.

.....
[2M]

[Selangor2022-Set01-06] (a) Rajah 6.1 menunjukkan formula struktur satu anion sabun.

Diagram 6.1 shows the structural formula of a soap anion.



Rajah 6.1 / Diagram 6.1

(i) Bulatkan pada bahagian anion sabun yang larut dalam air pada Rajah 6.1.

Circle the part of the soap anion that is soluble in water on Diagram 6.1.

[1M]

(ii) Sabun tidak berkesan sebagai agen pembersih dalam air liat. Terangkan.

Soap is not effective as a cleaning agent in hard water. Explain.

.....
[2M]

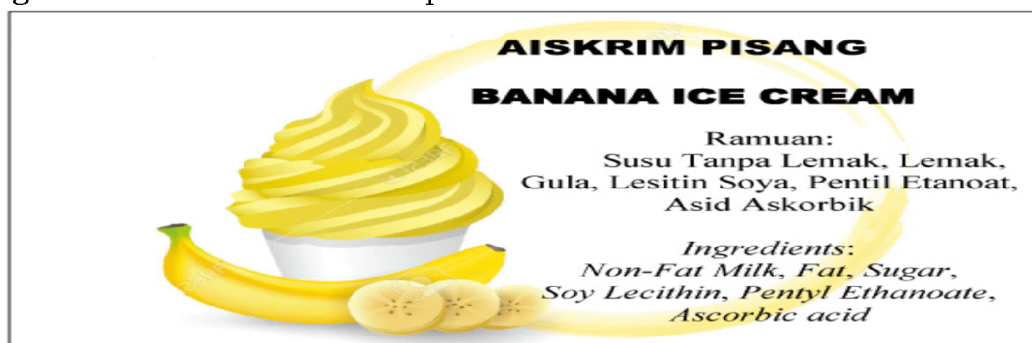
(iii) Sabun boleh membentuk buih dengan air. Apakah fungsi buih?

Soap can form foam with water. What is the function of foam?

.....[1M]

(b) Rajah 6.2 menunjukkan label satu bungkusan makanan.

Diagram 6.2 shows a label of a pack of food.



Berdasarkan maklumat tersebut,/ Based on the information,

(i) namakan sebatian yang digunakan sebagai penstabil.

Name the compound which is used as a stabiliser.

.....[1M]

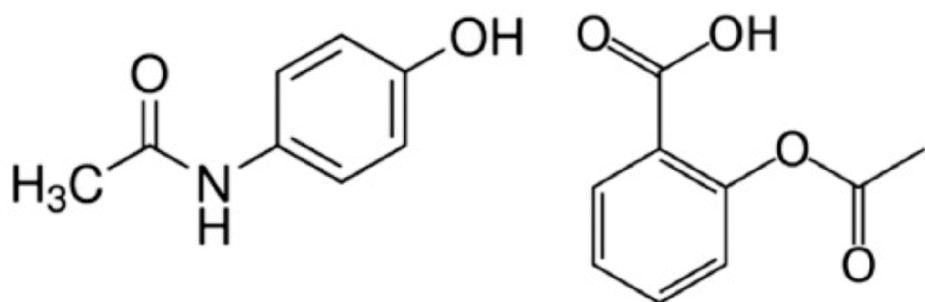
(ii) apakah yang akan berlaku kepada aiskrim apabila sebatian dalam 6(b)(i) tidak ditambahkan?

what will happen to ice cream when the compound in 6(b)(i) is not added?

.....[1M]

(c) Rajah 6.3 menunjukkan formula struktur bagi dua contoh analgesik.

Diagram 6.3 shows the structural formulae of two examples of analgesic.



Parasetamol/ Paracetamol

Aspirin/ Aspirin

(i) Seorang pesakit yang menghidapi demam memaklumkan kepada doktor bahawa beliau juga menghidapi gastrik.

Berdasarkan Rajah 6.3, jika anda adalah doktor tersebut, ubat manakah yang akan anda preskripsikan? Terangkan jawapan anda.

A patient who is suffering from fever informs the doctor that she also has gastric. Based on Diagram 6.3, if you are the doctor, which medicine will you prescribe? Explain your answer.

.....

.....[2M]

(ii) Ada kalanya doktor juga preskripsikan streptomisin kepada pesakit ini.

Pesakit perlu menghabiskan ubat tersebut seperti yang telah dipreskripsikan oleh doktor.

Jelaskan mengapa.

Sometimes the doctor also prescribes this patient with streptomycin. The patient has to finish up the medicine accordingly to the prescription.

Explain why.

.....[1M]

[PPinang2022-Set01-07] (a) Jadual 7.1 menunjukkan maklumat mengenai tiga bahan tambah makanan yang berlainan P, Q dan R.

Table 7.1 shows information of three different food additives, P, Q and R.

Bahan tambah makanan Food additive	Maklumat Information
P	Ditambah kepada minuman ringan berkalori rendah supaya ia menjadi manis dan untuk kegunaan pesakit diabetes. Added to a low-calories soft drinks to sweeten it and for the consumption of diabetic patients.
Q	Ditambah kepada daging segar supaya ia tahan lama dan kelihatan segar. Added to fresh meat to preserve it and to make it looks fresh.
R	Ditambah kepada cili jeruk atau jeruk mangga Added to pickled chili or mango pickles

(i) Cadangkan nama bagi bahan tambah makanan P, Q dan R.

Suggest the name for food additives P, Q and R.

P:

Q:

R: [3M]

(ii) Nyatakan kebaikan dan keburukan terhadap kegunaan bahan tambah makanan dalam kehidupan seharian.

State the advantage and disadvantage about the uses of food additives in daily life.

.....

.....

.....[2M]

(iii) Mengapakah bahan R ditambah kepada cili jeruk atau jeruk mangga?
Why is substance R added to chilli pickles or mango pickles?

.....[1M]

(iv) Bahan tambah makanan R adalah sejenis asid lemah.

Huraikan satu ujian kimia untuk mengesahkannya.

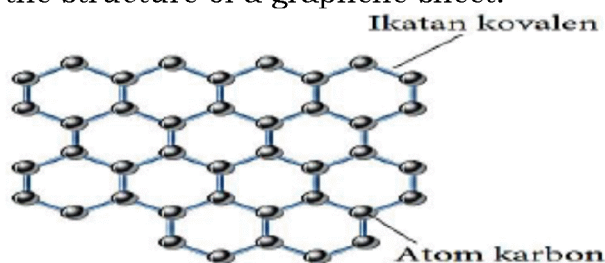
Food additives R is a weak acid. Describe the chemical test to confirm it.

.....

.....

.....[2M]

(b) Rajah 7.2 menunjukkan struktur bagi helaian grafen
Figure 7.2 shows the structure of a graphene sheet.



(i) Grafen merupakan salah satu alotrop bagi karbon dan merupakan alotrop karbon yang paling reaktif. Namakan satu alotrop yang lain bagi karbon.

Graphene is one of the carbon allotropes and is the most reactive carbon allotrope. Name one other allotrope of carbon.

.....[1M]

(ii) Nyatakan one sifat fizik grafen.

State one physical properties of graphene.

.....[1M]

[Pahang PPD Jerantut 2022-07] (a) Rajah 5.1 menunjukkan kandungan pada label sebotol sos cili dan ais krim.

Figure 5.1 shows the ingredients on a label of a bottle of chilli sauce and an ice-cream.

Cili, gula, garam, tepung jagung, pewarna tiruan dan natrium benzoat.

Chili, sugar, salt, cornflour, artificial colouring and sodium benzoate.

Susu, propil etanoat, gula, pewarna tiruan, bahan tambah makanan R.

Milk, propyl ethanoate, sugar, artificial colouring, food additive R.

(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: _____

[2M]

(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 menggantikan pewarna sintetik? Apakah kebaikan menggunakan bahan tersebut?

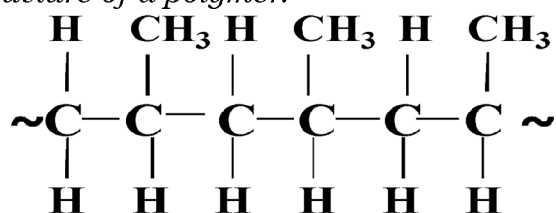
Puan Azwa wants to prepare a desert without using synthetic dyes. Suggest an ingredient should Puan Azwa add into the desert without using synthetic dye? What is the benefit of using this ingredient?

.....

.....[2M]

(b) Rajah 5.2 menunjukkan struktur sejenis polimer.

Figure 5.2 shows the structure of a polymer.



(i) Lukis dan namakan monomer yang terlibat.

Draw and name the monomers involved.

[2M]

(ii) Polimer sintetik lebih kuat dan tahan lama berbanding polimer semula jadi.

Wajarkan penggunaan polimer sintetik dalam kehidupan seharian.

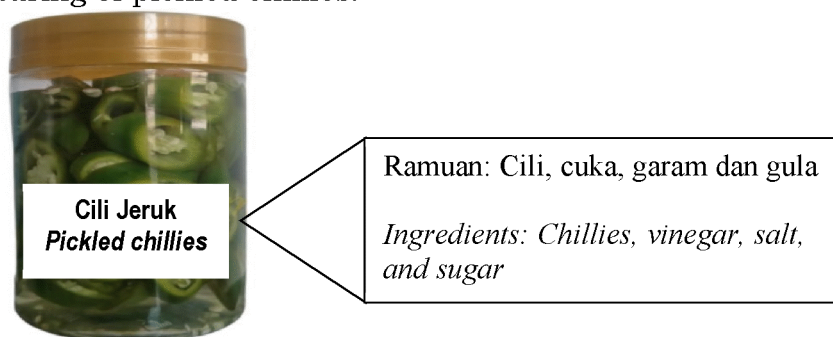
Synthetic polymers are stronger and more durable compared to natural polymers. Justify the use of synthetic polymers in our daily lives.

.....

.....[2M]

[Pahang2022-04] Rajah 4.1 menunjukkan ramuan yang mengandungi bahan tambah makanan dalam pembuatan cili jeruk.

Diagram 4.1 shows the ingredients containing food additives in manufacturing of pickled chillies.



(a) Berdasarkan Rajah 4.1,/ Based on Diagram 4.1,

(i) Namakan jenis bahan tambah makanan dalam cili jeruk.

Name the types of food additive in pickled chillies.

.....[1M]

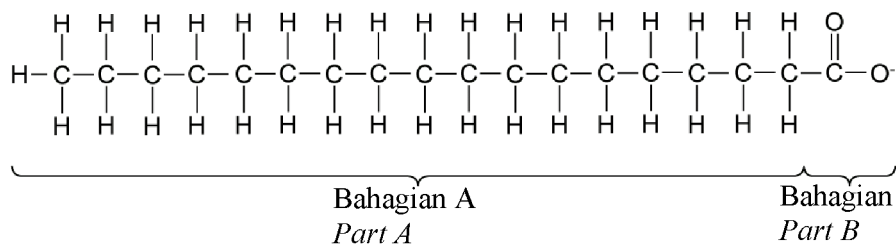
(ii) Mengapakah jenis bahan tambah makanan di 4(a)(i) ditambahkan pada cili jeruk. Berikan satu sebab.

Why the types of food additives in 4(a)(i) is added to the pickled chillies? Give a reason.

.....[1M]

(b) Rajah 4.2 menunjukkan formula struktur bagi anion sabun. Sabun boleh disediakan daripada sumber semula jadi melalui proses hidrolisis minyak atau lemak oleh alkali.

Diagram 4.2 shows the structural formula of soap anion. Soap can be prepared from natural sources through the process of hydrolysis of oil or fat by alkalis.



(i) Namakan proses untuk menghasilkan sabun.

Name the process to produce soap.

.....[1M]

(ii) Berdasarkan Rajah 4.2, kenal pasti bahagian yang larut dalam air.

Based on Figure 4.2, identify the part that dissolves in water.

.....[1M]

(c) Maziah menggunakan krim pemutih jenama Y yang dibeli secara atas talian. Selepas seminggu, kulit Maziah semakin cerah namun merengsa dan mengelupas. Maziah mengambil tindakan untuk menyemak kandungan bahan krim pemutih tersebut dalam laman web Bahagian Regulatori Farmasi Negara. Dia mendapati krim pemutih tersebut telah ditarik balik dari pasaran kerana mengandungi bahan kimia terlarang Z.

Maziah uses brand Y whitening cream bought online. After a week, Maziah's skin is brighter but irritated and peeled. Maziah took action to check the ingredient content of the whitening cream in the National Pharmaceutical Regulatory Agency website. She found that the whitening cream had been withdrawn from the market because it contained harmful chemical Z.

(i) Cadangkan nama bahan kimia terlarang Z.

Suggest the name of harmful chemical Z.

.....[1M]

(ii) Terangkan kesan yang akan dialami oleh Maziah sekiranya dia terus menggunakan krim pemutih yang mengandungi bahan kimia terlarang Z dalam jangka masa yang panjang.

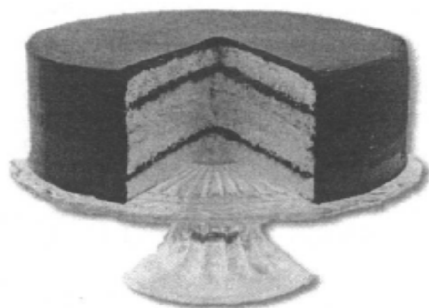
Explain the effects Maziah will experience if she continues to use whitening cream containing harmful chemical Z in a long period of time.

.....

.....[2M]

[MRSM2022-01] Rajah 1 menunjukkan ramuan bagi sebiji kek.

Diagram 1 shows the ingredients of a cake.



Ramuan:

Tepung Gandum, Lemak Tepu, Asid Sitrik, Sirap Jagung, Karamel, Lesitin, Telur, Marjerin.

Ingredients:

Wheat Flour, Saturated Fat, Citric Acid, Corn Syrup, Caramel, Lecithin, Egg, Margarine.

(a) Lemak ialah salah satu bahan yang terdapat dalam kek. Nyatakan keadaan fizikal lemak pada suhu bilik.

One of the ingredients in the cake is fats.

State the physical state of fats at room temperature.

.....[1M]

(b) Lemak tak tepu boleh ditukarkan kepada lemak tepu melalui suatu tindak balas. Namakan tindak balas tersebut.

Unsaturated fats can be converted to saturated fats through a reaction.

Name the reaction.

.....[1M]

(c) Asid sitrik digunakan secara meluas dalam makanan berminyak seperti kek dan biskut.

Nyatakan jenis bahan tambah makanan dan fungsi asid sitrik tersebut.

Citric acid is commonly used in oily food such as cakes and biscuits.

State the type of food additives and the function of the citric acid.

.....

.....[2M]

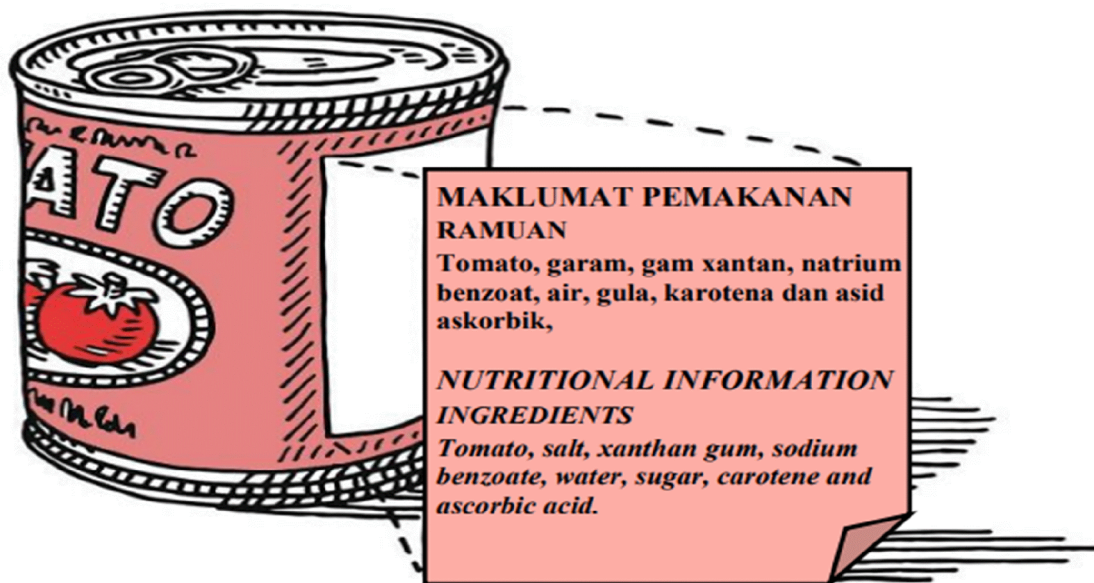
(d) Nyatakan satu contoh lain bahan tambah makanan yang terdapat dalam kek.

State another example of food additives in the cake.

.....[1M]

[JUU2022-Set01-01] Rajah 1 menunjukkan maklumat ramuan pemakanan pada label tin puri tomato.

Diagram 1 shows nutritional ingredients information on the label of the tomato puree can.



Berdasarkan maklumat ramuan pemakanan di dalam Rajah 1, terdapat beberapa bahan tambah makanan yang ditambahkan ke dalam puri tomato seperti gam xantan dan natrium benzoat.

Based on the nutritional ingredient information in Diagram 1, there are several food additives added to the tomato puree such as xanthan gum and sodium benzoate.

(a) Apakah maksud bahan tambah makanan?

What is meant by food additives?

.....

.....[1M]

(b) Berikan satu bahan tambah makanan selain natrium benzoat dan gam xantan yang ditambah di dalam puri tomato di atas.

Give one food additive other than sodium benzoate and xanthan gum that added in the tomato puree above.

.....[1M]

(c) Apakah fungsi gam xantan di dalam puri tomato?

What is the function of xanthan gum in tomato puree?

.....[1M]

(d) Terangkan bagaimana natrium benzoat dapat menjadikan puri tomato tahan lebih lama.

Explain how sodium benzoate can make the tomato puree last longer.

.....
.....[2M]

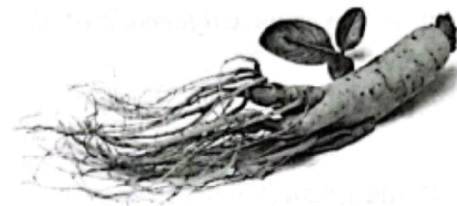
[SBP2022-04] (a) Rajah 4 menunjukkan satu pernyataan berkaitan bawang putih dan ginseng yang boleh digunakan sebagai ubat tradisional.
Diagram 4 shows a statement related to garlic and ginseng that can be used as traditional medicine.

“Kajian saintifik telah mendapati bahawa bawang putih boleh digunakan sebagai satu rawatan yang berkesan melawan bakteria dan ginseng boleh digunakan bagi membina pertahanan badan terhadap jangkitan”

“Scientific study has found that garlic can be used as an effective treatment against bacteria and ginseng can be used to build immunity against infection”



bawang putih
garlic



ginseng
ginseng

Berdasarkan Rajah 4,/ Based on Diagram 4,

(i) bagaimanakah cara bawang putih atau ginseng digunakan untuk merawat penyakit?

how garlic or ginseng is used to treat illness?

.....[1M]

(ii) berikan dua kelebihan menggunakan ubat-ubat yang dinyatakan dalam Rajah 4.

give two advantages of using the medicines stated in Diagram 4.

.....
.....
.....
.....[2M]

(b) Ali adalah seorang pesakit gastrik dan dia sedang mengalami sakit kepala. Bagi meredakan sakit kepalanya, Ali telah mengambil aspirin. Malangnya, dia mengalami kesakitan dalam perut.

Ali is a gastric patient and he is having headache. In order to relieve his headache, he took aspirin. Unfortunately, he got pain in his stomach.

(i) Terangkan mengapa beliau mengalami keadaan sedemikian.
Explain why he experiences that situation.

.....
.....
.....[2M]

(ii) Cadangkan nama ubat yang boleh menggantikan aspirin.
Suggest the name of the medicine that can replace aspirin.

.....[1M]

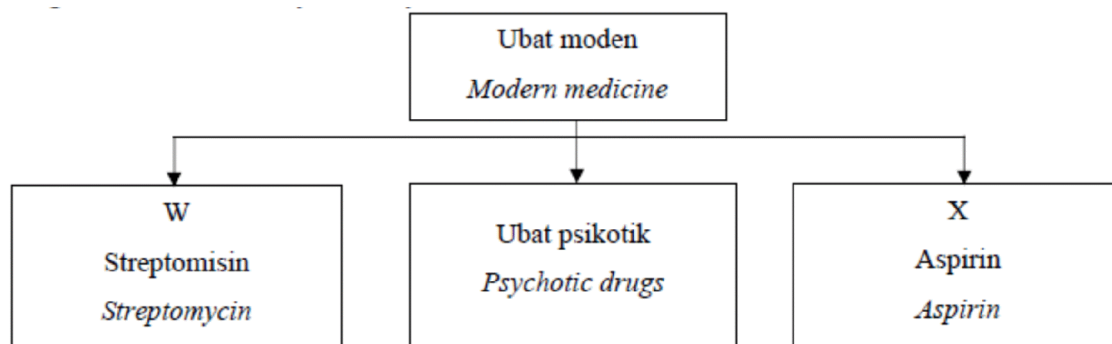
(iii) Nyatakan kesan sampingan jika ubat yang dicadangkan di 4(6)(ii) diambil secara berlebihan
State the side effect if the medicine suggested in 4(6)(ii) is taken excessively.

.....
.....
.....[1M]

[Putrajaya2022-08] ubat

8. Rajah 8 menunjukkan pengelasan ubat moden.

Diagram 8 shows a classification of modern medicine.



(a) Nyatakan jenis ubat W dan X. / State the type of medicine W and X.

.....[2M]

(b) (i) Apakah fungsi ubat W?/ What is the function of medicine W?

.....[1M]

(ii) Mengapakah ubat W perlu dihabiskan oleh pesakit? Terangkan.

Why medicine W need to be fully consumed by the patient? Explain.

.....

.....[2M]

(c) Berikan satu contoh ubat psikotik./ Give one example of psychotic drug.

.....[1M]

(d) (i) Apakah fungsi ubat X?/ What is the function of medicine X?

.....[1M]

(ii) Mengapakah aspirin tidak sesuai digunakan oleh pesakit gastrik?

Nyatakan cara pengambilan aspirin yang betul kepada pesakit gastrik.

Cadangkan ubat lain yang boleh diambil oleh pesakit gastrik untuk

menggantikan aspirin.

Why is aspirin not suitable for gastric patient's usage? State the correct

method for gastric patients to consume aspirin. Suggest other medicine that

can be taken by gastric patients to replace aspirin.

.....

.....

.....

.....[3M]

(b) Jadual di bawah menunjukkan dua jenis stokin yang berbeza.

The table below shows two different types of socks.

Jenis stoking Type of socks	A	B
Ciri-ciri Characteristics	• Stoking biasa yang tidak menggabungkan nanoteknologi. • Menjadi lembap apabila terdedah kepada cecair • Mengeluarkan bau busuk selepas digunakan	• Stoking biasa yang menggabungkan nanoteknplogi. • Kalis air • Tidak mengeluarkan bau busuk selepas digunakan

	• Regular socks that do not incorporate nanotechnology. • Becomes moist when exposed to liquid • Removes foul smell after use	• Regular socks that incorporate nanotechnology. • Waterproof • Does not emit foul odor after use
--	---	---

Berdasarkan maklumat dalam Jadual 4, stoking yang manakah lebih sesuai digunakan oleh atlet? Terangkan jawapan anda.

Based on the information in the Table 4, which socks are more suitable for athletes to use? Explain your answer.

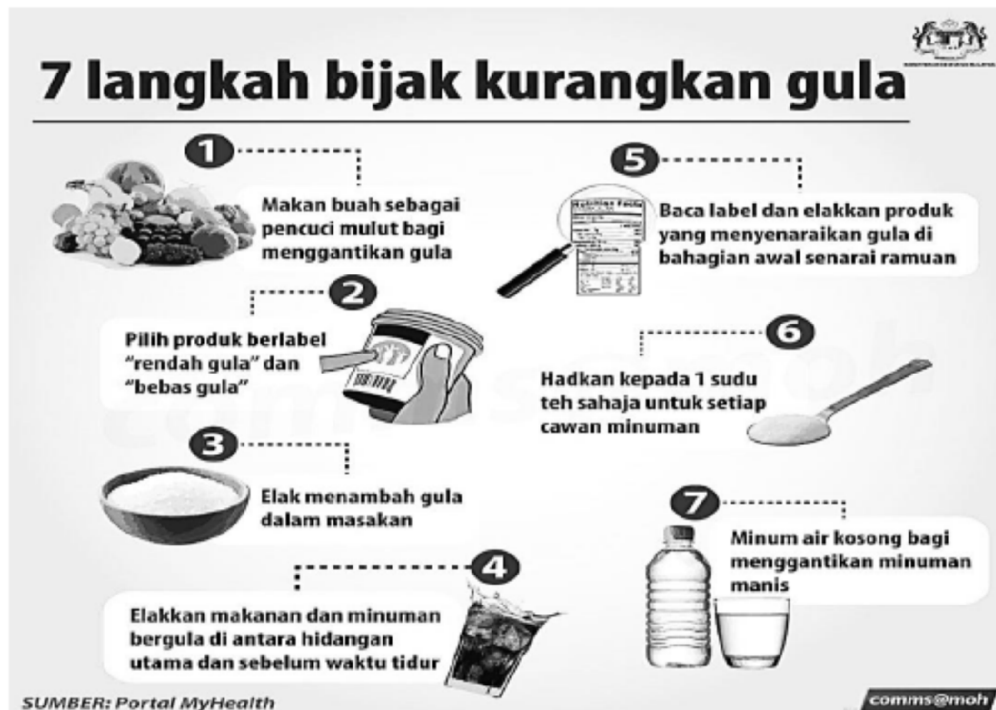
.....

.....

.....[2M]

(c) Rajah 4.2 menunjukkan kempen berkaitan gaya hidup sihat yang dijalankan oleh Kementerian Kesihatan Malaysia.

Figure 4.2 shows a campaign related to a healthy lifestyle carried out by the Malaysian Ministry of Health.



Cadangkan satu pemanis alternatif yang boleh menggantikan gula bagi pesakit kencing manis.

Suggest an alternative sweetener that can replace sugar for diabetics.

.....[1M]

(d) Bahan tambah makanan ialah bahan semula jadi atau sintetik yang ditambahkan ke dalam makanan bagi mengelakkan kerosakan atau meningkatkan rupa, rasa dan teksturnya.

Rajah 4.3 menunjukkan satu contoh makanan kegemaran remaja.

Food additives are natural or synthetic substances added to food to prevent spoilage or improve its appearance, taste and texture.

Figure 4.3 shows an example of teenagers' favourite foods.



(i) Natrium nitrat adalah satu contoh bahan tambah makanan yang ditambahkan ke dalam daging burger. Nyatakan jenis bahan tambah makanan bagi natrium nitrat.

Sodium nitrate is an example of a food additive added to burger meat. State the type of food additive for sodium nitrate.

.....[1M]

(ii) Terangkan bagaimana natrium nitrat bertindak sebagai bahan tambah makanan?

Explain how sodium nitrate acts as a food additive?

.....

.....[1M]

[Melaka2022-08] Rajah 7 menunjukkan tumbuhan yang digunakan secara meluas dalam ubatan tradisional.

Diagram 7 shows a plant that widely used in traditional medicine.



Berdasarkan Rajah 7,/ Based on Diagram 7,

(a) (i) nyatakan kegunaan tumbuhan tersebut dalam ubatan tradisional.
state the use of the plant in traditional medicine.

.....[1M]

(ii) bagaimanakah tumbuhan itu dapat digunakan untuk (a)(i)?
how can the plant be used for (a)(i)?

.....[1M]

(b) Pelbagai jenis bahan kosmetik mampu milik boleh diperolehi di pasaran. Namun begitu, terdapat kosmetik yang dikomersialkan mengandungi bahan kimia berbahaya yang boleh mengakibatkan kemudaratan kepada pengguna.

Various types of affordable cosmetic materials are available in the market. But there are some of the commercialized cosmetics that contain harmful chemicals which can cause harm to consumers.

(i) Nyatakan satu kesan penggunaan bahan kimia berbahaya kepada pengguna.

State one effect of harmful chemicals substance to consumers.

.....[1M]

(ii) **Kementerian Kesihatan Malaysia dan Bahagian Regulatori Farmasi Negara bertanggungjawab menyelia dan meluluskan bahan yang digunakan dalam kosmetik komersial.**

Ministry of Health Malaysia and National Pharmaceutical Regulatory Agency are responsible to supervise and approve the use of ingredients in commercialized cosmetics

Sebagai seorang pengguna, wajarkan penggunaan kosmetik komersil yang telah diluluskan dalam kehidupan harian.

As a consumer, justify the uses of approved commercialized cosmetics in daily life.

.....
.....[2M]

(c) Jadual 3 menunjukkan jenis kosmetik P, Q dan R serta kegunaannya.
Table 3 shows three types of cosmetics P, Q and R with its uses.

Jenis kosmetik Type of cosmetics	Kegunaan Uses
P	Untuk mencantikkan wajah To beautify the face
Q	Untuk merawat badan To treat the body
R	Untuk menghasilkan pewangi To provide fragrances

Jadual 3/ Table 3

Berdasarkan Jadual 3, berikan contoh P, Q dan R.

Based on Table 3, give an example of P, Q and R.

P :

Q :

R : [3M]

(d) Mei Ling mendapati mukanya mula tumbuh jerawat. Dia tertarik dengan iklan produk anti jerawat yang menyatakan bahawa jerawat akan hilang dalam tempoh 5 hari.

Mei Ling notices sudden acne breakouts on her face. She is attracted to an advertisement for an anti-acne product that claims the acne could disappear within 5 days.

Apakah langkah-langkah yang perlu Mei Ling lakukan sebelum membeli produk anti jerawat itu?

What steps should Mei Ling take before purchasing the anti-acne product?

.....

.....[2M]

[Selangor2022-Set02-06] [Selangor2022-Set3-06]

Rajah 6 menunjukkan pelbagai kosmetik di pasaran.

Diagram 6 shows various types of cosmetics found in the market.



(a) (i) Nyatakan maksud kosmetik./ State the meaning of cosmetics.

.....

.....[1M]

(ii) Nyatakan dua bahan asas dalam pembuatan kosmetik.
State two basic ingredients in cosmetics production.

.....
.....[2M]

(b) Terdapat kosmetik yang dikomersialkan mengandungi bahan kimia terlarang yang boleh mengakibatkan kemudaratan kepada pengguna.
Some of the commercialized cosmetics contain banned chemicals that can cause harm to consumers.

(i) Nyatakan dua kesan penggunaan bahan kimia terlarang kepada pengguna.
State two effects of the use of banned chemicals substance to consumers.

.....
.....[2M]

(ii) Cadangkan satu cara untuk mencegah keadaan di 6(b)(i) berlaku.
Suggest one method to prevent the situation in 6(b)(i) from happening.

.....[1M]

(c) Jadual 6 menunjukkan tiga jenis sebatian kimia yang digunakan sebagai bahan tambah makanan.
Table 6 shows three types of chemical compounds which are used as food additives.

Jenis bahan tambah makanan Types of food additives	Sebatian kimia Chemical compounds	Produk Products
X	Asid benzoik Benzoic acid	Sos cili Chilli sauces
Y	Mononatrium glutamat Monosodium glutamate	Mi segera Instant noodles
Z	Asid askorbik Ascorbic acid	Marjerin Margarine

(i) Terangkan bagaimana asid benzoik bertindak sebagai bahan tambah makanan X.
Explain how benzoic acid acts as food additive X.

.....[1M]

(ii) Apakah kesan sampingan mononatrium glutamat ke atas kesihatan manusia?

What is the side effect of monosodium glutamate on human health?

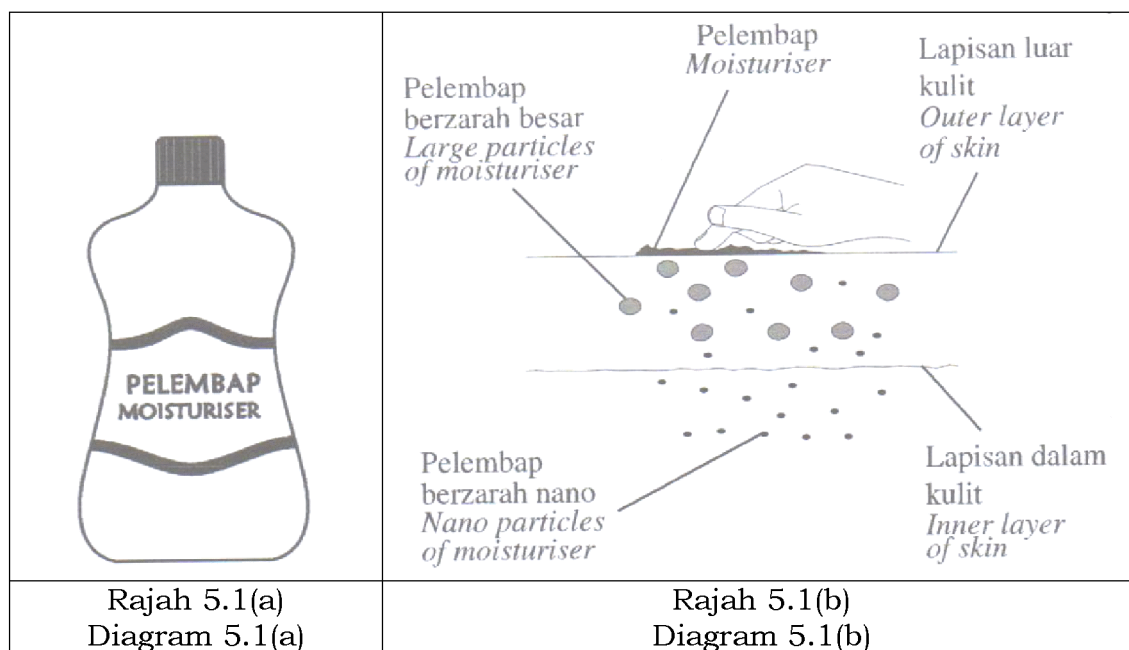
.....[1M]

(iii) Apakah fungsi bahan tambah makanan Z?

What is the function of food additive Z?

.....[1M]

[SPM2021-V2-06] (a) Rajah 5.1(a) menunjukkan bahan kosmetik yang digunakan sebagai pelembap kulit manakala 5.1(b) menunjukkan mekanisme zarah-zarah cecair pelembap apabila disapu pada kulit. Diagram 5.1(a) shows a cosmetics ingredient used as moisturizer while 5.1(b) shows the mechanism of the particles of liquid moisturiser when applied on skin.



Pelembap berzarah nano itu adalah hasil daripada nanoteknologi.

The nano particles of the moisturiser are the product of nanotechnology.

(i) Apakah yang dimaksudkan dengan nanoteknologi?

What is meant by nanotechnology?

.....

.....[1M]

(ii) Terangkan mengapa pelembap berzarah nano boleh meresap ke lapisan dalam kulit.

Explain why the nano particles of moisturiser are able to absorbed into the inner layer of the skin.

.....[1M]

(b) Jadual 3 menunjukkan tiga jenis bahan komposit, P, Q dan R yang digunakan secara meluas dalam industri dan kegunaannya.

Table 3 shows three types of composite materials, P, Q and R widely used in industry and their uses.

Bahan komposit Composite material	Kegunaan Use
P	Topi keledar dan bampar kereta Helmet and car bumper
Q	Kamera video dan perkabelan rangkaian komputer Video camera and cable computer network
R	Empangan dan jambatan Dam and bridge

Berdasarkan Jadual 3, kenal pasti P, Q dan R.

Based on Table 3, identify P, Q and R.

P:

Q:

R : [3M]

[PPinang2022-Set02-04] Rajah 4.1 menunjukkan beberapa contoh bahan kosmetik yang melibatkan nanoteknologi.

Diagram 4.1 shows some examples of cosmetic ingredients involving nanotechnology



Rajah 4.1 / Diagram 4.1

(a) (i) Apakah nanoteknologi? / What is nanotechnology?

.....

.....[1M]

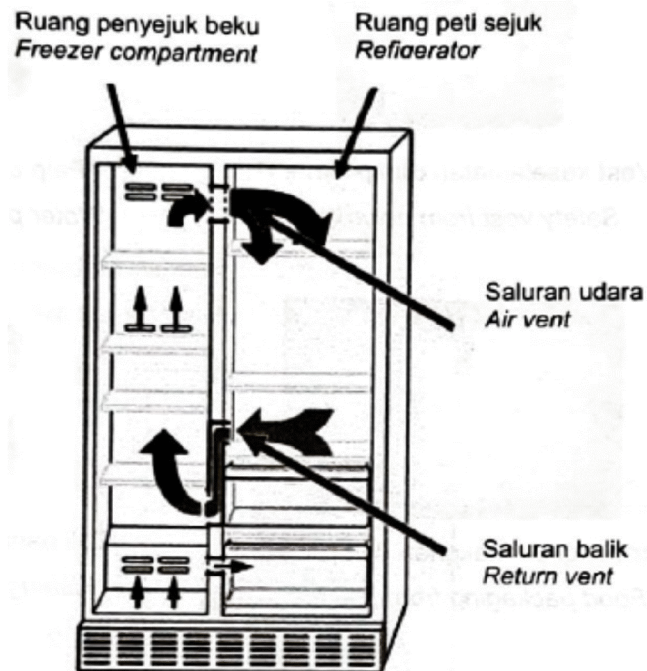
(ii) Nyatakan satu kelebihan aplikasi nanoteknologi bagi kosmetik dalam Rajah 4.1.

State one advantage of the application of nanotechnology for cosmetics in Diagram 4.1.

.....
.....[1M]

[Kedah2022-04] Rajah 4.1 menunjukkan sebuah peti ais yang dilapisi teknologi antibakteria nano titanium dalam bahagian sistem pembersihannya.

Diagram 4.1 shows a refrigerator coated with titanium nano antibacterial technology in its cleaning system.



(a) (i) Apakah yang dimaksudkan dengan nanoteknologi?
What is the meaning of nanotechnology?

.....
.....[1M]

(ii) Nyatakan satu kelebihan penggunaan nanoteknologi ke atas makanan yang disimpan di dalam peti ais dalam Rajah 4.1.

State one advantage of the use of nanotechnology over food stored in the refrigerator in Diagram 4.1.

.....
.....[1M]

(b) Rajah 4.2 di bawah menunjukkan pelbagai barangan yang terdiri daripada polimer.

Diagram 4.2 below shows a variety of items composed of polymers



Vest keselamatan dan polimer P
Safety vest from polymer P



Paip air dari polimer Q
Water pipes of polymer Q



Pembungkus makanan dan polimer R
Food packaging from polymer R



tali Pancing dari polimer S
Fishing line of polymer S

(i) Kelaskan bahan P, Q, R dan S mengikut tindak balas pempolimeran.
Classify materials P, Q, R and S according to the polymerization reaction.

Pempolimeran penambahan Addition polymerization	Pempolimeran kondensasi Condensation polymerization

[2M]

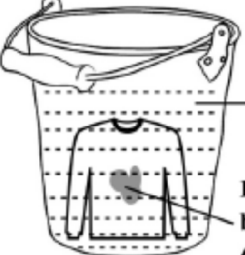
(ii) Namakan polimer bagi R.[1M]
Name the polymer for R.

(iii) Lukis formula struktur monomer bagi polimer Q.
Draw the monomer structure formula for polymer Q.

[2M]

[Perak2022-Set02-07] (a) Rajah 6.1 menunjukkan kesan tindakan pencucian agen pencuci X dan agen pencuci Y ke atas pakaian yang kotor akibat tumpahan kuah kari.

Diagram 6.1 shows effects of cleansing action of cleaning agent X and the cleaning agent Y on dirty clothes due to the spill of curry gravy.

Situasi Situation	Susunan radas Apparatus set-up	Pemerhatian Observation
I	 Air laut + agen pencuci X Sea water + cleaning agent X Kotoran berminyak Oily stain	
II	 Air laut + agen pencuci Y Sea water + cleaning agent Y Kotoran berminyak Oily stain	

(i) Berdasarkan Rajah 6.1, dalam situasi manakah tindakan agen pencuci yang kurang berkesan? Terangkan jawapan anda.

Based on Diagram 6.1, in which situation is the cleaning agent action less effective? Explain your answer.

.....

[3M]

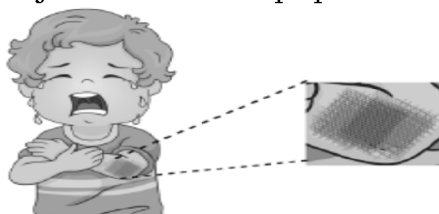
(ii) Namakan agen pencucian bagi jawapan anda di 7(a)(i).

Name the cleaning agent based on your answer in 7(a)(i).

.....[1M]

(b) Rajah 6.2 menunjukkan tangan seorang murid yang luka.

Diagram 6.2 shows the injured hand of a pupil.



Murid tersebut menyapu luka itu dengan menggunakan iodine. Namakan sejenis ubat tradisional yang boleh digunakan sebagai alternatif kepada iodine. Berikan dua kelebihan penggunaan ubat tradisional tersebut.
The student wipes the wound with iodine. Name a type of traditional medicine that can be used as an alternative to iodine. Give two benefits of using the traditional medicine.

.....
.....
.....[2M]

(c) Rajah 6.3 menunjukkan bil elektrik yang tinggi akibat penggunaan penyaman udara di rumah Syahmi.
Diagram 6.3 shows a relatively expensive electricity bill due to the usage of air conditioners in Syahmi's house.

BIL ELEKTRIK DAN INVOIS CUKAI	
No. Akaun : 220137442900	 Bayaran Tertunggak NOTIS PEMOTONGAN DI BAWAH TNB Careline 1300 88 5454
No. Kontrak : 242321	
Deposit : RM 510.42	
No. Invois Cukai: 1200277706	
SYAHMI BIN ALI MANAF NO. 10, JALAN TAMAN SARI 3, 48700, SHAH ALAM, SELANGOR	
Jumlah Perlu Dibayar RM 296.90	Tarikh Bil 15 Okt 2017

Rajah / Diagram 6.3

Berdasarkan pengetahuan anda tentang aplikasi teknologi hijau, terangkan bagaimanakah anda dapat mengurangkan penggunaan tenaga di rumah Syahmi?

Based on your knowledge of green technology applications, explain how you can reduce the energy usage in Syahmi's house?

.....
.....
.....[3M]