Bahagian A
Section A

[60markah]
[60 marks]

Jawab **semua** soalan dalam bahagian ini.
*Answer **all** the questions in this section.*

1. Rajah 1 menunjukkan bahan-bahan yang diperbuat daripada polimer S.
Diagram 1 shows the substances produced from polymer S.

Rajah 1 / *Diagram 1*

(a) Apakah polimer?
What is polymer?

……

……
[1 markah/ *1 mark*]

(b) Namakan polimer S.
Name polymer S.

……
[1 markah/ *1 mark*]

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

……
[1 markah/ *1 mark*]

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

……..……..

[1 markah/ *1 mark*]

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

[1 markah/ *1 mark*]

2. Jadual 2 menunjukkan maklumat sebahagian unsur yang terdapat dalam Kala 3 Jadual Berkala Unsur.
Table 2 shows information about some of the elements found in Period 3 of the Periodic Table of Elements.

Unsur ***Element***	**Natrium** ***Sodium***	**Magnesium** ***Magnesium***	**Aluminium** ***Aluminium***	**Silikon** ***Silicon***	**Klorin** ***Chlorine***
Nombor proton *Proton number*	11	12	13	14	17

Jadual 2 / *Table 2*

Berdasarkan Jadual 2,
Based on Table 2,

(a) apakah maksud kala?
what is the meaning of period?

……..……..

[1 markah/ *1 mark*]

(b) nyatakan unsur yang wujud sebagai molekul dwiatom.
state the element that exists as diatomic molecule.

……..……..

[1 markah/ *1 mark*]

(c) tuliskan susunan elektron bagi atom aluminium.
write the electron arrangement for aluminium atom.

……..……..

[1 markah/ *1 mark*]

(d) terangkan mengapa saiz atom natrium lebih besar berbanding atom klorin.
explain why size of sodium atoms are larger than chlorine atoms.

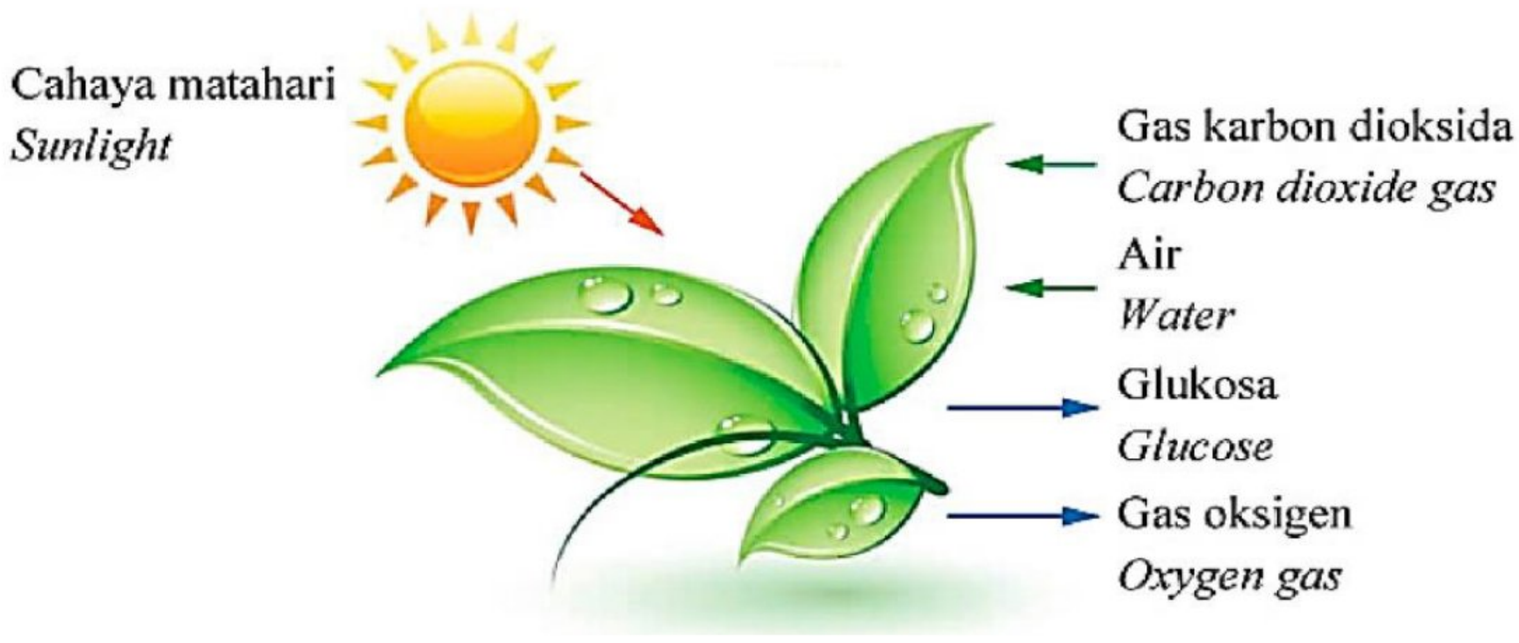
……

……

……

[2 markah/ *2 marks*]

3. Rajah 3 menunjukkan proses fotosintesis untuk penghasilan glukosa, $C_6H_{12}O_6$ dalam tumbuhan hijau.
Diagram 3 shows the photosynthesis process for the production of glucose, $C_6H_{12}O_6$ in green plants.



Rajah 3 / *Diagram 3*

(a) Berikan maksud formula empirik.
Give the definition of empirical formula.

……

……

[1 markah/ *1 mark*]

(b) Tulis formula empirik bagi glukosa.
Write the empirical formula for glucose.

……

[1 markah/ *1 mark*]

(c) Tulis persamaan kimia yang seimbang bagi proses fotosintesis.
Write a balanced chemical equation for the photosynthesis process.

……

[2 markah / *2 marks*]

(d) Hitung peratus karbon mengikut jisim dalam satu molekul glukosa.
[Jisim atom relatif: H=1, C=12, O=16]
Calculate the percentage of carbon by mass in one glucose molecule.
[Relative atomic mass: H=1, C=12, O=16]

[2 markah / *2 marks*]

4. (a) Persamaan di bawah menunjukkan tindak balas dalam penyediaan sabun di makmal.
The equation below shows the reaction in the preparation of soap in the laboratory.

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

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

……

[1 markah/ *1 mark*]

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

……

[1 markah/ *1 mark*]

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

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

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

[2 markah/ *2 marks*]

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

Marjerin Lazat

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

Rajah 4.1 / *Diagram 4.1*

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

……

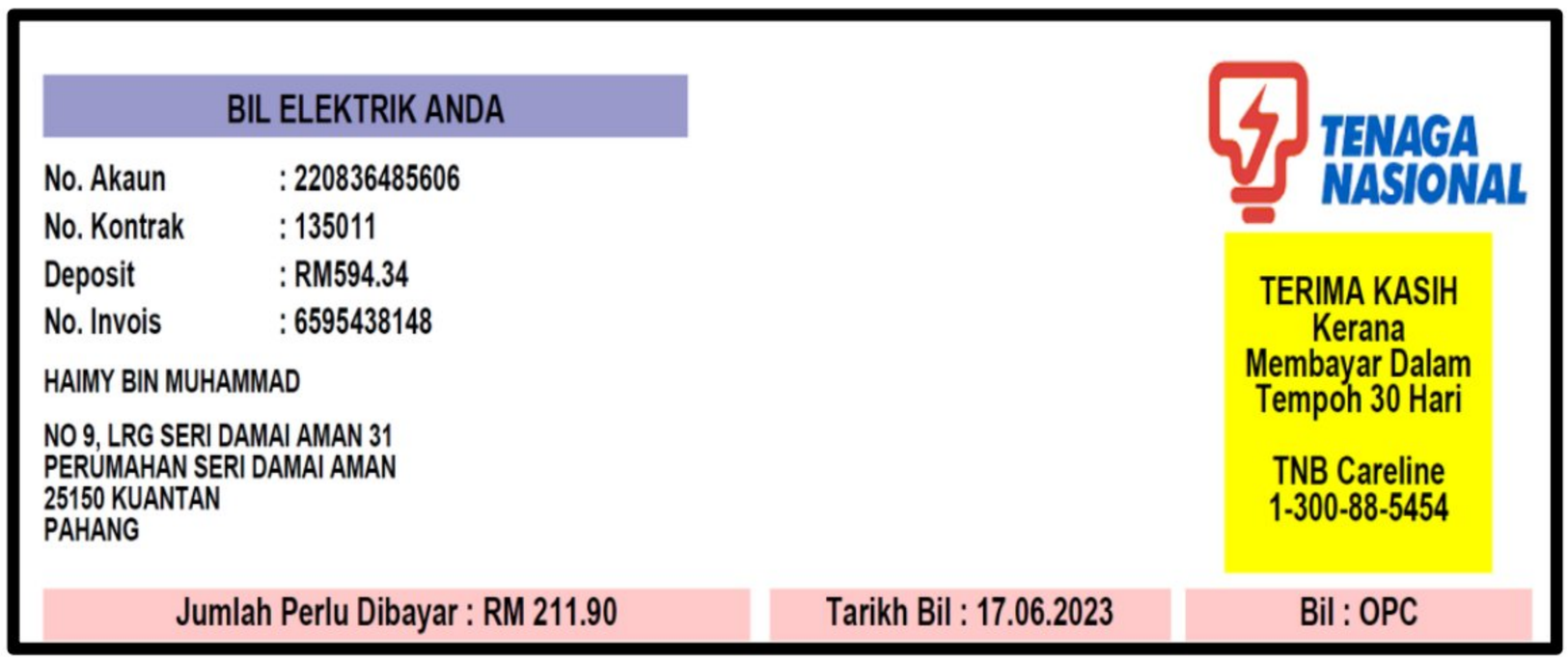
[1 markah/ *1 mark*]

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

……

[1 markah/ *1 mark*]

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


BIL ELEKTRIK ANDA

No. Akaun : 220836485606
No. Kontrak : 135011
Deposit : RM594.34
No. Invois : 6595438148

HAIMY BIN MUHAMMAD

NO 9, LRG SERI DAMAI AMAN 31
PERUMAHAN SERI DAMAI AMAN
25150 KUANTAN
PAHANG

TENAGA NASIONAL

TERIMA KASIH
Kerana
Membayar Dalam
Tempoh 30 Hari

TNB Careline
1-300-88-5454

Jumlah Perlu Dibayar : RM 211.90 | Tarikh Bil : 17.06.2023 | Bil : OPC

Rajah 4.2 / *Diagram 4.2*

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

……

……

[1 markah/ *1 mark*]

5. Magnesium terdiri daripada tiga isotop. Rajah 5 menunjukkan perwakilan piawai untuk atom-atom magnesium.
Magnesium consist of three isotopes. Diagram 5 shows the standard representation for magnesium atoms.

$^{24}_{12}Mg$ $^{25}_{12}Mg$ $^{26}_{12}Mg$

Rajah 5 / *Diagram 5*

(a) Apakah maksud isotop?
What is is the meaning of isotope?

……

……

[1 markah/ *1 mark*]

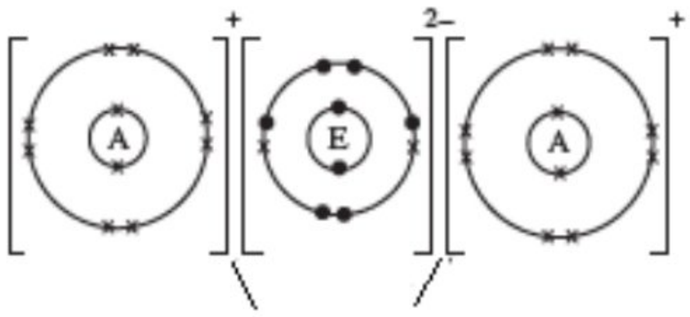
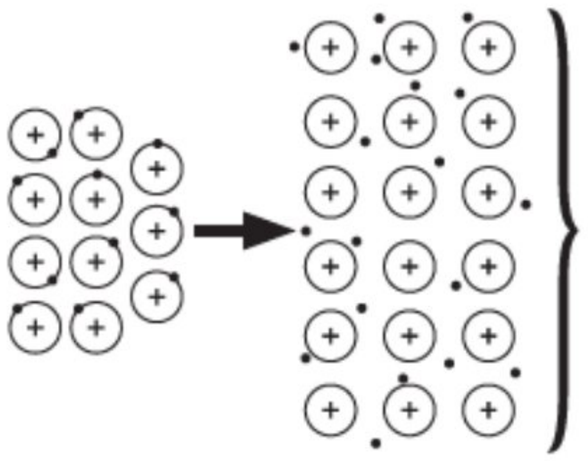
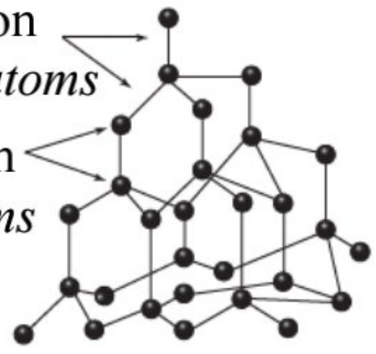
(b) Lukiskan struktur atom bagi magnesium, Mg-24.
Draw the atomic structure of magnesium, Mg-24

[2 markah/ *2 marks*]

(c) Magnesium wujud secara semula jadi sebagai tiga isotop, iaitu 79.0% ^{24}Mg, 10.0% ^{25}Mg dan 11.0% ^{26} Mg. Hitung jisim atom relatif magnesium.
Magnesium exist naturally as three isotopes, which are 79.0% of ^{24} Mg, 10.0% of ^{25}Mg and 11.0% of ^{26} Mg. Calculate the relative atomic mass of magnesium.

[2 markah/ *2 marks*]

(d) Jadual 5 menunjukkan maklumat ikatan yang terdapat dalam bahan R, S dan T.
Table 5 shows the bond information found in substances R, S and T.

Bahan ***Substances***	**Maklumat ikatan** ***Bond information***
R	 Daya elektrostatik yang kuat antara ion *Strong electrostatic force between ions*
S	 Daya elektrostatik kuat antara lautan elektron dan ion-ion logam *Strong electrostatic force between sea of electron and metal ions*
T	Ikatan kovalen antara atom karbon *Covalent bond between carbon atoms* Atom karbon *Carbon atoms* 

Jadual 5 / *Table 5*

Berdasarkan Jadual 5, pilih satu bahan yang boleh mengkonduksikan arus elektrik di dalam keadaan pepejal dan leburan. Terangkan bagaimana bahan ini boleh mengkonduksikan arus elektrik di dalam keadaan pepejal dan leburan.
Based on Table 5, choose one substance that can conduct electricity in the solid and molten states. Explain how this substance can conduct electricity in the solid and molten states.

……

……

……

……

[3 markah/ *3 marks*]

6. (a) **Aloi J yang bersifat ringan tetapi kuat digunakan untuk membuat basikal lumba.**
Alloy J which is light but strong is used to make racing bicycles.

Berdasarkan pernyataan di atas,
Based on the above statement,

(i) Nyatakan maksud aloi.
State the meaning of alloy.

.....

.....

[1 markah/ *1 mark*]

(ii) Kenal pasti aloi J.
Identify alloy J.

.....

[1 markah/ *1 mark*]

(b) Seramik termaju diperbuat daripada bahan bukan organik seperti oksida, karbida, dan nitrida. Nyatakan satu kegunaan seramik termaju dalam industri pembuatan kenderaan dan jelaskan jawapan anda.
Advanced ceramics are made from inorganic compounds such as oxides, carbides and nitrides. State one use of advanced ceramics in the vehicle manufacturing industry and explain your answer.

.....

.....

.....

.....

[3 markah/ *3 marks*]

(c) Bahan komposit W dihasilkan daripada gabungan bahan matriks U dan bahan pengukuhan V. Jadual 6 menunjukkan perbandingan sifat bagi bahan matriks U, bahan pengukuhan V dan bahan komposit W.
Composite material W is produced from a combination of matrix substance U and strengthening substance V. Table 6 shows the comparison of properties for matrix substance U, strengthening substance V and composite material W.

Bahan matriks U *Matrix substance U*	**Bahan pengukuhan V** *Strengthening substance V*	**Bahan komposit W** *Composite material W*
• Kekuatan regangan rendah *Low stretching strength* • Kekonduksian haba dan elektrik rendah *Low heat and electrical conductivity* • Tahan kakisan *Resistant to corrosion* • Tahan lasak *Durable*	• Kekuatan regangan tinggi *High stretching strength* • Kekonduksian haba dan elektrik rendah *Low heat and electrical conductivity*	• Kekuatan regangan tinggi *High stretching strength* • Penebat haba dan elektrik *Heat and electrical insulator* • Tahan kakisan *Resistant to corrosion* • Tahan lasak *Durable*

Jadual 6 / *Table 6*

(i) Kenal pasti bahan matriks U, bahan pengukuhan V dan bahan komposit W.
Identify matrix substance U, strengthening substance V and composite material W.

Bahan matriks U : .....
Matrix substance U

Bahan pengukuhan V : .....
Strengthening substance V

Bahan komposit W : .....
Composite material W

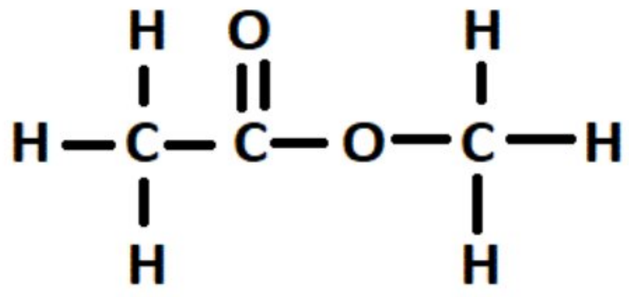
[3 markah/ *3 marks*]

(ii) Nyatakan satu kegunaan bahan komposit W dalam kehidupan seharian.
State one use of composite material W in daily life.

.....

[1 markah/ *1 mark*]

7. Rajah 7.1 menunjukkan formula strukrur bagi satu sebatian karbon Z.
Diagram 7.1 shows the structural formula for a carbon compound Z.



Rajah 7.1 / *Diagram 7.1*

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

……

……

[1 markah/ *1 mark*]

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

……

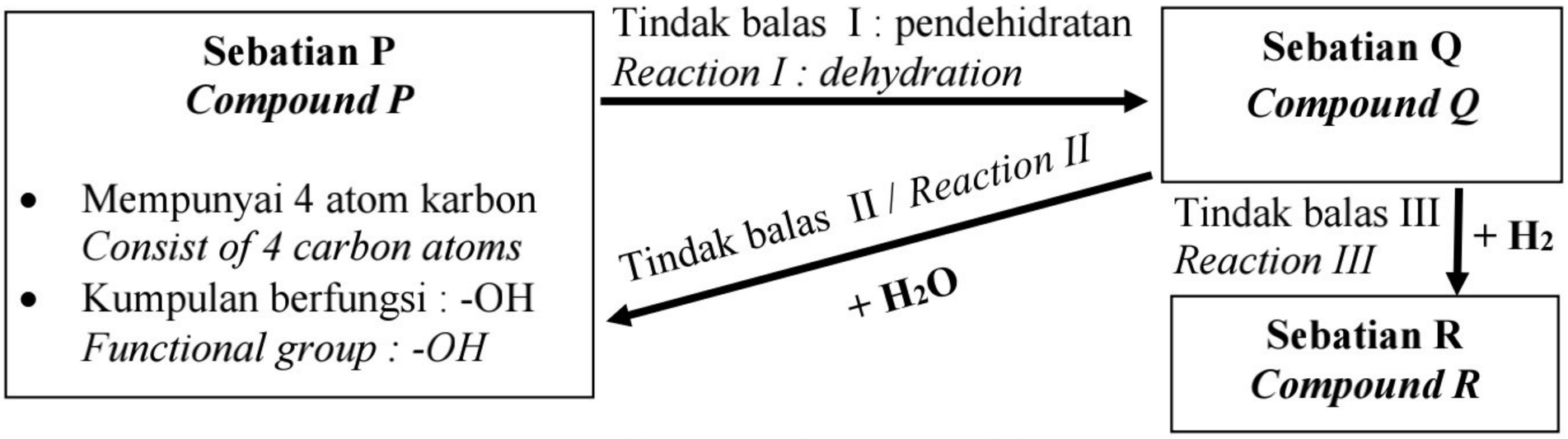
[1 markah/ *1 mark*]

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

……

[2 markah/ *2 marks*]

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



Rajah 7.2 / *Diagram 7.2*

Berdasarkan Rajah 7.2,
Based on Diagram 7.2,

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

……

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

……

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

……

[3 markah/ *3 marks*]

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

……

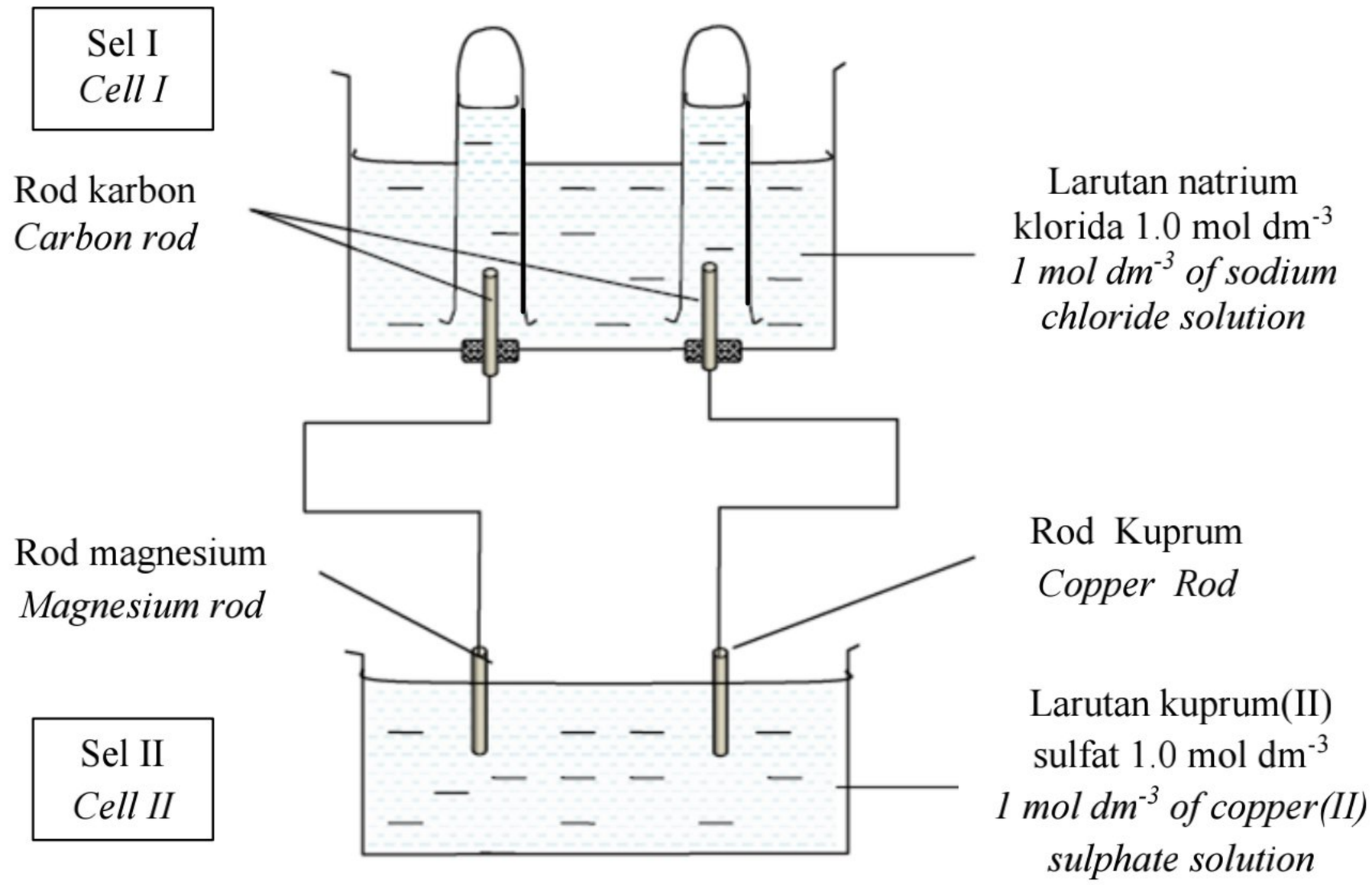
……

……

……

[3 markah/ *3 marks*]

8. Rajah 8 menunjukkan gabungan satu sel kimia dengan satu sel elektrolisis.
Diagram 8 shows the combination between a chemical cell and an electrolytic cell.



Rajah 8 / *Diagram 8*

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

.....

.....

[1 markah/ *1 mark*]

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

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

.....

[1 markah/ *1 mark*]

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

.....

[1 markah/ *1 mark*]

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

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

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

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

(ii) terminal positif/ *positive terminal* : .....

[2 markah/ *2 marks*]

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

[2 markah/ *2 marks*]

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

Notasi sel : .....
Cell notation

Voltan sel : .....
Cell voltage

[3 markah/ *3 marks*]

Bahagian B
***Section* B**

[20 markah]
[20 marks]

Jawab mana-mana **satu** soalan daripada bahagian ini.
*Answer any **one** question from this section.*

9. (a) Jadual 9 menunjukkan maklumat bagi tiga set eksperimen untuk menyiasat faktor-faktor yang mempengaruhi kadar tindak balas antara zink dengan asid sulfurik.
Table 9 shows the information for three sets of experiments to investigate the factors that affect the rate of reaction between zinc and sulphuric acid.

Set	**Bahan tindak balas** ***Reactants***	**Masa yang diambil untuk mengumpul 40 cm^3 gas hidrogen (s)** ***Time taken to collect 40 cm^3 of hydrogen gas (s)***
I	25 cm^3 asid sulfurik 0.2 mol dm^{-3} + serbuk zink berlebihan *25 cm^3 of 0.2 mol dm^{-3} sulphuric acid + excess zinc powder*	33
II	25 cm^3 asid sulfurik 0.2 mol dm^{-3} + ketulan zink berlebihan *25 cm^3 of 0.2 mol dm^{-3} sulphuric acid + excess zink granule*	45
III	25 cm^3 asid sulfurik 0.2 mol dm^{-3} + serbuk zink berlebihan + larutan kuprum(II) sulfat *25 cm^3 of 0.2 mol dm^{-3} + excess zinc powder + copper(II) sulphate solution*	25

Jadual 9 / *Table 9*

(i) Nyatakan maksud kadar tindak balas.
State the meaning of rate of reaction.

[1 markah/ *1 mark*]

Berdasarkan Jadual 9,
Based on Table 9,

(ii) tuliskan persamaan ion bagi tindak balas tersebut dan hitungkan kadar tindak balas dalam Set I dan Set II.
Lukis gambarajah profil tenaga bagi tindak balas Set I dan Set III di dalam satu paksi tenaga yang sama. Tunjuk dan labelkan tenaga pengaktifan bagi Set I sebagai Ea dan Set III sebagai Ea'.
write the ionic equation for the reaction and calculate the rate of reaction in Set I and Set II.
Draw the energy profile diagram for Set I and Set III reactions on the same energy axis. Show and label the activation energy of Set I as Ea and Set III as Ea'.

[6 markah/ *6 marks*]

(iii) bandingkan kadar tindak balas antara;
compare the rate of reaction between;

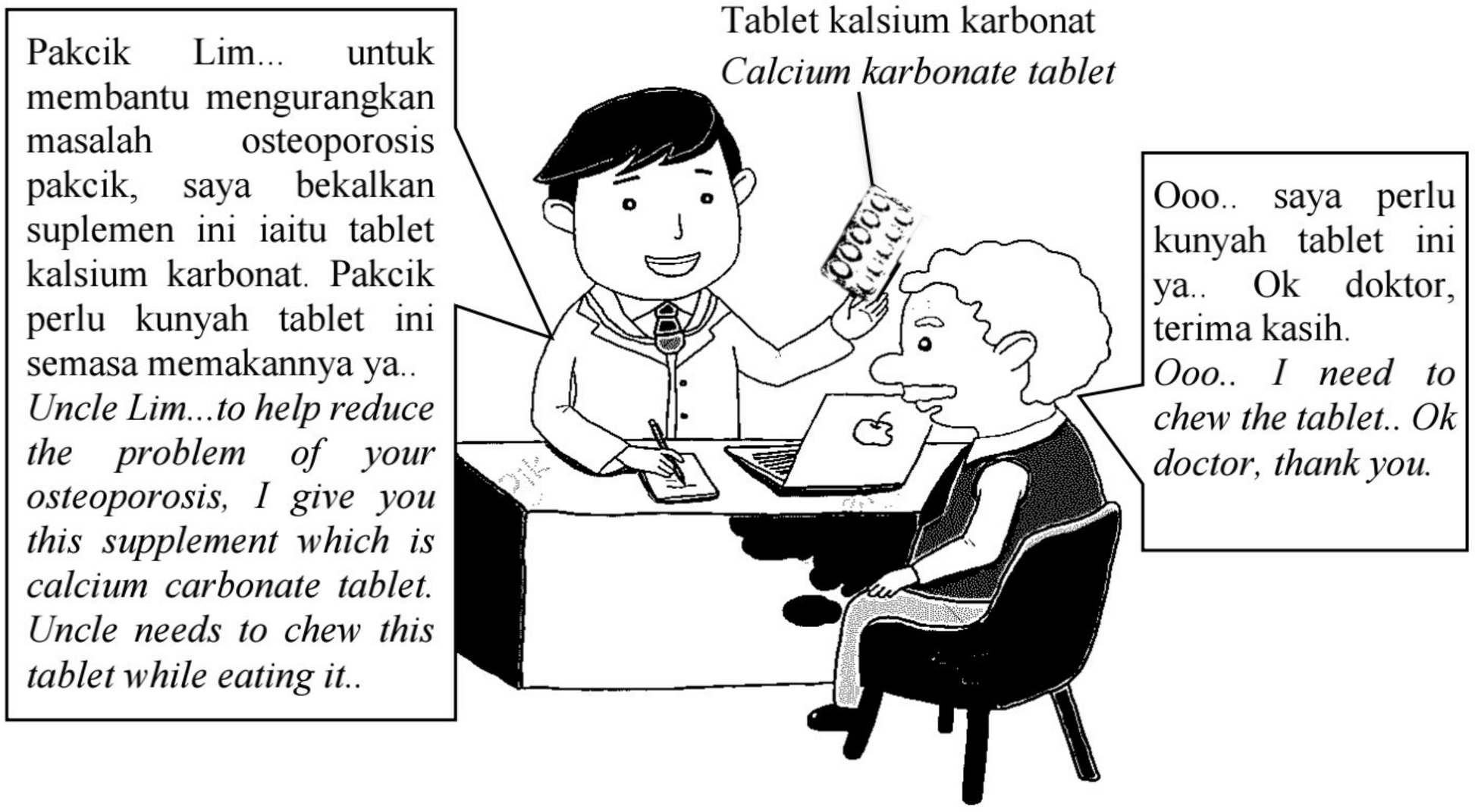
- Set I dan Set II
  Set I and Set II

- Set I dan Set III
  Set I and Set III

Jelaskan jawapan anda berdasarkan teori perlanggaran.
Explain your answer based on collision theory.

[10 markah/ *10 marks*]

(b) Rajah 9 menunjukkan perbualan semasa temujanji antara doktor dan pesakitnya.
Diagram 9 shows conversation during appointment between a doctor and his patient.

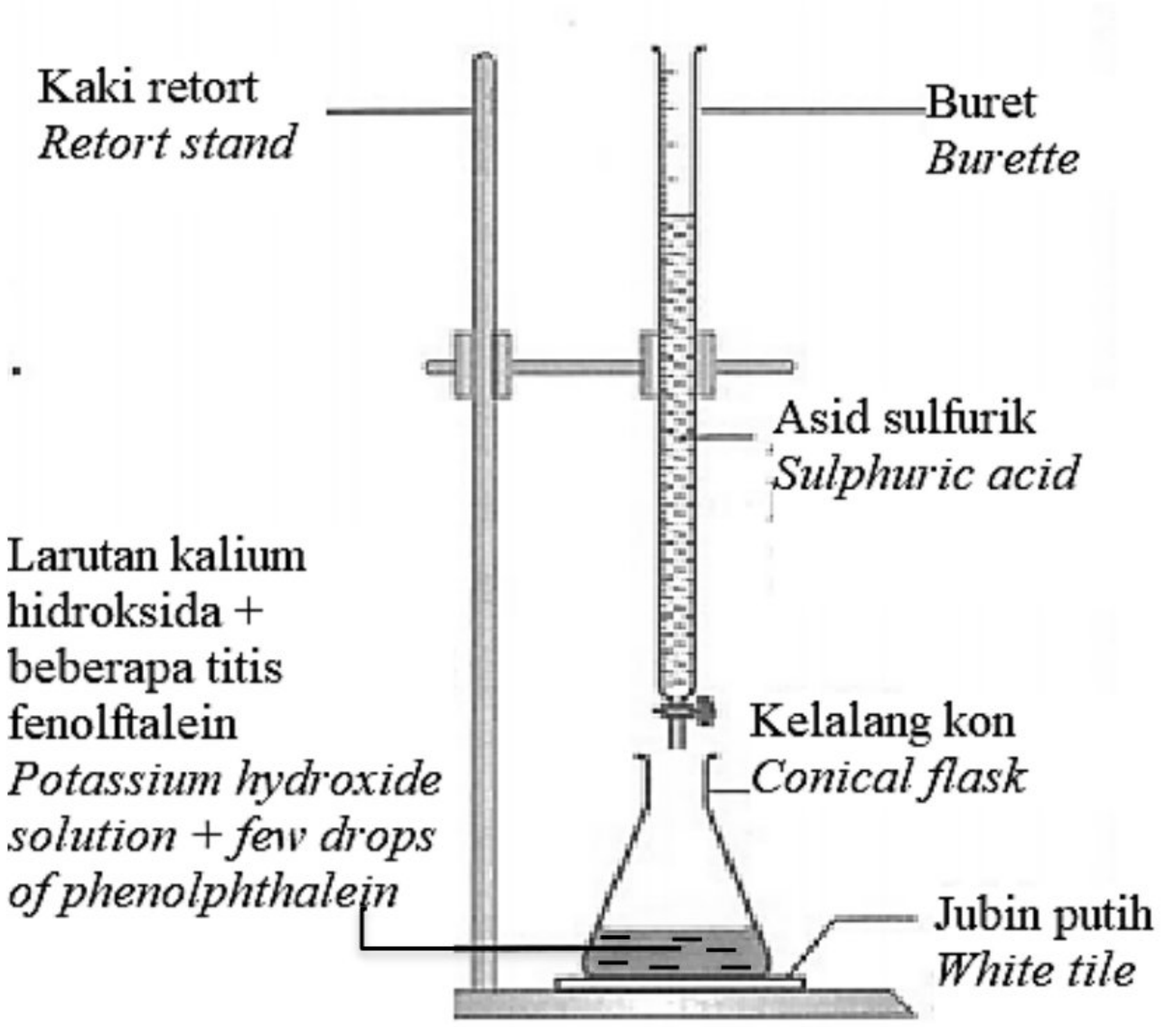


Rajah 9 / *Diagram 9*

Berdasarkan Rajah 9 dan faktor mempengaruhi kadar tindak balas, terangkan mengapa doktor tersebut mengarahkan Pakcik Lim mengunyah tablet tersebut semasa memakannya.
Based on Diagram 9 and factor that affect the rate of reaction, explain why the doctor instructed Uncle Lim to chew the tablet while eating it.

[3 markah/ *3 marks*]

10. (a) Rajah 10.1 menunjukkan tindak balas di antara asid sulfurik, H_2SO_4 dan larutan kalium hidroksida, KOH.
Diagram 10.1 shows the reaction between sulphuric acid, H_2SO_4 and potassium hydroxide solution, KOH.



Rajah 10.1 / *Diagram 10.1*

(i) Nyatakan maksud peneutralan dan mengapakah fenolftalein dimasukkan ke dalam kelalang kon di dalam Rajah 10.1?
State the meaning of neutralisation and why phenolphthalein is inserted into the conical flask in Diagram 10.1?

[2 markah/ *2 marks*]

(ii) Persamaan kimia bagi tindak balas tersebut ditulis seperti berikut:
Chemical equation for the reaction is written as follows:

$$\mathbf{H_2SO_4 + 2KOH \rightarrow K_2SO_4 + 2H_2O}$$

Tafsirkan persamaan tindak balas di atas secara kualitatif dan kuantitatif. Jika 0.005 mol larutan kalium hidroksida bertindak balas dengan asid sulfurik 0.2 mol dm^{-3}, hitung isipadu asid sulfurik yang diperlukan bagi tindak balas ini.
Interpret the above equation reaction qualitatively and quantitatively. If 0.005 mol of potassium hydroxide solution reacted with 0.2 mol dm^{-3} of sulphuric acid, calculate the volume of sulphuric acid required for this reaction.

[4 markah/ *4 marks*]

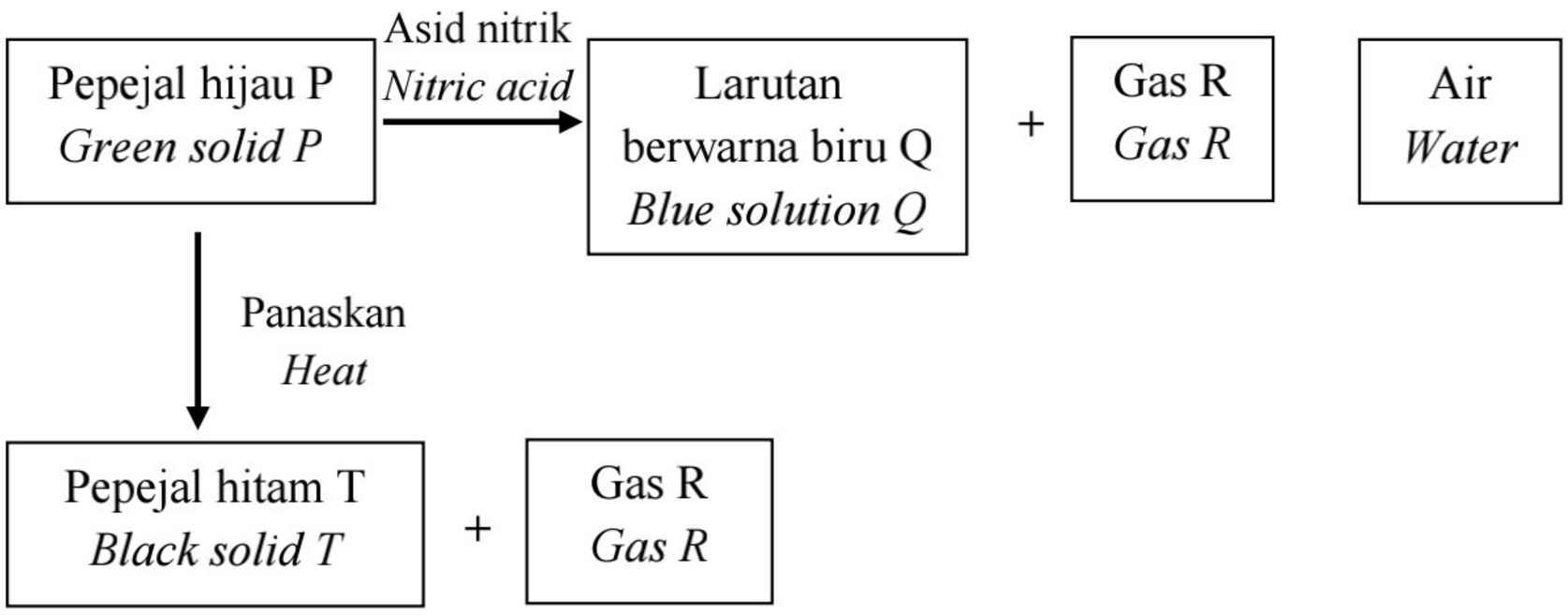
(b) Rajah 10.2 menunjukkan seorang lelaki yang menggunakan sabun pencuci tangan X untuk mencuci tangannya. Dia mendapati tangannya menjadi kemerahan setelah dicuci dengan sabun pencuci tangan X.
Diagram 10.2 shows a man using hand soap X to wash his hands. He noticed that his hands were reddened after washing them with hand soap X.

Rajah 10.2 / *Diagram 10.2*

Nyatakan bahan yang terdapat dalam sabun pencuci tangan X dan terangkan bagaimana bahan tersebut menyebabkan hal ini berlaku. Cadangkan satu bahan yang ada di rumah yang boleh digunakan untuk membantu meredakan kesan alkali berlebihan yang menyebabkan kemerahan tersebut.
State the ingredient in hand soap X and explain how it cause this to happen. Suggest one home ingredient that can be used to help alleviate the effects of excess alkali that causes the redness.

[4 markah/ *4 marks*]

(c) Rajah 10.3 menunjukkan tindak balas yang melibatkan pepejal hijau P.
Diagram 10.3 shows the reaction involving the green solid P.



Rajah 10.3 / *Diagram 10.3*

Berdasarkan Rajah 10.3,
Based on Diagram 10.3,

(i) kenal pasti bahan P, Q, R dan T.
identify substance P, Q, R and T.

[4 markah/ 4 *marks*]

(ii) huraikan satu ujian kimia untuk menentusahkan kehadiran kation dan anion dalam larutan Q.
describe a chemical test to confirm the presence of cations and anions in solution Q.

[6 markah/ 6 *marks*]

Bahagian C
***Section* C**

[20 markah]
[20 marks]

Jawab **semua** soalan daripada bahagian ini.
*Answer **all** of the question from this section.*

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

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

Jadual 11 / *Table 11*

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

[1 markah/ 1 *mark*]

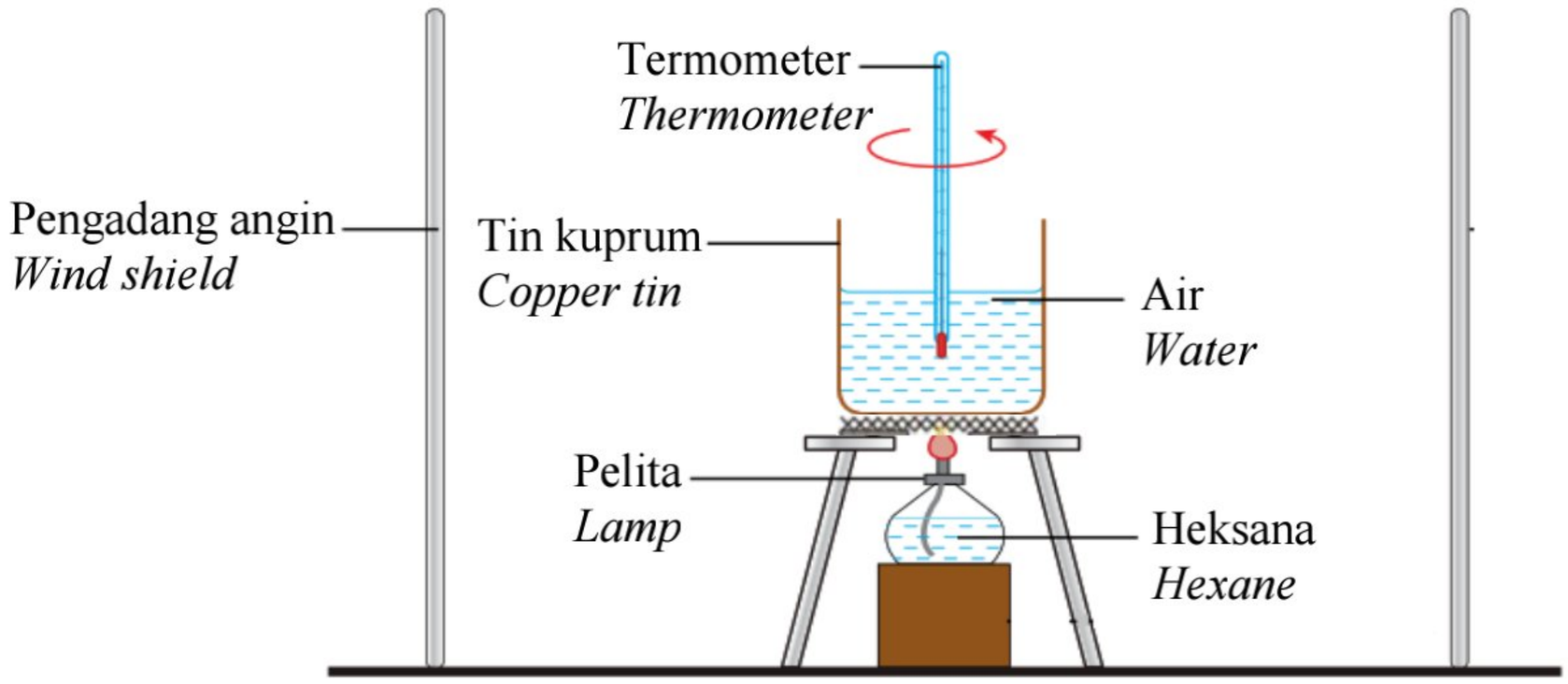
(ii) Cadangkan asid X dan Y. Terangkan perbezaan haba peneutralan bagi tindak balas II apabila dibandingkan dengan tindak balas I.
Suggest acid X and Y. Explain the difference in the heat of neutralisation for reaction II when compared to reaction I.

[4 markah/ 4 *marks*]

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

[3 markah/ 3 *marks*]

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



Rajah 11 / *Diagram 11*

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

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

[2 markah/ 2 *marks*]

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

[4 markah/ 4 *marks*]

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

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

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

[6 markah/ 6 *marks*]

KERTAS SOALAN TAMAT
END OF QUESTION PAPER

Selamat mengulangkaji dari telegram@soalanpercubaanspm
Kimia K2

JADUAL BERKALA UNSUR

1 H Hidrogen 1																	2 He Helium 4
3 Li Litium 7	4 Be Berilium 9											5 B Boron 11	6 C Karbon 12	7 N Nitrogen 14	8 O Oksigen 16	9 F Flourin 19	10 Ne Neon 20
11 Na Natrium 23	12 Mg Magnesium 24											13 Al Aluminum 27	14 Si Silikon 28	15 P Fosforus 31	16 S Sulfur 32	17 Cl Klorin 35	18 Ar Argon 40
19 K Kalium 39	20 Ca Kalsium 40	21 Sc Skandium 45	22 Ti Titanium 48	23 V Vanadium 51	24 Cr Kromium 52	25 Mn Mangan 55	26 Fe Ferum 56	27 Co Kobalt 59	28 Ni Nikel 59	29 Cu Kuprum 64	30 Zn Zink 65	31 Ga Galium 70	32 Ge Germanium 73	33 As Arsenik 75	34 Se Selenium 79	35 Br Bromin 80	36 Kr Kripton 84
37 Rb Rubidium 86	38 Sr Strontium 88	39 Y Itrium 89	40 Zr Zirkonium 91	41 Nb Niobium 93	42 Mo Molibdenum 96	43 Tc Teknetium 98	44 Ru Rutenium 101	45 Rh Rodium 103	46 Pd Paladium 106	47 Ag Argentum 108	48 Cd Kadmium 112	48 In Indium 115	50 Sn Stanum 119	51 Sb Antimoni 122	52 Te Telurium 128	53 I Iodin 127	54 Xe Xenon 131
55 Cs Sesium 133	56 Ba Barium 137	57 La Lantanum 139	72 Hf Hafnium 179	73 Ta Tantalum 181	74 W Tungsten 184	75 Re Renium 186	76 Os Osmium 190	77 Ir Iridium 192	78 Pt Platinum 195	79 Au Aurum 197	80 Hg Merkuri 201	81 Tl Talium 204	82 Pb Plumbum 207	83 Bi Bismut 209	84 Po Polonium 210	85 At Astatin 210	86 Rn Radon 222
87 Fr Fransium 223	88 Ra Radium 226	89 Ac Aktinium 227	104 Unq Unnil-kuadium 257	105 Unp Unnil-pentium 260	106 Unh Unnilhek sium 263	107 Uns Unnilseptium 262	108 Uno Unniloktium 265	109 Une Unnilenium 266									

10 Ne Neon 20 — Nombor proton; Simbol; Nama unsur; Jisim atom relatif

58 Ce Serium 140	59 Pr Praseo-dimium 141	60 Nd Neodimium 144	61 Pm Prometium 147	62 Sm Samarium 150	63 Eu Europium 152	64 Gd Gadolinium 157	65 Tb Terbium 159	66 Dy Disprosium 163	67 Ho Holmium 165	68 Er Erbium 167	69 Tm Tulium 169	70 Yb Iterbium 173	71 Lu Lutetium 175
90 Th Torium 232	91 Pa Proaktinium 231	92 U Uranium 238	93 Np Neptunium 237	94 Pu Plutonium 244	95 Am Amerisium 243	96 Cm Kurium 247	97 Bk Berkelium 247	98 Cf Kalifornium 249	99 Es Einsteinium 254	100 Fm Fermium 253	101 Md Mendele-vium 256	102 No Nobelium 254	103 Lr Lawrensium 257

THE PERIODIC TABLE OF ELEMENTS

1 H Hydrogen 1																	2 He Helium 4
3 Li Lithium 7	4 Be Beryllium 9											5 B Boron 11	6 C Carbon 12	7 N Nitrogen 14	8 O Oxygen 16	9 F Flourine 19	10 Ne Neon 20
11 Na Sodium 23	12 Mg Magnesium 24											13 Al Aluminium 27	14 Si Silicon 28	15 P Phosphorus 31	16 S Sulphur 32	17 Cl Chlorine 35	18 Ar Argon 40
19 K Potassium 39	20 Ca Calcium 40	21 Sc Scandium 45	22 Ti Titanium 48	23 V Vanadium 51	24 Cr Chromium 52	25 Mn Manganese 55	26 Fe Iron 56	27 Co Cobalt 59	28 Ni Nickel 59	29 Cu Copper 64	30 Zn Zinc 65	31 Ga Gallium 70	32 Ge Germanium 73	33 As Arsenic 75	34 Se Selenium 79	35 Br Bromine 80	36 Kr Krypton 84
37 Rb Rubidium 86	38 Sr Strontium 88	39 Y Yttrium 89	40 Zr Zirconium 91	41 Nb Niobium 93	42 Mo Molybdenum 96	43 Tc Technetium 98	44 Ru Ruthenium 101	45 Rh Rhodium 103	46 Pd Palladium 106	47 Ag Silver 108	48 Cd Cadmium 112	48 In Indium 115	50 Sn Tin 119	51 Sb Antimony 122	52 Te Tellurium 128	53 I Iodine 127	54 Xe Xenon 131
55 Cs Cesium 133	56 Ba Barium 137	57 La Lanthanum 139	72 Hf Hafnium 179	73 Ta Tantalum 181	74 W Tungsten 184	75 Re Rhenium 186	76 Os Osmium 190	77 Ir Iridium 192	78 Pt Platinum 195	79 Au Gold 197	80 Hg Mercury 201	81 Tl Thallium 204	82 Pb Lead 207	83 Bi Bismuth 209	84 Po Polonium 210	85 At Astatine 210	86 Rn Radon 222
87 Fr Francium 223	88 Ra Radium 226	89 Ac Actinium 227	104 Unq Unnil-quadium 257	105 Unp Unnil-pentium 260	106 Unh Unnil-hexium 263	107 Uns Unnilseptium 262	108 Uno Unniloctium 265	109 Une Unnilennium 266									

10 Ne Neon 20 — Proton number; Symbol; Name of element; Relative atomic mass

58 Ce Cerium 140	59 Pr Praseo-dymium 141	60 Nd Neodymium 144	61 Pm Promethium 147	62 Sm Samarium 150	63 Eu Europium 152	64 Gd Gadolinium 157	65 Tb Terbium 159	66 Dy Dysprosium 163	67 Ho Holmium 165	68 Er Erbium 167	69 Tm Thulium 169	70 Yb Ytterbium 173	71 Lu Lutetium 175
90 Th Thorium 232	91 Pa Proactinium 231	92 U Uranium 238	93 Np Neptunium 237	94 Pu Plutonium 244	95 Am Americium 243	96 Cm Curium 247	97 Bk Berkelium 247	98 Cf Californium 249	99 Es Ein-steinium 254	100 Fm Fermium 253	101 Md Mendele-vium 256	102 No Nobelium 254	103 Lr Lawrensium 257

Reference: Chang, Raymond (1991). Chemistry. McGraw-Hill, Inc.

MAKLUMAT UNTUK CALON
INFORMATION FOR CANDIDATES

1. Kertas peperiksaan ini mengandungi tiga bahagian: **Bahagian A**, **Bahagian B** dan **Bahagian C**.
   This question paper consists of three sections: ***Section*** **A**, ***Section*** **B** *and* ***Section*** **C**.

2. Jawab **semua** soalan dalam **Bahagian A**. Jawapan anda bagi **Bahagian A** hendaklah ditulis pada ruang yang disediakan dalam kertas peperiksaan.
   Answer ***all*** *questions in* ***Section*** **A**. *Write your answers for* ***Section*** **A** *in the spaces provided in this question paper.*

3. Jawab mana-mana **satu** soalan daripada **Bahagian B** dan **semua** soalan daripada **Bahagian C**. Tulis jawapan anda bagi **Bahagian B** dan **Bahagian C** dalam helaian tambahan yang dibekalkan oleh pengawas peperiksaan. Anda boleh menggunakan persamaan, rajah, jadual, graf dan cara lain yang sesuai untuk menjelaskan jawapan anda.
   Answer any ***one*** *question from* ***Section*** **B** *and* ***all*** *question from* ***Section*** **C**. *Write your answers for* ***Section*** **B** *and* ***Section*** **C** *on the 'helaian tambahan' provided by the invigilators. You may use equations, diagrams, tables, graphs and other suitable methods to explain your answers.*

4. Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.
   The diagrams in the questions are not drawn to scale unless stated.

5. Markah yang diperuntukkan bagi setiap soalan atau ceraian soalan ditunjukkan dalam kurungan.
   Marks allocated for each question or sub-part of a question are shown in brackets.

6. Tunjukkan kerja mengira. Ini membantu anda mendapatkan markah.
   Show your working. It may help you to get marks.

7. Jika anda hendak menukar jawapan, batalkan jawapan yang telah dibuat. Kemudian tulis jawapan yang baharu.
   If you wish to change your answer, cross out the answer that you have done. Then write down the new answer.

8. Jadual Berkala Unsur disediakan di halaman 25 dan 26.
   The Periodic Table of Elements is provided on pages 25 and 26.

9. Anda dibenarkan menggunakan kalkulator saintifik.
   You may use a scientific calculator.

10. Anda dinasihati supaya mengambil masa 90 minit untuk menjawab soalan dalam **Bahagian A**, 30 minit untuk **Bahagian B** dan 30 minit untuk **Bahagian C**.
    You are advised to spend 90 *minutes to answer questions in* ***Section*** **A**, 30 *minutes for* ***Section*** **B** *and* 30 *minutes for* ***Section*** **C**.