4541/2
Kimia
Kertas 2
Ogos
2010
2 ½ jam

Nama Pelajar : .....

Tingkatan :.....

PERSIDANGAN KEBANGSAAN PENGETUA-PENGETUA
SEKOLAH MENENGAH MALAYSIA
CAWANGAN KELANTAN

PEPERIKSAAN PERCUBAAN 2010
SIJIL PELAJARAN MALAYSIA

KIMIA

Kertas 2

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini adalah dalam dwibahasa*
2. *Setiap soalan mengandungi kedua-dua bahasa Inggeris dan bahasa Melayu. Bahagian atas dalam bahasa Inggeris dan diikuti di bawahnya oleh bahasa Melayu*
3. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan samada dalam bahasa Melayu atau bahasa Inggeris*
4. *Calon dikehendaki membaca maklumat dihalaman 2.*

Kod Pemeriksa			
Bahagian	Soalan	Markah Penuh	Markah Diperolehi
A	1	9	
	2	10	
	3	10	
	4	10	
	5	10	
	6	11	
B	7	20	
	8	20	
C	9	20	
	10	20	
Jumlah			

Kertas soalan ini mengandungi 24 halaman bercetak

INFORMATION FOR CANDIDATES

1. This question paper consists of three sections**: Section A, Section B** and **Section C.**

2. Answer **all** questions in **Section A**. Write your answers for section A in the space provided in the question paper.

3. Answer one question from **Section B** and one question from **Section C.**

4. Write your answer for **Section B** and **Section C** on the "helaian tambahan" .

5. The diagrams in the questions are not drawn to scale unless stated.

6. Mark allocated for each question or part question are shown in brackets.

7. The time suggested to answers **Section A** is 90 minute, **Section B** is 30 minute and **Section C** is 30 minute

8. You may use a non-programmable scientific calculator.

MAKLUMAT KEPADA CALON

1. Kertas soalan ini mengandungi tiga bahagian: ***Bahagian A, Bahagian B*** *dan* ***Bahagian C****.*

2. Jawab semua soalan dalam Bahagian A. Tuliskan jawapan anda untuk Bahagian A dalam ruang yang disediakan dalam kertas soalan.

3. Jawab satu soalan daripada Bahagian B dan satu soalan daripada Bahagian C.

4. Tuliskan jawapan anda bagi Bahagian B dan C pada helaian tambahan.

5. Rajah yang mengiringi soalan tidak dilukis mengikut skala secuali dinyatakan.

6. Markah yang diperuntukkan bagi setiap soalan atau ceraian soalan ditunjukkan dalam kurungan.

7. Masa yang dicadangkan untuk menjawab Bahagian A ialah 90 minit, Bahagian B 30 minit dan Bahagian C ialah 30 minit.

8. Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogramkan.

Section A

[60 marks]
[60 *markah*]

Answer **all** questions
Jawab **semua** *soalan*

1 (a) Table 1 shows the information of atoms P, Q and R.
Jadual 1 *menunjukkan maklumat bagi atom-atom* P, Q dan R

Atom	**Number of protons** ***Bilangan proton***	**Number of neutrons** ***Bilangan neutron***	**Nucleon Number** ***Nombor Nukleon***
P	12	12	24
Q	17		35
R	20	20	40

Table 1
Jadual 1

(i) What is meant by nucleon number?
Apakah yang dimaksudkan dengan nombor nukleon?

……..
[1 mark]

(ii) State the number of neutrons for element Q .
Nyatakan bilangan neutron bagi unsur Q.

……..
[1 mark]

(iii) Draw and label the atomic structure of atom P.
Lukis dan labelkan struktur atom bagi atom P.

[2 marks]

(iv) State the number of electrons for element R.

Nyatakan bilangan elektron bagi unsur R.

……..

[1 mark]

(b) Table 2 shows the temperature from an experiment to determine the freezing point of naphthalene.
Jadual 2 *menunjukkan suhu daripada satu eksperimen untuk menentukan takat beku naftalena.*

Time (s)	0	30	60	90	120	150	180	210
Temperature (^oC)	95	85	82	80	80	80	80	70

Table 2
***Jadual* 2**

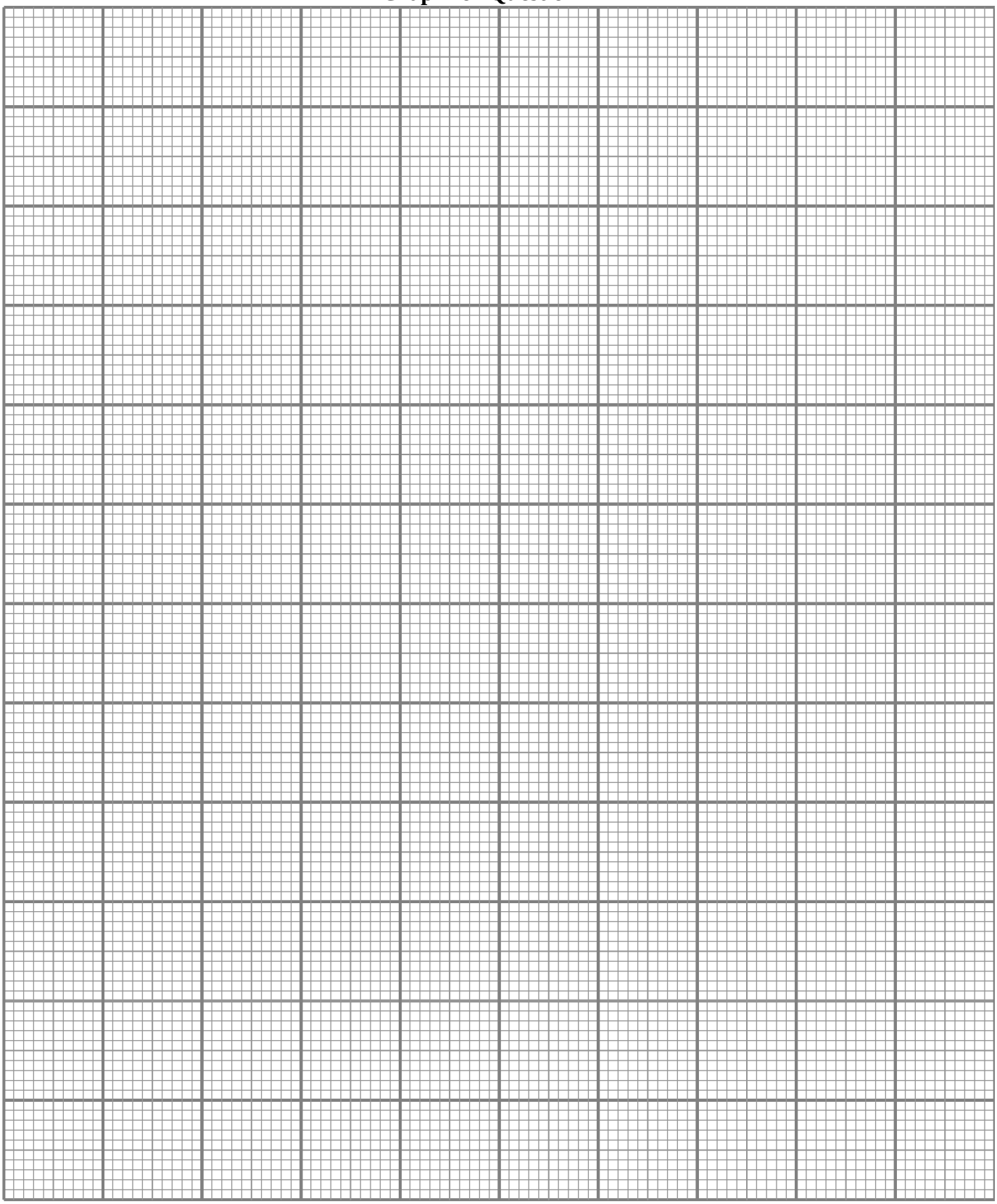
(i) On the graph paper provided, draw the graph of temperature against time for the cooling of naphthalene.
Pada kertas graf yang disediakan, lukiskan graf suhu melawan masa bagi penyejukan naftalena.

[3 marks]

(ii) Using the graph in (b), determine the freezing point of naphthalene. Show on the graph how you determine this freezing point.
Menggunakan graf di (b)*, tentukan takat beku naftalena. Tunjukkan pada graf bagaimana anda menentukan takat beku ini.*

[1 mark]

Graph for Question 1



2 (a) In a close container, contains 6.0 dm^3 of carbon dioxide gas at room temperature.
Di dalam suatu bekas tertutup, terdapat 6.0 dm^3 *gas karbon dioksida, pada suhu bilik.*

(i) How many molecules are there in 6.0 dm^3 of carbon dioxide gas, CO_2 ?
Berapakah bilangan molekul yang terdapat dalam 6.0 dm^3 *gas karbon dioksida ?*
[Avogadro's number = 6.02×10^{23} mol^{-1}]
[1 mole of gas occupies 24 dm^3 at room temperature]
Use: No of mole = $\frac{\text{Number of particles}}{6.02 \times 10^{23} \text{ mol}^{-1}]}$

[2marks]

(ii) Calculate the mass of carbon dioxide gas in the container
[Relative molecular mass for CO_2 = 44]
Use: No of mole = $\frac{\text{mass}}{\text{molar mass}}$

[1mark]

(b) Diagram 2 shows the set-up of apparatus for an experiment to determine the empirical formula of magnesium oxide.
Rajah 2 menunjukkan susunan radas bagi satu experiment untuk menentukan formula empirik magnesium oksida.

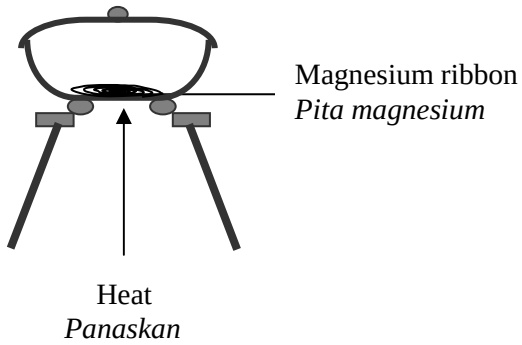


Diagram 2
Rajah 2

Table 2 shows the results of this experiment
Jadual 2 menunjukkan keputusan eksperimen ini

Description ***Penerangan***	**Mass (g)** ***Jisim* (g)**
Mass of crucible + lid *Jisim mangkuk pijar + penutup*	34.0
Mass of crucible + lid + magnesium ribbon *Jisim mangkuk pijar + penutup + pita magnesium*	36.4
Mass of crucible + lid + magnesium oxide *Jisim mangkuk pijar + penutup + magnesium oksida*	38.0

(b) (i) What is the meaning of emperical formula
Apakah maksud formula empirik

…….

……..
[1mark]

(ii) Base on table 2, calculate the mass of:
Berdasarkan jadual 2, *hitungkan jisim bagi*

Magnesium :

Oxygen :

[2marks]

(iii) Calculate the ratio of mole of magnesium atoms to oxygen atoms.
Hitung nisbah mol bagi atom magnesium kepada atom oksigen
[Relative atomic mass: O=16, Mg =24]

[1 mark]

(iv) Determine the empirical formula of magnesium oxide.
Hitungkan formula empirik magnesium oxida

[1 mark]

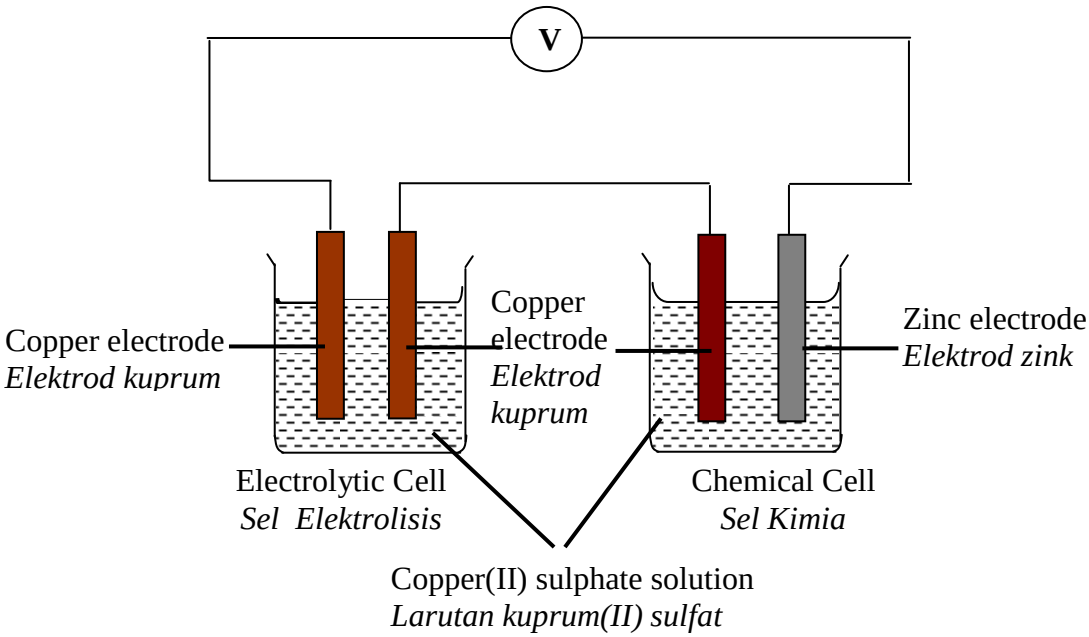
(v) Why was the crucible lid opened once in a while during the experiment?
Mengapakah penutup mangkuk pijar semasa experiment di jalanakan?

……..……..
[1 mark]

(v) State why the empirical formula of copper oxide cannot be determine by using the same technique.
Nyatakan mengapa formula empirik bagi kuprum oksida tidak dapat di tentukan dengan menggunakan teknik yang sama.

……..……..
[1 mark]

3 Diagram 3 shows the set up of the apparatus with the combination of electrolytic cell and chemical cell.
Rajah 3 menunjukkan susunan radas gabungan sel elektrolisis dan sel kimia..



(a) Which cell will produce electrical energy?
Sel yang manakah akan menghasilkan tenaga elektrik?

……..……..
[1 mark]

(b) Write the formulae of all ions that are present in copper(II) sulphate solution.
Tuliskan formula semua ion yang hadir di dalam larutan kuprum(II) sulfat

…… ……..……..
[1 mark]

(c) Based on the chemical cell
Berdasarkan kepada sel kimia

(i) Label the negatif terminal of the cell.
Labelkan terminal negatif sel itu.

[1 mark]

(ii) State the flow of electron.
Nyatakan arah pengaliran elektron.

……..……..
[1 mark]

(iii) State the observation at copper electrode.
Nyatakan pemerhatian pada elektrod kuprum.

……..
[1 mark]

(iv) Write half equation for the reaction at cooper.
Tuliskan persamaan setengah bagi tindak balas di kuprum.

……..
[1 mark]

(d) Based on the reaction in electrolytic cell
Berdasarkan tindakbalas pada sel elektrolisis

(i) What is the observation at anode
Apakah pemerhatian di anod

……..……..
[1 mark]

(ii) Explain the observation in (d)(i)
Terangkan pemerhatian di (d)(i)

. ……

. ……
[2 marks]

(iii) Name the product formed at cathode.
Namakan hasil yang terbentuk pada katod.

……..……..
[1 mark]

4 Diagram 4 shows Experiment I and II in the preparation of a salt.
Rajah 4 menunjukkan Eksperimen 1 *dan* II *dalam penyediaan suatu garam.*

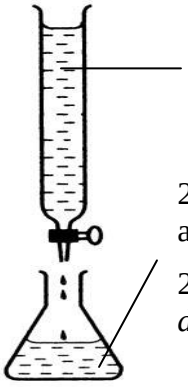
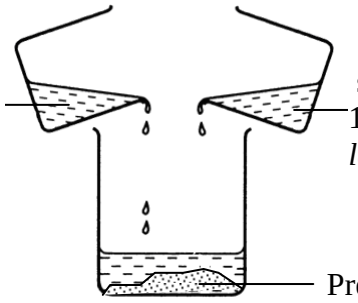
Experiment ***Eksperimen***	**Method** ***Kaedah***
I	 40.0 cm^3 of 0.1 mol dm^{-3} hydrochloric acid 40.0 cm^3 0.1 mol dm^{-3} *asid hidroklorik* 20.0 cm^3 of 0.2 mol dm^{-3} potassium hydroxide and methyl orange 20.0 cm^3 0.2 mol dm^{-3} *kalium hidroksida dan metil jingga*
II	Excess lead(II) nitrate solution *Larutan plumbum(II) nitrat berlebihan*  10 cm^3 of 0.5 mol dm^{-3} sodium sulphate solution 10 cm^3 0.5 mol dm^{-3} *larutan natrium sulfat* Precipitate X *Mendakan* X

Diagram 4
Rajah 4

(a) Based on Experiment I:
Berdasarkan Eksperimen I *:*

(i) State **one** observation in this experiment
Nyatakan ***satu*** *pemerhatian dalam eksperimen ini*

.....

[1 mark]

(ii) State the name of the salt formed.
Nyatakan nama garam yang terbentuk.

.....

[1 mark]

(b) Experiment I is repeated by using sulphuric acid of the same concentration. Predict the volume of sulphuric acid is required to react with all potassium hydroxide.
Experiment I *diulang dengan menggunakan asid sulfurik yang berkepekatan sama. Ramalkan isipadu asid sulfurik yang diperlukan untuk tindak balas dengan semua kalium hidroksida.*

.....

[1 mark]

(c) Based on Experiment II:
Berdasarkan Eksperimen II *:*

(i) State the type of the reaction.
Nyatakan jenis tindak balas itu.

.....

[1 mark]

(ii) Write a balanced chemical equation for the reaction.
Tuliskan persamaan kimia seimbang bagi tindak balas itu.

.....

[2 marks]

(iii) State the name of precipitate X
Nyatakan nama bagi mendakan X.

.....

[1 mark]

(iv) Calculate the number of mole of sodium sulphate in the solution.
Hitungkan bilangan mol natrium sulfat yang terdapat dalam larutan.

[1 mark]

(v) Calculate the mass of precipitate X formed.
[Relative atomic mass ; O = 16, S = 32, Pb=207]
Hitungkan jisim mendakan X yang terbentuk.
[Jisim atom relatif ; O = 16, S = 32, Pb=207*]*

[2 marks]

5 Diagram 5 shows the flow chart of a series of reactions undergone by propene.
Rajah 5 menunjukkan carta alir siri tindakbalas yang dialami oleh propena.

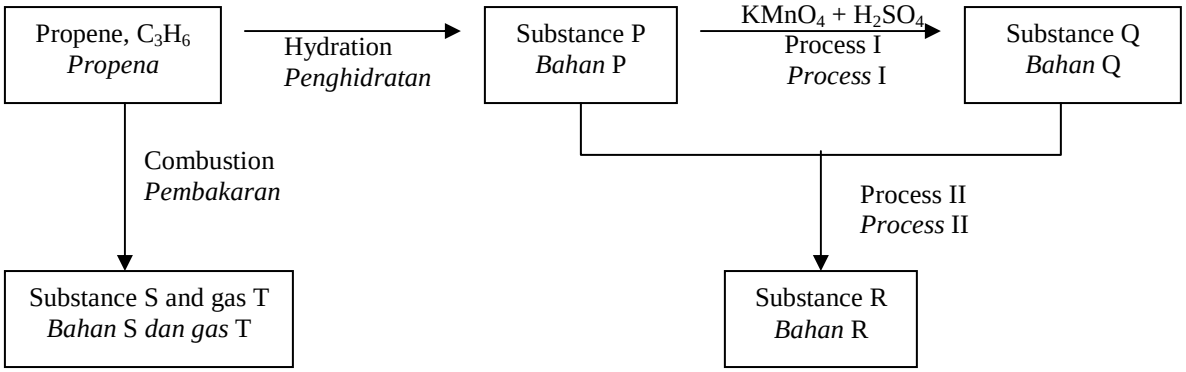


Diagram 5
Rajah 5

(a) Name the homologous series of propene.
Namakan siri homolog untuk propena

.....

[1 mark]

(b) Draw the structural formula of substance P.
Lukiskan formula struktur bahan P.

[1 mark]

(c) Propene is burnt completely in air to produce substance S and gas T.
Propena dibakar lengkap dalam udara untuk menghasilkan bahan S dan gas T .

(i) Write the chemical equation for the reaction.
Tuliskan persamaan kimia untuk tindakbalas.

.....

[1 mark]

(ii) State a chemical test to identify the gas T.
Nyatakan satu ujian kimia untuk mengenalpasti gas T.

.....

.....

[2 marks]

(d) Draw the set up of apparatus used in Process I.
Lukiskan susunan alat radas yang digunakan dalam proses I .

[2 marks]

(e) Name another chemical that can be used to replace acidified potassium manganate(VII) solution in Process I .
Namakan bahan kimia lain yang boleh digunakan untuk menggantikan larutan kalium mangganat (VII) berasid dalam proses I .

.....

[1 mark]

(f) Based on Process II,
Berdasarkan Proses II,

(i) write the chemical formula of substance R.
tulis formula kimia bahan R

.....

[1 mark]

(ii) what would be observed when substance R is added to the water?
a*pakah yang akan diperhatikan apabila sebatian R ditambah kepada air ?*

.....

[1 mark]

6

Rusting of iron is a redox reaction which can occurs naturally.
Pengaratan besi adalah suatu tindak balas redoks yang boleh berlaku secara semulajadi.

(a) What is redox reaction.
Apakah tindakbalas redoks.

.....
[1 mark]

(b) State the conditions for iron rust naturally
Nyatakan keadaan untuk besi berkarat secara semulajadi.

.....
[1 mark]

(c) Iron undergoes oxidation reaction during rusting .Write half equation for the oxidation of iron.

Besi mengalami pengoksidaan semasa berkarat. Tuliskan setengah persamaan untuk pengoksidaan besi..

.....
[1 mark]

(d) Draw a labeled diagram for rusting of iron to show how the condition of rusting of iron involves the flow of electron, negative pole and positive pole.

Lukiskan gambarajah berlabel bagi proses pengaratan besi yang menunjukkan bagaimana syarat untuk pengaratan besi melibatkan pengaliran elektron, kutub negatif dan kutub positif.

[3marks]

(e) Describe the transfer of electron and the reaction that take place at the positive pole after iron is oxidized.

Huraikan pemindahan elektron dan tindak balas yang berlaku pada kutub positif selepas besi dioksidakan.

.....

.....

.....

[3marks]

(f) State **two** ways of preventing the rusting of iron.

Nyatakan dua cara untuk mengelakkan besi berkarat..

.....

.....

[2marks]

Section B
Bahagian B

[20 marks]

7 (a) Diagram 7.1 shows the electron arrangement of ion W^{3-}.

Rajah 7.1 *menunjukkan susunan elektron bagi ion* W^{3-}.

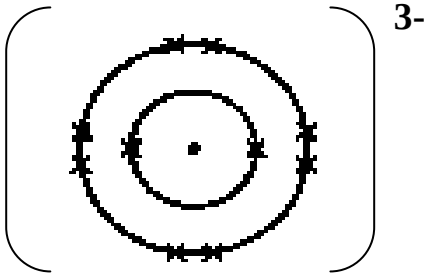


Diagram 7.1
Rajah 7.1

(i) Write the electron arrangement for the **atom** W.

*Tuliskan susunan elektron bagi **atom*** W.

[1 mark]

(ii) State the position for atom W in the Periodic Table of Elements.
Give **a** reason for your answer.

Nyatakan kedudukan bagi atom W *dalam Jadual Berkala Unsur*
Berikan sebab bagi jawapan anda.

[4 marks]

(b) (i) Rubidium, Rb, is located below sodium, Na, in Group 1 of the Periodic Table.
Predict **two** observations when rubidium reacts with water.

Rubidium, Rb, *terletak di bawah natrium,* Na, *dalam Kumpulan* 1 *Jadual Berkala.*
Ramalkan **dua** *pemerhatian apabila rubidium bertindak balas dengan air.*

[2 marks]

(ii) Write a chemical equation for the reaction between rubidium and water.

Tuliskan persamaan kimia bagi tindak balas antara rubidium dan air.

[2 marks]

(iii) State **one** precaution that must be taken in handling Group 1 elements.

Nyatakan **satu** *langkah berjaga-jaga yang perlu diambil dalam pengendalian unsur Kumpulan* 1.

[1 mark]

(c) Diagram 7.2 shows four compounds.

Rajah 7.2 *menunjukkan empat sebatian.*

- Magnesium oxide, MgO
  Magnesium oksida, MgO
- Ethanol, C_2H_5OH
  Etanol, C_2H_5OH
- Hexane, C_6H_{14}
  Heksana, C_6H_{14}
- Sodium chloride, NaCl
  Natrium klorida, NaCl

Diagram 7.2
Rajah 7.2

(i) Based on Diagram 7.2, classify each of the compounds into ionic compound and covalent compounds.

Berdasarkan Rajah 7.2 *, kelaskan setiap sebatian itu kepada sebatian ion dan sebatian kovalen.*

[2 marks]

(ii) Choose **one** of the ionic and **one** of the covalent compounds given in (c) (i) and state **two** differences in their physical properties.
Explain the differences.

Pilih ***satu*** *sebatian ionik dan* ***satu*** *sebatian kovalen yang diberi dalam* (c) (i) *dan* n*yatakan* ***dua*** *perbezaan dalam sifat fiziknya.*
Terangkan perbezaan itu.

[8 *marks*]

8 (a) Explain why metal structures of buildings in industrial areas are easier to corrode than those in housing areas.

Terangkan mengapa struktur logam pada bangunan di kawasan perindustrian lebih mudah terkakis berbanding dengan bangunan di kawasan perumahan.

[4 *marks*]

(b) A student was carried out three experiments to investigate some factors which influence the rate of reaction between zinc and hydrochloric acid.
Table 8 shows the results of the experiments.

Seorang pelajar telah menjalankan tiga eksperimen untuk mengkaji beberapa faktor yang mempengaruhi kadar tindak balas antara zink dan asid hidroklorik. Jadual 8 *menunjukkan keputusan eksperimen itu.*

Experiment **Eksperimen**	**I**	**II**	**III**
Reactants *Bahan tindak balas*	6.5 g of zinc granules and 50 cm^3 of 0.2 mol dm^{-3}.hydrocholoric acid 6.5 g *ketulan.zink dengan* 50 cm^3 0.2 mol dm^{-3} *asid hidroklorik*	6.5 g of zinc granules and 50 cm^3 of 0.4 mol dm^{-3}.hydrocholoric acid 6.5 g *ketulan zink dengan* 50 cm^3 0.4 mol dm^{-3} *asid hidroklorik* .	6.5 g of zinc powder and 50 cm^3 of 0.2 mol dm^{-3} hydrocholoric acid 6.5 g *serbuk zink dengan* 50 cm^3 0.2 mol dm^{-3} *asid hidroklorik* .
Time taken for the maximum volume of gas collected (minute) *Masa yang diambil untuk mengumpul isi padu maksimum gas* (minit)	10.0	10.0	5.0
Observation when the reaction stopped. *Pemerhatian apabila tindak balas berhenti*.	Some zinc is left unreacted *Sedikit zink tertinggal tidak bertindak balas*	Some zinc is left unreacted *Sedikit zink tertinggal tidak bertindak balas*	Some zinc is left unreacted *Sedikit zink tertinggal tidak bertindak balas*

Table 8
Jadual 8

(i) Write the chemical equation for the reaction between zinc and hydrochloric acid.
Calculate the maximum volume of gas collected in Experiment II
[Molar gas volume: 24 dm^3 mol^{-1} at room condition]

Tuliskan persamaan kimia bagi tindak balas antara zink dengan asid hidroklorik.
Hitungkan isi padu maksimum gas yang dikumpulkan dalam Eksperimen II.
[*Isi padu molar gas*: 24 dm^3 mol^{-1} *pada keadaan bilik*]

[4 marks]

(ii) Sketch the graphs for the volume of gas against time for Experiment I, II and III on the same axes.

Lakarkan graf bagi isipadu gas melawan masa bagi eksperimen I, II, *dan* III *pada paksi yang sama*.

[4 marks]

(iii) Calculate the average rate of reaction for Experiment I, II and III in cm^3s^{-1}.

Hitungkan kadar tindak balas purata bagi Eksperimen I, II dan III dalam cm^3s^{-1}.

[3 marks]

(iv) Compare the initial rates of reaction between Experiment I and Experiment II, and between Experiment I and Experiment III.
With reference to collision theory, explain why there are differences in the initial rates of reaction in the experiments.

Bandingkan kadar awal tindak balas bagi Eksperimen I *dengan Eksperimen* II *dan Eksperimen* I *dengan Eksperimen* III.
Terangkan dengan merujuk kepada teori pelanggaran mengapa terdapat perbezaan kadar awal tindak balas dalam eksperimen tersebut.

[8 *marks*]

Section C
Bahagian C

[20 marks]

9 (a) Ammonium sulphate,$(NH_4)_2SO_4$ and urea,$(NH_2)_2CO$ are two fertilisers. Which is the better fertiliser?. Explain your answer.

Ammonium sulfat,$(NH_4)_2SO_4$ dan urea,$(NH_2)_2CO$ adalah dua contoh baja. Baja yang manakah lebih baik?. Terangkan jawapan anda

[Relative atomic mass; H=1,C=12, N=14, O=16, S=32]

[4 marks]

(b) Diagram 9 shows the arrangement of atoms in pure copper and bronze.

Rajah 9 menunjukkan susunan atom dalam kuprum tulen dan gangsa.

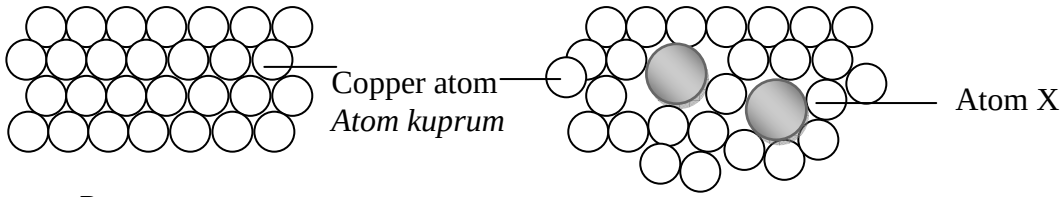


Diagram 9
Rajah 9

(i) Name atom X.
Namakan atom X.

[1 mark]

(ii) Explain why bronze is harder than pure copper.

Terangkan mengapa gangsa lebih keras daripada kuprum tulen.

[6 marks]

(c) You are given liquid soap, sample of hard water, sample of soft water and other materials. Describe an experiment to investigate the effectiveness of cleaning action of the soap in different types of water. Your description must include example of hard and soft water, observation and conclusion.

Anda dibekalkan dengan cecair sabun, contoh air liat, contoh air lembut serta bahan-bahan lain. Huraikan satu eksperimen untuk menyiasat kesan pencucian sabun dalam jenis air yang berbeza. Huraian anda hendaklah mengandungi contoh air liat dan air lembut, pemerhatian dan kesimpulan.

[10 marks]

10(a) The thermochemical equation between hydrogen and chlorine is shown below:

Persamaan termokimia antara hidrogen dan klorin adalah seperti di bawah:

$$H_2 + Cl_2 \rightarrow 2HCl \qquad \triangle H = 184 kJmol^{-1}$$

Explain, in terms of the bonds broken and bonds formed, why the reaction is exothermic?

Terangkan berdasarkan pemecahan ikatan dan pembentukan ikatan, mengapakah tindak balas ini adalah eksotermik?

[4 marks]

(b) The following equation represents a neutralisation reaction.

Persamaan berikut mewakili satu persamaan tindakalas peneutralan.

$$HCl + NaOH \longrightarrow NaCl + H_2O \quad \triangle H = -57\ kJmol^{-1}$$

Draw the energy profile diagram for the neutralisation reaction. Label on the diagram the activation energy, Ea, and the heat of neutralisation, $\triangle H$.

Lukiskan gambarajah profil tenaga bagi tindakbalas peneutralan. Labelkan pada rajah, tenaga pengaktifan, Ea, dan haba peneutralan, $\triangle H$.

[5 marks]

(c) By using an example of reaction, describe an experiment to determine the heat of neutralisation between a weak acid and a strong alkali. Your description should include the following:

Dengan menggunakan satu contoh tindak balas, huraikan satu eksperimen untuk menentukan haba peneutralan antara acd lemah dan alkali kuat. Huraian anda perlu mengandungi perkara berikut:

- procedure of experiment
  prosedur eksperimen
- * result and calculations
  keputusan dan pengiraan

[11 marks]

END OF QUESTION PAPER

4541/3
Kimia
Kertas 3
Ogos
2010
1 ½ jam

Nama Pelajar : .....

Tingkatan :.....

PERSIDANGAN KEBANGSAAN PENGETUA-PENGETUA
SEKOLAH MENENGAH MALAYSIA
CAWANGAN KELANTAN

PEPERIKSAAN PERCUBAAN 2010
SIJIL PELAJARAN MALAYSIA

KIMIA

Kertas 3

Satu jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas soalan ini adalah dalam dwibahasa.*

2. *Setiap soalan mengandungi kedua-dua bahasa Inggeris dan bahasa Melayu. Bahagian atas dalam bahasa Inggeris dan diikuti di bawahnya oleh bahasa Melayu*

3. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan samada dalam bahasa Melayu atau bahasa Inggeris*

4. *Calon dikehendaki membaca maklumat di halaman 2 dan 3*

Kod Pemeriksa		
Soalan	Markah Penuh	Markah Diperolehi
1	33	
2	17	
JUMLAH	50	

Kertas soalan ini mengandungi 11 halaman bercetak

INFORMATION FOR CANDIDITES

1. This question paper consists of two questions. Answer all questions.

2. Write your answers for **Question 1** in the spaces provided in the question paper.

3. Write your answers for **Question 2** on the "helaian tambahan". You may use equation, diagrams, tables, graphs and other suitable methods to explain your answer.

4. Show your working, it may help you to get marks.

5. If you wish to change your answer, neatly cross out the answer that you have done. Then write down the new answer.

6. The diagrams in the questions are not drawn to scale unless stated.

7. Mark allocated for each question or part question are shown in brackets.

8. The time suggested to answers **Question 1** is 45 minutes and **Question 2** is 45 minutes.

9. You may use a non-programmable scientific calculator.

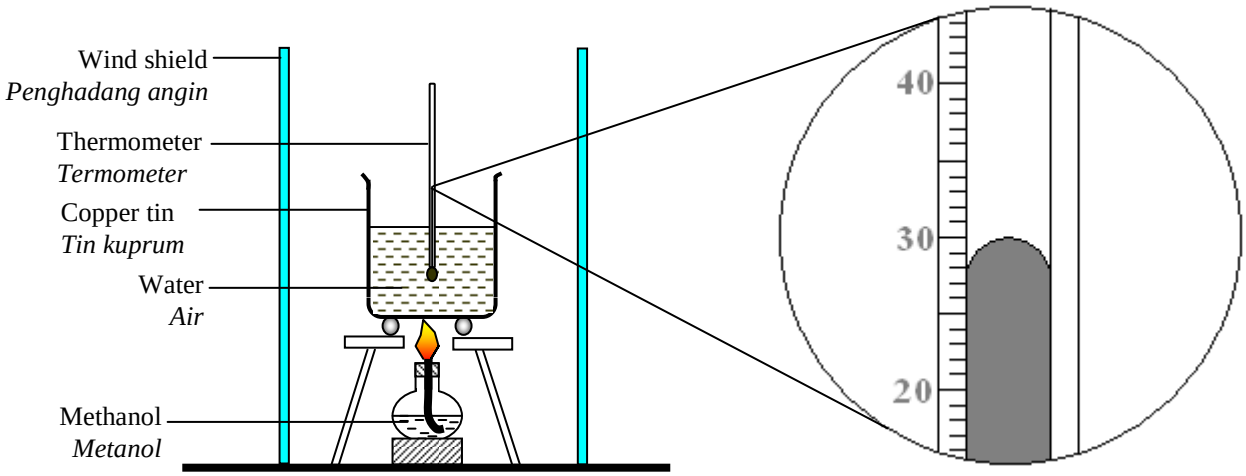
10. Hand your answer sheets at the end of the examination.

Marks awarded:

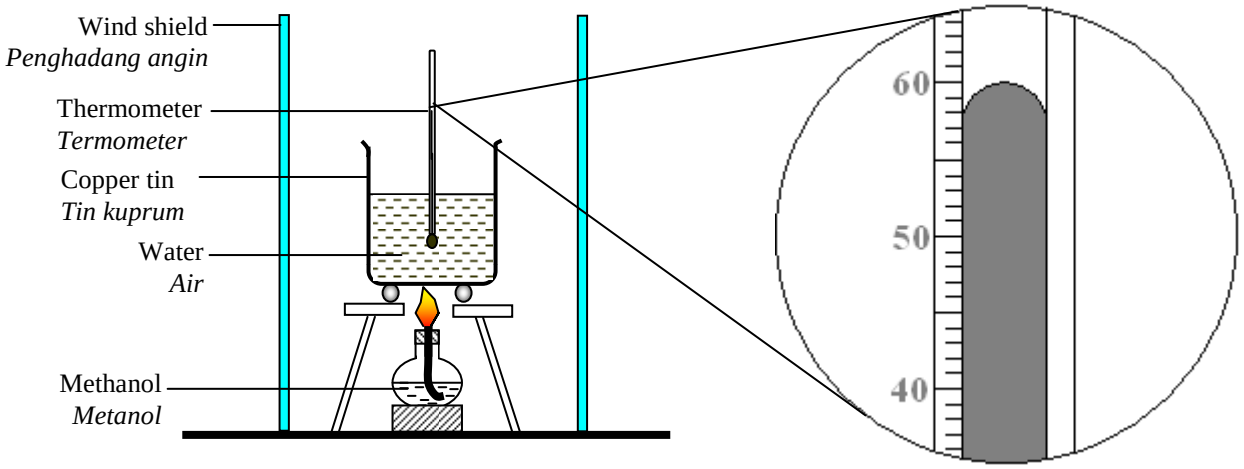
Mark	Description
3	Excellent : The best response
2	Satisfactory : An average response
1	Weak : An inaccurate response
0	No response or wrong response

1. An experiment is carried out to determine the heat of combustion of four alcohols, methanol (CH_3OH), ethanol (C_2H_5OH), propanol (C_3H_7OH) and butanol (C_4H_9OH). The initial mass of lamp containing alcohol is measured before burning the alcohol. 200 cm^3 of water is then heated with alcohol in the spirit lamp until the temperature of water rises by 30°C. The final mass of lamp containing alcohol is measured again after burning. Diagram 1.1 shows the set up of apparatus and thermometer reading of water for this experiment.

Satu eksperimen telah dijalankan untuk menentukan haba pembakaran empat jenis alkohol, metanol (CH_3OH), etanol (C_2H_5OH), propanol (C_3H_7OH) dan butanol (C_4H_9OH). *Jisim awal pelita yang mengandungi alkohol diukur sebelum pembakaran alkohol.* 200 cm^3 *air kemudian dipanaskan dengan alkohol dalam pelita sehingga suhu air meningkat sebanyak* 30°C. *Jisim akhir pelita yang mengandungi alkohol diukur sekali lagi selepas pembakaran. Rajah* 1.1 *menunjukkan susunan radas dan bacaan termometer suhu air bagi eksperimen ini.*



Initial temperature
Suhu awal



Final temperature
Suhu akhir

Diagram 1.1
Rajah 1.1

(a) (i) State **one** observation in Diagram 1.1.
*Nyatakan **satu** pemerhatian dalam Rajah* 1.1.

……
[3 marks]
[3 *markah*]

(ii) Give **one** inference based on the observation in (a)(i).
*Berikan **satu** inferens berdasarkan pemerhatian dalam* (a)(i).

……
[3 marks]
[3 *markah*]

(b) For this experiment, state:
Bagi eksperimen ini, nyatakan:

(i) The manipulated variable
Pembolehubah dimanipulasi

……

(ii) The responding variable
Pembolehubah bergerak balas

……

(iii) The fixed variable
Pembolehubah dimalarkan

……
[3 marks]
[3 *markah*]

(c) State **one** hypothesis for this experiment.
*Nyatakan **satu** hipotesis bagi eksperimen ini.*

…..……

……..

……..
[3 marks]
[3 *markah*]

(d) Diagram 1.2 shows the initial and final reading of the electronic balance for the mass of spirit lamp before burning and after burning of four alcohols.
Rajah 1.2 *menunjukkan bacaan awal dan akhir penimbang elektronik bagi jisim pelita sebelum pembakaran dan selepas pembakaran bagi empat alkohol.*

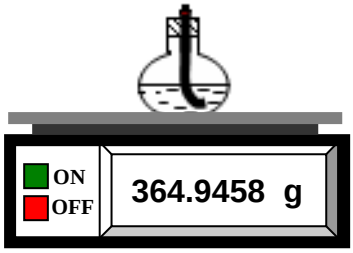
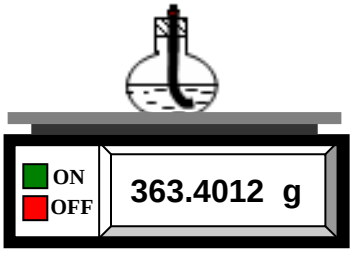
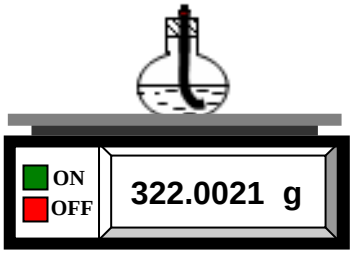
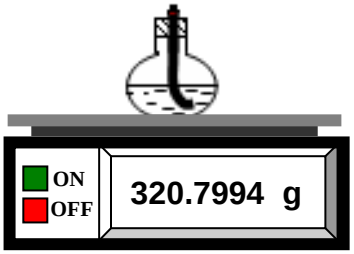
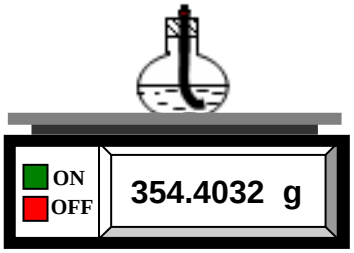
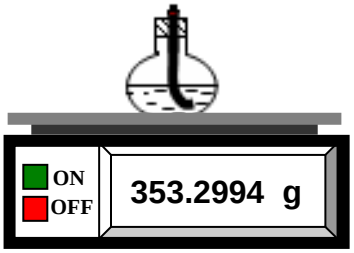
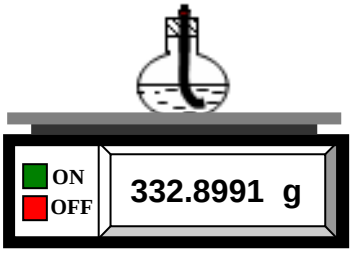
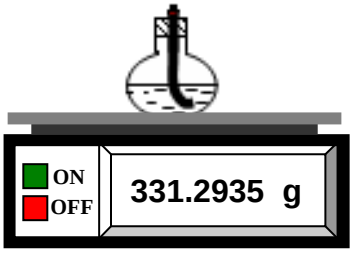
Alcohol *Alkohol*	Initial reading (g) *Bacaan awal*	Final reading (g) *Bacaan akhir*	Mass of alcohol used (g) *Jisim alkohol digunakan*
Methanol *Metanol*			
Ethanol *Etanol*			
Propanol *Propanol*			
Butanol *Butanol*			

Diagram 1.2
Rajah 1.2

Based on Diagram 1.2, state the mass of the alcohols used in space provided into two decimal places.
Berdasarkan Rajah 1.2, *nyatakan jisim alkohol yang digunakan dalam ruangan yang disediakan kepada dua tempat perpuluhan.*

[3 marks]
[3 *markah*]

(e) Calculate the heat of combustion of methanol.
[Heat capasity of water = 4.2 $Jg^{-1o}C^{-1}$]
[Molar mass of methanol = 32gmol $^{-1}$]

Hitungkan haba pembakaran bagi metanol.
[*Muatan haba tentu air = 4.*2 $Jg^{-1o}C^{-1}$]
[*Jisim molar metanol* = 32gmol $^{-1}$]

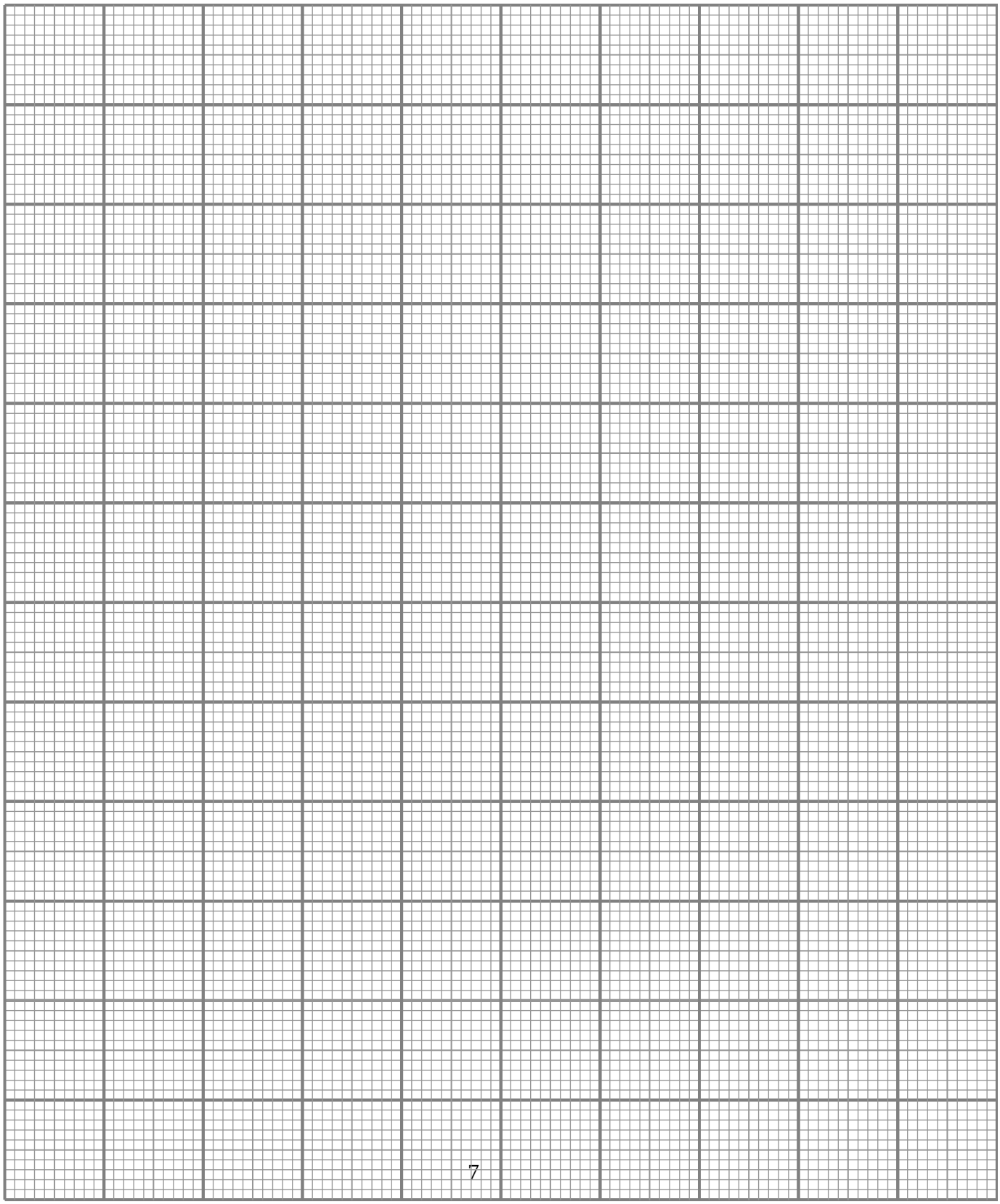
[3 marks]
[3 *markah*]

(f) Using the data in Table 1.1 and the heat of combustion of methanol calculated in (e), plot a graph of heat of combustion against number of carbon atoms per molecule of alcohol.
Dengan menggunakan data dalam Jadual 1.1 *dan haba pembakaran bagi metanol yang dihitung dalam (e), lukiskan graf haba pembakaran melawan bilangan atom karbon per molekul alkohol.*

Alcohol *Alkohol*	Number of carbon atoms per molecule *Bilangan atom karbon per molekul*	Heat of combustion *Haba pembakaran* (kJ mol^{-1})
Methanol *Metanol*	1	
Ethanol *Etanol*	2	970
Propanol *Propanol*	3	1400
Butanol *Butanol*	4	1860

[3 marks]

[3 *markah*]



(g) Based on the graph in (f), predict the heat of combustion for pentanol, $C_5H_{11}OH$.
Berdasarkan graf dalam (f), *ramalkan haba pembakaran bagi pentanol,* $C_5H_{11}OH$.

……..
[3 marks]
[3 *markah*]

(h) State the operational definition for heat of combustion of methanol.
Nyatakan definisi secara operasi bagi haba pembakaran metanol.

……..

……..

.....
[3 marks]
[3 *markah*]

(i) The actual heat of combustion for ethanol is 1376 kJ mol^{-1}.
State **three** reasons why the experimental value heat of combustion for ethanol less than the actual value.
Nilai sebenar haba pembakaran bagi etanol ialah 1376 kJ mol^{-1}.
*Nyatakan **tiga** sebab mengapa nilai eksperimen haba pembakaran bagi etanol kurang daripada nilai sebenar.*

1. ……..

2. ……..

3. ……..
[3 marks]
[3 *markah*]

(j) Table 1.2 shows a list of carbon compounds and their molecular formula.
Jadual 1.2 *menunjukkan senarai sebatian karbon dan formula molekulnya.*

Carbon compound *Sebatian karbon*	Molecular formula *Formula molekul*
Propane *Propana*	C_3H_8
Methanoic acid *Asid metanoik*	HCOOH
Butene *Butena*	C_4H_8
Ethanol *Etanol*	C_2H_5OH

Classify the above carbon compounds into hydrocarbon and non hydrocarbon by completing Table 1.3.
Kelaskan sebatian karbon di atas kepada hidrokarbon dan bukan hidrokarbon dengan melengkapkan Jadual 1.3.

Hydrocarbon *Hidrokarbon*	Non hydrocarbon *Bukan hidrokarbon*

Table 1.3
Jadual 1.3

2. Diagram 2 shows the conversation between two students about the electrolysis experiment.

Rajah 2 menunjukkan perbualan antara dua orang pelajar tentang eksperimen elektrolisis.

I carried out an experiment of electrolysis process using carbon electrodes. I observed the gas bubbles are released at anode.

Saya menjalankan satu eksperimen tentang proses elektrolisis menggunakan elektrod karbon, saya dapati terdapat gelembung-gelembung gas dibebaskan di anod.

When I used copper as electrodes, I observed the anode become thinner
Bila saya gunakan kuprum sebagai elektrod , saya dapati anod menjadi nipis.

Diagram 2
Rajah 2

Referring to the conversation above, plan a laboratory experiment to investigate the effect of the type of electrode to the product at anode.
Your answer should consist of the following:

Merujuk kepada perbualan di atas, rancangkan satu eksperimen untuk menyiasat kesan jenis elektrod terhadap hasil di anod.
Jawapan anda hendaklah mengandungi perkara berikut :

(a) Problem statement
Penyataan masalah

(b) All the variables.
Semua p*emboleh ubah.*

(c) Hypothesis
Hipotesis

(d) Lists of materials and apparatus
Senarai bahan dan radas

(e) Procedure
Prosedur

(f) Tabulation of data
Penjadualan data

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

MARKING SCHEME
PAPER 1

QUESTION NO	ANSWER	QUESTION NO	ANSWER
1	A	26	A
2	B	27	C
3	C	28	B
4	D	29	B
5	C	30	C
6	D	31	C
7	A	32	C
8	B	33	B
9	B	34	C
10	D	35	B
11	B	36	C
12	B	37	B
13	B	38	B
14	D	39	B
15	B	40	B
16	B	41	D
17	D	42	B
18	A	43	B
19	B	44	C
20	A	45	D
21	B	46	B
22	D	47	C
23	A	48	B
24	B	49	C
25	B	45	C

QUESTION NO			Marking Criteria	MARK	
				SUB	TOTAL
1	(a)	(i)	Nucleon number of an element is the total number of protons and neutrons in its atom	1	9
		(ii)	35 – 17 = 18	1	
		(iii)	shows nucleus and three shells occupied with electron Label 12 proton, 12 neutron	1 +1	
		(iv)	Number of electrons = 20	1	
	(b)	(i)	Uniform scale for X-axis and Y-axis and labelled Tranfer of point Smooth cuve and correct form of the graph	1 1 1	
		(ii)	Dotted line on the graph from the horizontal line to Y-axis at 80^{o}C.	1	

2	(a)	(i)	0.25 mol $0.25 \times 6.02 \times 10^{23}$ // $1.505\ 10^{23}$ molecules	1 1	10
		(ii)	number of mole of CO_2 = $\frac{6.0}{24.0}$ // 0.25 mole 0.25×44 // 11g	1	
	(b)	(i)	Chemical formula that shows simplest mole ratio of each atom of each element in the compound	1	
		(ii)	Mg = 2.4g , O = 1.6g	1+1	
		(iii)	1 : 1	1	
		(iv)	MgO	1	
		(v)	To allow oxygen enter the crucible	1	
		(vi)	Copper is less/almost not reactive metal	1	

3	(a)		Chemical cell	1	10
	(b)		Cu^{2+}, H^{+}, SO_4^{2-} , OH^{-}	1	
	(c)	(i)	label (-) at zinc	1	
		(ii)	From zinc to copper through the external circuit	1	
		(iii)	Copper electrode become thicker	1	
		(iv)	Cu^{2+} + 2e → Cu	1	
	(d)	(i)	Copper anode become thinner	1	
		(ii)	Copper atom release electron//copper atom ionize	1	
			Copper atom dissolve in solution.	1	
		(iii)	Copper metal	1	

4	(a)	(i)	Yellow solution turns orange//Container/solution feels hot	1	10
		(ii)	Potassium chloride	1	
	(b)		$20cm^3$	1	
	(c)	(i)	Precipitation reaction//Double decomposition reaction	1	
		(ii)	$Pb(NO_3)_2 + Na_2SO_4 \rightarrow PbSO_4 + 2NaNO_3$ Correct formula of substances Balancing	1 + 1	
		(iii)	Lead(II) sulphate	1	
		(iv)	Number of mole of $Na_2SO_4 = 10 \times 0.5/1000$ // 0.005 mol	1	
		(v)	Number of moles of $PbSO_4 = 0.005$ Mass of $PbSO_4 = 0.005 \times 303 = 1.515g$	1 1	

5	(a)		Alkene	1	10
	(b)		$CH_3-\underset{\displaystyle OH}{\underset{\vert}{CH}}-CH_3$ // $H-\underset{\displaystyle OH}{\underset{\vert}{CH}}-CH_2-CH_3$	1	
	(c)	(i)	$2C_3H_6 + 9O_2 \rightarrow 6CO_2 + 6H_2O$	1	
		(ii)	Gas is bubbled through lime water. Lime water turns cloudy	1+1	
	(d)		correct set up apparatus Label	1	
	(e)		Acidified potassium dichromate((VI) solution	1	
	(f)	(i)	$C_2H_5COOC_3H_5$ Label $C_2H_5COOC_3H_5$	1+1	

		(ii)	Float on the water.	1	

6	(a)	Redox reaction is a reaction in which oxidation and reduction occur at the same time.		1	11
	(b)		Oxygen and water	1	
	(c)		Fe (s) → Fe^{2+} (aq) + $2e^-$	1	
	(d)		Label of water droplet, oxygen and iron Label of negative pole and positive pole Draw arrow from negative to positive pole iron	1 1 1	
	(e)		Electron transfer from negative pole to iron Electron gains by oxygen in water Hydroxide ion is form	1 1 1	
	(f)		Using sacrificial metal By alloying the ion By tin platting By galvanizing * any two	1 1	

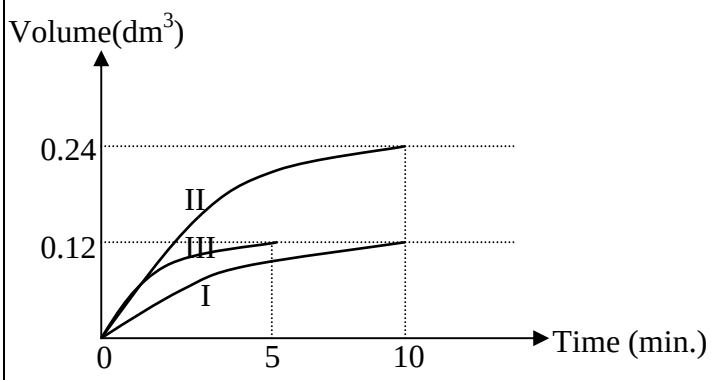
<table>
<tr><th colspan="3" rowspan="2">QUESTION NO</th><th rowspan="2">Marking Criteria</th><th colspan="2">MARK</th></tr>
<tr><th>SUB</th><th>TOTAL</th></tr>
<tr><td>7</td><td>(a)</td><td>(i)</td><td>2.5</td><td>1</td><td rowspan="2">5</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>- Atom W is in Group 15 and Period 2
- Because it has 5 valence electrons and 2 shells occupied with electrons.</td><td>1+1
1+1</td></tr>
<tr><td></td><td>(b)</td><td>(i)</td><td>- reacts explosively// rubidium melts// produced ‘hissing’ sound// produced fire// move rapidly. [any two]</td><td>1+1</td><td rowspan="3">5</td></tr>
<tr><td></td><td></td><td>(ii)</td><td>$2Rb + 2H_2O \rightarrow 2RbOH + H_2$
- reactant and product
- balance equation</td><td>
1
1</td></tr>
<tr><td></td><td></td><td>(iii)</td><td>Do not holding the metals with bare hand// wear safety goggles/gloves // kept metals in paraffin oil // no flammable substance near the burning metals.</td><td>1</td></tr>
<tr><td></td><td>(c)</td><td>(i)</td><td>ionic compound: Magnesium oxide, sodium chloride
Covalent compound: ethanol, hexane</td><td>1
1</td><td rowspan="2"></td></tr>
<tr><td></td><td></td><td>(ii)</td><td>
<table>
<tr><th>property</th><th>Ionic compound</th><th>Covalent compound</th></tr>
<tr><td>Melting point/ boiling point</td><td>MgO/NaCl is high</td><td>C_2H_5OH/C_6H_{14} is low</td></tr>
<tr><td>Explanation:</td><td>The forces between Mg^{2+}/Na^+ ion and O^{2-}/Cl^- ions are strong.</td><td>The forces between C_2H_5OH/C_6H_{14} molecules are weak.</td></tr>
<tr><td></td><td>More heat energy needs to overcome the forces.</td><td>Less heat energy needs to overcome the forces.</td></tr>
</table>
</td><td>1+1

1+1

1+1</td></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td>Electrical conductivity</td><td>Conduct in molten state or aqueous.</td><td>Not conduct electricity.</td></tr>
<tr><td>Explanation:</td><td>The freely moving ions are able to carry electrical charges.</td><td>Neutral molecules are not able to carry electrical charges.</td></tr>
<tr><td>Solubility</td><td>NaCl is soluble in water.
r: MgO</td><td>C_2H_5OH/C_6H_{14} is soluble in benzene/ toluene / any organic solvents.</td></tr>
</table>
</td><td>1+1

1+1</td><td></td></tr>
</table>

			Explanation:	Water molecule is polar solvent.	The attraction forces between molecules in solute and solvent are the same.	Max 10

QUESTION NO			Marking Criteria	MARK	
				SUB	TOTAL
8	(a)		- Industries emit (acidic gases)/(sulphur dioxide). - These gases dissolve in rainwater forming acid rain. - The rain water has a higher concentration of acid. - more collisions between (reacting particles)/(metal and acid) to occur.	1 1 1 1	4
	(b)	(i)	$Zn + 2HCl \rightarrow ZnCl_2 + H_2$ HCl : H_2 = 2 : 1 Mole of H_2 = ½ x 0.4 x 50/1000// 0.01 Volume of H_2 = 0.01 x 24 // 0.24 #dm^3#	1 1 1 1	4
		(ii)	 - Axes are labels with units - Curves I, II and curve III are leveling started at 10 and 5 minutes respectively. - The gradient of curves II and III are more steep than curve I - Volume of graph level off in Exp. II is 0.24 dm^3 and 0.12 dm^3 in Exp. I and III.	 1 1 1 1	4
		(iii)	I: rate = 0.12 x 1000/10 x 60 // 0.2 II: rate = 0.24 x 1000/10 x 60 //0.4 III: rate = 0.12 x 1000/5 x 60 // 0.4	1 1 1	3
		(iv)	Experiment I and Experiment II: - The initial rate of reaction in experiment II is higher.	 1	

			- The concentration of hydrochloric acid in experiment II is higher. - The frequency of collision between zinc atoms and hydrogen ions is higher. - The frequency of effective collision also increases. Experiment I and Experiment III: - The initial rate of reaction in experiment III is higher. - The powdered zinc has a larger total surface area. - The frequency of collision between zinc atoms and hydrogen ions is higher. - The frequency of effective collision also increases.	1 1 1 1 1 1	8

9	(a)	1-Relative molecular mass $(NH_4)_2SO_4$: 2[14+4]+32+4(16)//132 2- Relative molecular mass $(NH_2)_2CO$: 2[14+2]+12+16//60 3- % of N in $(NH_4)_2SO_4$: 28/132 x100 //21.2% % of N in: $(NH_2)_2CO$:28/60 x100 //46.7% 4- Urea is a better firtiliser .	1 1 1 1	4
	(b)	1- X is tin In pure copper, 2-atoms are of the same size 3-atoms are orderly arranged in layers 4-the layers of atoms can slide over each one another when a force is apply In bronze, 5-atoms of tin and copper have different size 6-the presence of tin atoms disrupt the orderly arrangement of the copper atoms. The layers of copper atoms are prevented from sliding over each other easily.	1 1 1 1 1 1 1	max 6
	(c)	1- soft water: rain water	1	

		2- Hard water : well water 3- 20 cm^3 of the soap is poured into 500 cm^3 of rain water and stired. 4- Oily stain cloth is put 5- The cloth is washed 6- oily stain is removed 7- Experiment is repeated with hard water 8- using same volume of soap and water. 9- oily stain remain 10- soft water is more effectiveness	1 1 1 1 1 1 1 1 1	10
			Total	**20**

10	(a)	1-Heat is absorbed when H-H and Cl-Cl bonds are broken 2-Heat is released when H-Cl bonds are formed 3-Heat that is released are bigger then heat that is absorbed 4.Energy change is 184 kJ	1 1 1 1	4
	(b)	1- arrow up-ward and label energy 2- two horizontal line 3- label reactants and product at the correct horizontal line 4- show correct position of activation energy 5- show correct position of H	1 1 1 1 1	5
	(c)	1- correct weak acid and strong alkali 2- 25 cm^3 of sodium hidroxide 1.0 $moldm^{-3}$ and 3- 25 cm^3 of ethanoic acid 1.0 mol dm^{-3} is measured. 4- The initial temperature of the solution is recorded. 5- The solution is poured into a plastic beaker. 6- The mixture is stired. 7- The maximum temperature of the mixuture is recorded 8- Results: Initial temperature of acid = t_1 ^oC Initial temperature of alkali = t_2 ^oC Highest temperature of mixture = t_3 ^oC Rise in temperature = $t_3 - (t_2 + t_1) / 2$ ^oC = T ^oC 9-Number of mol of acid /alkali 10-Heat change = 50 x 4.2 x T 11-Heat of neutralisation = - $\frac{50 \times 4.2 \times T}{\text{mol acid/alkali}}$ kJ mol^{-1}	1 1 1 1 1 1 1 1 1 1 1	11
			Total	**20**

PAPER 3

Question	Explanation	Maximum score
1(a)(i)	*[Able to state the observations correctly]* *Sample answer :* Thermometer reading rises // Temperature increases	3
	[Able to state observation] *Sample answer:* Temperature rises	2
	[Able to give an idea of observation] *Sample answer:* Thermometer reading change // Temperature change	1
	[No response given or wrong response]	0

Question	Explanation	Maximum score
1 (a)(ii)	*[Able to state the inference correctly]* *Sample answer*: Water absorbed heat energy // Mercury expand	3
	[Able to state the inference] *Sample answer*: Exothermic reaction	2
	[Able to state an idea of inference] *Sample answer*: Water temperature increases	1
	[No response given or wrong response]	0

Question	Explanation	Maximum score
1 (b)	*[Able to state all variables correctly]* *Sample answer:* **Manipulated variable**: Types of alcohols **Responding variable:** Heat of combustion of alcohol **Fixed variable**: Volume of water	3
	[Able to state any 2 variables correctly]	2
	[Able to state any 1 variable correctly]	1
	[No response given or wrong response]	0

Question	Explanation	Maximum score
1 (c)	*[Able to state the relationship between the manipulated variable and the responding variable with direction correctly]* *Sample answer*: The higher the number of carbon atoms per alcohol molecule, the higher the heat of combustion. *Note : RV → MV score 2*	3
	[Able to state the relationship between the manipulated variable and the responding variable] *Sample answer*: The higher the number of carbon atoms, the higher the heat of combustion.	2
	[Able to state an idea of hypothesis] *Sample answer*: Different alcohols different heat of combustion.	1
	[No response given or wrong response]	0

Question	Explanation	Maximum score
1 (d)	*[Able to state all the mass of alcohols and round off into two decimal places correctly]* *Sample answer*: Methanol = 1.54 Ethanol = 1.20 Propanol = 1.10 Butanol = 1.61	3
	[Able to statee any three the mass of alcohols and round off into two decimal places correctly]	2
	[Able to state any two the mass of alcohols and round off into two decimal places correctly]	1
	[No response given or wrong response]	0

Question	Explanation	Maximum score
1(e)	*Able to calculate the heat of combustion of methanol by fulfill the following criteria :* *(i) Heat absorbed by water* *(ii) Number of mole* *(iii) Heat of combustion* *Sample answer:* Heat absorbed by water = 25200 J Number of mole = 0.048125 mol Heat of combustion = 523636.36 J mol-1 // 523.64 kJ mol-1	3
	Able to calculate the heat of combustion of methanol by fulfill any two criteria. *Note : ecf criteria (i) or (ii)*	2
	Able to calculate the heat of combustion of methanol by fulfill any one criteria. *Note : ecf criteria (i) and (ii)*	1

	[No response given or wrong response]	0

Question	Explanation	Maximum score
1 (f)	*Able to plot a graph by fulfill the following criteria:* *(i) Axes are labelled with unit correctly* *(ii)Uniform scale so the size of graph at least 50%* *(iii)All point transferred correctly* *(iv) Best fit straight line*	3
	Able to plot a graph by fulfill the following criteria: *(i) Axes are labeled/ unit correctly* *(ii) At least three point are transferred correctly* *(iii) straight line*	2
	Able to plot a graph by fulfill the following criteria: *(i) At least two point are transferred correctly* *(ii) straight line*	1
	[No response given or wrong response]	0

Question	Explanation	Maximum score
1(g)	*Able to predict the heat of combustion of pentanol with consist of the following criteria:* 1. *Horizontal line is drawn towards Y axis from n=5.* 2. *value = 2400*	3
	Able to predict the heat of combustion of pentanol. *Sample answer:* $2375 \leq x < 2400$ // $2400 < x \leq 2425$	2
	Able to give an idea to predict the heat of combustion. *Sample answer* More than 1860	1
	[No response given or wrong response]	0

Question	Explanation	Maximum score
1(h)	*Able to state the operational definition for heat of combustion correctly* Sample answer: The heat energy released/produced when 1 mole of alcohol is burnt completely.	3
	Able to state the operational definition for heat of combustion Sample answer: Heat released/produced when alcohol is burnt completely.	2
	Able to state an idea of operational definition for heat of combustion Sample answer: Energy change when alcohol burns.	1
	[No response given or wrong response]	0

Question	Explanation	Maximum score
1(i)	*Able to give **three** reasons correctly* *Sample answer:* 1. incomplete combustion 2. loss of heat to the surrounding 3. container absorbed some heat	3
	*Able to give any **two** reasons correctly*	2
	*Able to give any **one** reason correctly*	1
	[No response given or wrong response]	0

<table>
<tr><th>Question</th><th>Explanation</th><th>Maximum score</th></tr>
<tr><td rowspan="4">1(j)</td><td>Able to classify all the substances correctly
Sample answer:
<table><tr><td>Hydrocarbon</td><td>Non hydrocarbon</td></tr><tr><td>Propane
Butene</td><td>Methanoic acid
Ethanol</td></tr></table></td><td>3</td></tr>
<tr><td>[Able to classify any three substances correctly]</td><td>2</td></tr>
<tr><td>[Able to classify any two substances correctly]</td><td>1</td></tr>
<tr><td>[No response given or wrong response]</td><td>0</td></tr>
</table>

Question number	Rubric	Score
2 (a)	**Able to give the statement of problem correctly.** Sample answer: Does the type of electrode/anode affect the choice of ions to be discharged?	3
	Able to give the statement of problem less correctly. Sample answer: The type of electrode/anode affect the choice of ions to be discharged.	2
	Able to give an idea about the statement of problem/ aim. Sample answer: Electrode affect the product formed.	1
	No response or wrong response	0

Question number	Rubric	Score
2 (b)	**Able to state all variables correctly.** Sample answer: **Manipulated variable** Type of electrode/ anode **Responding variable** Product formed at anode **Controlled variable** Electrolyte	3
	Able to state any two variables above correctly.	2
	Able to state any one variable above correctly.	1
	No response or wrong response	0

Question number	Rubric	Score
2(c)	**Able to give the hypothesis accurately** Sample answer: Type of electrode/anode will influence the choice of ion to be discharged// type of electrode/anode will produce different product. .	3
	Able to give the statement of problem correctly. Sample answer: Different anode will influence the choice of ion to be discharged// Different anode will produce different product.	2
	Able to give an idea of the hypothesis Sample answer: Different electrode will produce different product	1
	No response or wrong response	0

Question number	Rubric	Score
2(d)	**Able to list completely the materials and apparatus.** Sample answer: Materials: 1. copper(II) sulphate solution, (0.5 – 2.0) mol dm^{-3} //any suitable solution that match with metal plate used. 2. carbon rod 3. copper plate// any metal plate that match with a solution used. 4. wooden splinter// any suitable material used for testing a gas or any product at anode. Apparatus: 1. electrolytic cell 2. battery 3. connecting wire 4. test tube	3

	Able to list incompletely materials and apparatus. Sample answer: Materials: 1. Copper(II) sulphate solution //any suitable solution that match with metal plate used. 2. carbon rod 3. copper plate// any metal plate that match with a solution used. Apparatus: 1. beaker/any suitable container 2. battery 3. connecting wire	2
	Able to give an idea of materials and apparatus. Sample answer: Materials: 1. any solution 2 carbon rod / any metal plate Apparatus: 1. any container 2. battery	1
	No response or wrong respons	0

Question number	**Rubric**	**Score**
2(e)	**Able to state all procedures completely and correctly.** Sample answer: 1. Fill the electrolytic cell (beaker) with half full of copper(II) sulpahate solution (any suitable electrolyte that match with metal plate used). 2. A test tube filled with copper(II) solution is inverted on the **anode carbon** electrode. 3. Complete the circuit. 4. Electricity is flowed. 5. Record observation at anode.. 6. Step 1-5 is repeated using copper plate	3

	Able to state procedures incompletely. Sample answer: 1. Copper(II) sulpahate solution (any suitable electrolyte that match with metal plate used) is poured into a beaker/any suitable container. 2. Complete the circuit. 3. Record observation at anode . 4. Step 1-3 is repeated using copper plate.	2
	Able to give an idea of the procedure. Sample answer: 1. Copper(II) sulpahate solution is poured into a any container. 2. Complete the circuit //	1
	No response or wrong respons	0

Question number	Rubric	Score
2(f)	**Able to exhibit the tabulation of data correctly.** Sample answer: Type of electrode | Observation Carbon | Copper/any metal |	2

<table>
<tr><td></td><td>Able to exhibit the tabulation of data less accurately.
<u>Sample answer:</u>

<table><tr><td>Type of electrode</td><td>Observation</td></tr><tr><td></td><td></td></tr></table></td><td>1</td></tr>
<tr><td></td><td>No response or wrong response</td><td>0</td></tr>
</table>

END OF MARKING SCHEME