

SEKTOR PEMBELAJARAN



MODUL KENYALANG CEMERLANG SPM 2024



KIMIA



Setulus Kata, Sebait Madah

السَّلَامُ عَلَيْكُمْ وَرَحْمَةُ اللَّهِ وَبَرَكَاتُهُ

Salam Sejahtera

Salam Menjulung Pendidikan Negeri Sarawak

Terlebih dahulu saya ingin memanjatkan rasa syukur kepada Allah SWT atas terbitnya Modul Kenyalang Cemerlang SPM 2024 bagi calon-calon yang menduduki Peperiksaan SPM tahun 2024.

Penerbitan ini adalah bertujuan membantu calon-calon untuk menyesuaikan diri mereka dalam menghadapi peperiksaan SPM dan seterusnya sebagai satu langkah permulaan dalam persediaan mereka menghadapi peperiksaan SPM pada awal sesi persekolahan tahun 2024/ 2025.

Terima kasih yang tidak terhingga kepada semua yang terlibat dengan penghasilan modul ini terutamanya kepada pengggubal modul bagi mata pelajaran-mata pelajaran yang terlibat. Ucapan penghargaan juga tidak dilupakan kepada pegawai-pegawai meja mata pelajaran yang telah menyelaras dan menjayakan penghasilan modul ini. Kerjasama yang erat di antara kedua-dua pihak perlu diteruskan bagi meningkatkan kecemerlangan mata-mata pelajaran tersebut.

Akhir kata, saya berharap agar modul ini dimanfaatkan sepenuhnya oleh semua guru dan murid-murid, serta dijadikan sebagai panduan dalam menghadapi peperiksaan yang bakal diduduki dan mendoakan semua mendapat keputusan yang cemerlang nanti.

Fly Kenyalang Fly

Fly High

HAJAH SITI ZULAIHA BINTI HAJI IBRAHIM

Timbalan Pengarah,
Sektor Pembelajaran
Jabatan Pendidikan Negeri Sarawak

Cover page

Templet akan diberi kemudian.
Tinggalkan ruang ini tidak diisi untuk
dimasukkan maklumat kemudian.

**PROGRAM
SEMARAK KASIH SPM 2.0
TAHUN 2024
JABATAN PENDIDIKAN NEGERI SARAWAK**

KIMIA 4541

KERTAS 1

SET 1

PENGENALAN

Program Semarak Kasih yang dilaksanakan pada tahun 2020 telah mendapat sambutan yang menggalakkan daripada warga pendidik dan murid, khususnya calon SPM 2020. Sehubungan dengan itu, pada tahun 2024 ini, Sektor Pembelajaran, Jabatan Pendidikan Negeri Sarawak mengadakan **Modul Kenyalang Cemerlang** untuk membantu guru dan calon SPM menghadapi peperiksaan SPM 2024.

Modul yang dihasilkan disertakan dengan sampel Jadual Spesifikasi Ujian (JSU) dan sampel item/soalan mengikut format baharu peperiksaan SPM mulai 2021 untuk dijadikan bahan panduan dan rujukan guru-guru dan juga sebagai bahan latihan/ulangkaji kepada calon-calon SPM 2024 di semua sekolah menengah di negeri Sarawak.

OBJEKTIF PROGRAM

1. Memastikan calon SPM menguasai format baharu Peperiksaan SPM 2024.
2. Memastikan calon SPM mempunyai bahan pembelajaran yang berfokus ke arah peperiksaan SPM.
3. Meningkatkan pencapaian akademik calon SPM 2024.
4. Melonjakkan keputusan SPM 2024 Negeri Sarawak

SENARAI KANDUNGAN

Bil.	Perkara	Muka surat
1	Format Kertas Peperiksaan SPM Mulai Tahun 2021	2
2	Latihan - Praktis Kimia 4541/2: Set 1	3 - 25
3	Skema Jawapan/Pemarkahan	26
4	LAMPIRAN: Sampel Jadual Spesifikasi Ujian (JSU) untuk Praktis Kimia 4541/2: Set 2	27

SENARAI AHLI PANEL PEMBINA MODUL KENYALANG CEMERLANG SPM

Bil.	Nama Guru	Sekolah	PPD
1.	Francisca Lau Siew Hsia (Ketua)	SMK Methodist	SIBU
2.	Chien Hui Siong	SMK Tinggi Sarikei	SARIKEI
3.	Bella Mahony Sie	SMK Luar Bandar Sibu	SIBU
4.	Fun Ngiiik Ngon	SMK Bandar Sibu	SIBU
5.	Goh Leh Ling	SMK Sacred Heart	SIBU
6.	Ling Mee Ling	SMK St Elizabeth	SIBU
7.	Ling Teck Ping	SMK Tung Hua	SIBU
8.	Wong Kee Ping	SMK Bukit Assek	SIBU
9.	Yap Liew Yiing	SMK Tiong Hin	SIBU
10.	Law Hui Nong	SMK Tinggi Sarikei	SARIKEI
11.	Victoria Petrus	SMK Tun Abdul Razak	SERIAN
12.	Dalimawaty Binti Ahmad	SMK Santubong	KUCHING

PENYELARAS

Bil.	Nama Pegawai	Stesen Bertugas
1	Haslina binti Marzoki	Unit Sains dan Matematik, JPN Sarawak

**FORMAT INSTRUMEN PEPERIKSAAN SPM MULAI TAHUN 2021
BAGI MATA PELAJARAN KIMIA (KOD: 4541)**

BIL	PERKARA	KERTAS 1 (4541/1)	KERTAS 2 (4541/2)	KERTAS 3 (4541/3)
1	Jenis Instrumen	Ujian Bertulis		Ujian Amali
2	Jenis Item	Objektif Aneka Pilihan	<ul style="list-style-type: none"> • Subjektif Berstruktur • Subjektif Respons Terhad • Subjektif Respons Terbuka 	Subjektif Berstruktur
3	Bilangan Soalan	40 soalan (40 markah) (Jawab semua soalan)	Bahagian A: <ul style="list-style-type: none"> • 8 soalan (60 Markah) (Jawab semua soalan) • Bahagian B: (20 Markah) • 2 soalan (Jawab 1 soalan) Bahagian C: (20 Markah) <ul style="list-style-type: none"> • 1 soalan 	3 item (Jawab mengikut subjek yang didaftar)
4	Jumlah Markah	40 markah	100 markah	15 markah bagi setiap item
5	Konstruk	<ul style="list-style-type: none"> • Mengingat • Memahami • Mengaplikasi • Menganalisis 	<ul style="list-style-type: none"> • Mengingat • Memahami • Mengaplikasi • Menganalisis • Menilai • Mencipta 	Kemahiran proses sains
6	Tempoh Ujian	1 jam 15 minit	2 jam 30 minit	40 minit + 5 minit setiap item (5 minit: sesi merancang) (40 minit: masa menjawab soalan)
7	Cakupan Konteks	Standard kandungan dan standard pembelajaran dalam Dokumen Standard Kurikulum dan Pentaksiran (DSKP) KSSM (Tingkatan 4 dan 5)		
8	Aras Kesukaran	Rendah : Sederhana : Tinggi 5 : 3 : 2		
9	Kaedah Penskoran	Dikotomus	Analitikal	
10	Alat Tambahan	Kalkulator saintifik		

PRAKTIS KIMIA 4541/1
SET 1

1. Antara yang berikut, yang manakah merupakan unsur?
Which of the following is an element?
- | | |
|--|--|
| <p>A Ammonia
<i>Ammonia</i></p> <p>B Oksigen
<i>Oxygen</i></p> | <p>C Naftalena
<i>Naphthalene</i></p> <p>D Metana
<i>Methane</i></p> |
|--|--|
2. Rajah 1 menunjukkan perwakilan piawai bagi atom magnesium.
Diagram 1 shows the standard representation of magnesium atom.



Rajah 1 / *Diagram 1*

- Apakah bilangan elektron valens bagi atom tersebut?
What is the number of valence electrons of the atom?
- | | |
|-------------------------------------|---------------------------------------|
| <p>A 2</p> <p>B 8</p> | <p>C 12</p> <p>D 24</p> |
|-------------------------------------|---------------------------------------|
3. Antara yang berikut, pernyataan manakah yang menerangkan sebab karbon-12 dipilih sebagai rujukan piawai untuk menentukan jisim atom relatif dengan paling tepat?
Which of the following statements explains the reason of carbon-12 chosen as the standard reference for determining the relative atomic mass most accurately?
- A** Mempunyai tiga isotop
Has three isotopes
- B** Unsur bukan logam
Non-metal element
- C** Tidak mudah bergabung dengan unsur-unsur lain
Not easily combines with other elements.
- D** Pepejal pada suhu bilik dan mudah dikendalikan
Solid at room temperature and can be handled easily
4. Antara berikut, yang manakah kegunaan isotop iodin-131?
Which of the following is the use of iodine-131 isotopes?
- A** Menentukan umur fosil
Determine the age of fossil
- B** Merawat masalah tiroid
Treat thyroid disorders
- C** Membunuh sel kanser
Kill cancer cells
- D** Mengesan kebocoran paip bawah tanah
Detect the leakage of underground pipes

5. Antara yang berikut, pernyataan manakah yang betul tentang sifat fizik unsur Kumpulan 18 apabila menuruni Kumpulan?

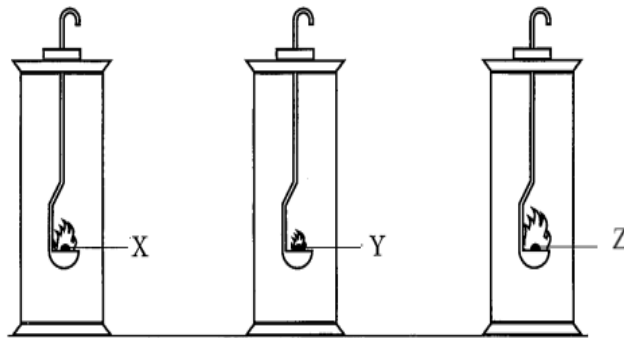
Which of the following statements are correct about the physical properties of elements in Group 18 when going down the group?

- I** Keamatan warna berkurang
The intensity of colour decreases
- II** Daya tarikan antara atom meningkat
The attraction forces between atom increases
- III** Ketumpatan unsur-unsur ini berkurang
The density of the elements decreases
- IV** Takat lebur dan takat didih unsur-unsur ini meningkat
Melting point and boiling point of these elements increases

- A** I dan II
I and II
- B** I dan III
I and III
- C** II dan IV
II and IV
- D** III dan IV
III and IV

6. Rajah 2 menunjukkan susunan radas bagi suatu eksperimen untuk mengkaji kereaktifan unsur Kumpulan 1 terhadap gas klorin.

Diagram 2 shows the apparatus set-up of an experiment to study the reactivity of element in Group 1 towards chlorine gas.



Rajah 2 / Diagram 2

Apakah logam alkali X, Y dan Z?

What is alkali metal X, Y and Z?

	X	Y	Z
A	Litium <i>Lithium</i>	Natrium <i>Sodium</i>	Kalium <i>Potassium</i>
B	Natrium <i>Sodium</i>	Kalium <i>Potassium</i>	Litium <i>Lithium</i>
C	Natrium <i>Sodium</i>	Litium <i>Lithium</i>	Kalium <i>Potassium</i>
D	Kalium <i>Potassium</i>	Natrium <i>Sodium</i>	Litium <i>Lithium</i>

7. Oksida Y adalah pepejal putih yang tidak larut dalam air tetapi boleh bertindak balas dengan asid nitrik dan juga larutan natrium hidroksida. Apakah unsur Y?
Oxide of Y is a white solid that is insoluble in water but can react with nitric acid and sodium hydroxide solution. What is Y element?

- | | |
|--|--|
| A Aluminium
<i>Aluminium</i> | C Karbon
<i>Carbon</i> |
| B Kalium
<i>Potassium</i> | D Magnesium
<i>Magnesium</i> |

8. Jadual 1 menunjukkan maklumat tentang kedudukan unsur W, X, Y dan Z dalam Jadual Berkala Unsur.
Table 1 shows the information for the position of elements, W, X, Y and Z in the Periodic Table of Elements.

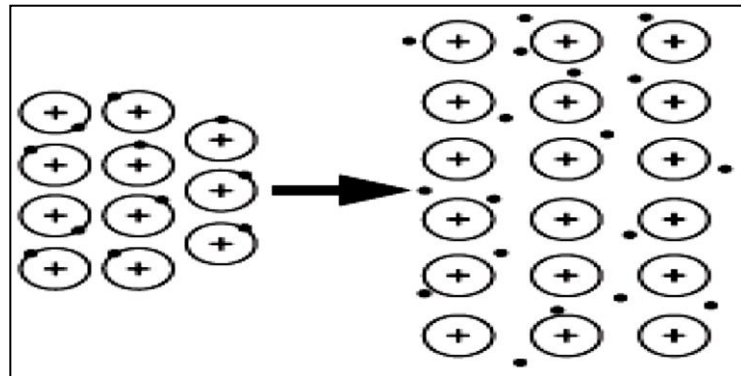
Unsur Element	W	X	Y	Z
Kumpulan Group	1	16	17	14
Kala Period	2	2	3	2

Jadual 1 / Table 1

- Pasangan unsur manakah yang membentuk sebatian yang mempunyai takat lebur yang tinggi?
Which pair of elements form a compound with high melting point?

- | | |
|------------------------------------|------------------------------------|
| A W dan X
<i>W and X</i> | C X dan Z
<i>X and Z</i> |
| B W dan Z
<i>W and Z</i> | D Y dan Z
<i>Y and Z</i> |

9. Rajah 3 menunjukkan sejenis ikatan.
Diagram 3 shows a type of bond.



Rajah 3 / Diagram 3

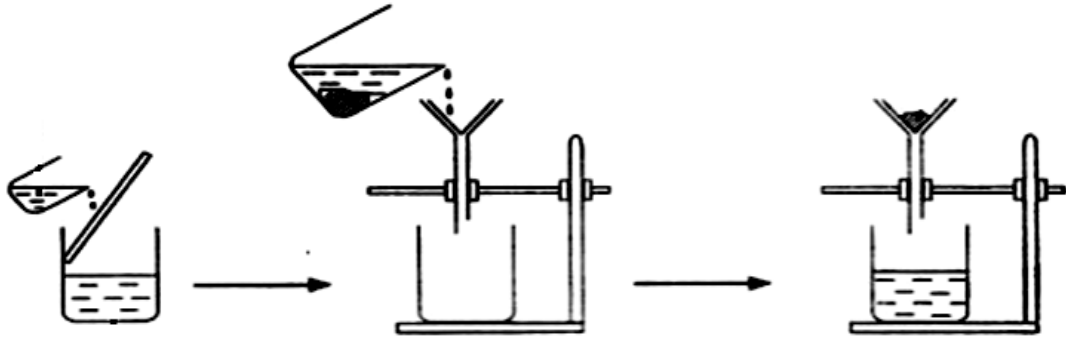
Antara berikut, yang manakah betul tentang ikatan tersebut?
Which of the following is correct about the bond?

- A** Sejenis ikatan di mana pasangan elektron yang dikongsi berasal daripada satu atom sahaja
A type of bond where the electron pairs shared come from one atom only
- B** Ikatan yang terbentuk melalui pemindahan elektron antara atom logam dengan atom bukan logam
A bond that is formed through the transfer of electrons between metal atoms and non-metal atoms
- C** Daya tarikan antara atom hidrogen dengan satu atom yang lebih elektronegatif dalam molekul lain
The forces of attraction between hydrogen with a high electronegativity atom in another molecule
- D** Wujud daya tarikan elektrostatik antara lautan elektron dan ion-ion logam bercas positif
There is an electrostatic attraction force between the sea of electrons and the positively-charged metal ions
10. Antara pernyataan berikut, yang manakah betul tentang molekul ringkas?
Which of the following statements is correct about simple molecule?
- A** Struktur besar
Large structure
- B** Takat lebur dan didih rendah
Low melting and boiling point
- C** Wujud sebagai pepejal sahaja
Exist as solid only
- D** Lebih banyak tenaga haba untuk memutuskan ikatan antara atom
More heat energy to break the bond between atoms

11. Dalam satu eksperimen, kertas penunjuk semesta lembap bertukar daripada kuning kepada ungu apabila gas X dialirkan kepadanya. Antara pernyataan berikut, yang manakah betul tentang X?

In an experiment, moist universal indicator paper changes from yellow to purple when gas X is delivered to it. Which of the following statements is correct about X?

- A** Nilai pH kurang daripada 7
pH value less than 7
- B** X terhasil daripada tindak balas antara asid dan alkali
X is produced from the reaction between acid and alkali
- C** X mempunyai kepekatan ion hidrogen yang tinggi
X has high concentration of hydrogen ions
- D** X mengion dalam air menghasilkan ion hidroksida
X ionises in water produces hydroxide ion
12. Rajah 4 menunjukkan susunan radas bagi penyediaan garam.
Diagram 4 shows the apparatus set-up for the preparation of salt.



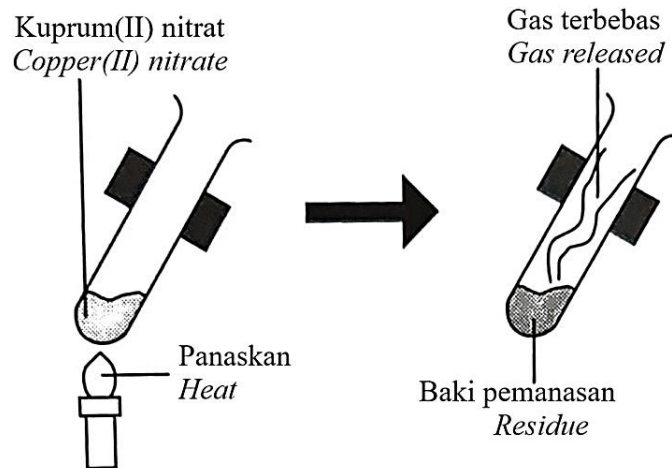
Rajah 4 / Diagram 4

Garam manakah yang disediakan melalui kaedah ini?

Which salt is prepared through this method?

- | | |
|--------------------------|-----------------------------------|
| A AgNO_3 | C CaSO_4 |
| B BaCl_2 | D Na_2CO_3 |

13. Rajah 5 menunjukkan susunan radas bagi pemanasan sejenis garam.
 Diagram 5 shows the apparatus set-up of heating a type of salt.

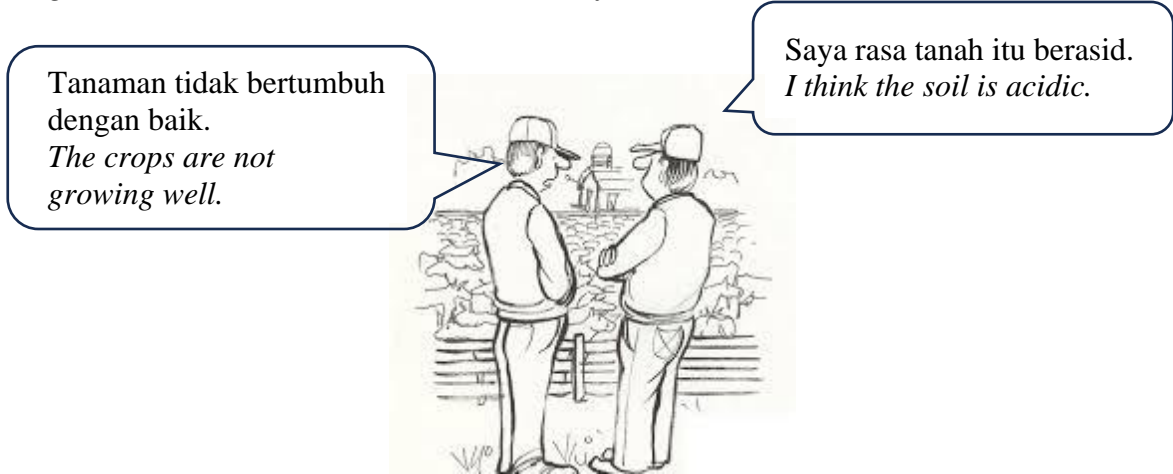


Rajah 5 / Diagram 5

Pemerhatian dan ujian yang manakah betul untuk mengenal pasti gas yang terbebas?
 Which observation and test are correct to identify the gas released?

	Pemerhatian <i>Observation</i>	Ujian <i>Test</i>
A	Gas perang terbebas <i>Brown gas released</i>	Kertas litmus biru menjadi merah <i>Blue litmus paper turns red</i>
B	Gas tidak berwarna terbebas <i>Colourless gas released</i>	Kayu uji berbara menyala <i>The glowing wooden splinter is rekindled</i>
C	Wasap putih terbebas <i>White fumes released</i>	Kertas litmus biru menjadi merah <i>Blue litmus paper turns red</i>
D	Gas kuning kehijauan terbebas <i>Greenish-yellow gas released</i>	Kayu uji berbara menyala <i>The glowing wooden splinter is rekindled</i>

14. Rajah 6 menunjukkan perbualan antara dua orang petani.
 Diagram 6 shows a conversation between two farmers.



Rajah 6 / Diagram 6

Berdasarkan perbualan dalam Rajah 6, bahan manakah yang sesuai untuk mengatasi masalah yang dihadapi oleh petani tersebut?
 Based on the conversation in Diagram 6, which of the following substance is suitable to overcome the problem faced by the farmer?

- I** Barium sulfat
Barium sulphate
- II** Kalsium oksida
Calcium oxide
- III** Kalsium klorida
Calcium chloride
- IV** Kapur mati
Slake lime
- A** I dan II
I and II
- B** I dan III
I and III
- C** II dan IV
II and IV
- D** III dan IV
III and IV
15. Antara berikut, yang manakah dipadankan dengan betul bagi kadar tindak balas rendah dan kadar tindak balas tinggi?
 Which of the following is a correct match of a low rate of reaction and high rate of reaction?

	Kadar tindak balas rendah <i>Low rate of reaction</i>	Kadar tindak balas tinggi <i>High rate of reaction</i>
A	Pengaratian besi <i>Rusting of iron</i>	Penapaian glukosa <i>Fermentation of glucose</i>
B	Peneutralan <i>Neutralisation</i>	Pengaratian besi <i>Rusting of iron</i>
C	Penapaian glukosa <i>Fermentation of glucose</i>	Pemendakan <i>Precipitation</i>
D	Pemendakan <i>Precipitation</i>	Peneutralan <i>Neutralisation</i>

16. Antara pernyataan berikut, yang manakah benar tentang kesan kepekatan bahan tindak balas yang tinggi ke atas kadar tindak balas?
Which of the following statements is true about the effect of higher concentration of reactants on the rate of reaction?

- A** Tenaga kinetik zarah-zarah bahan tindak balas bertambah
The kinetic energy of the reactant particles increases
- B** Bilangan zarah-zarah bahan tindak balas per unit isi padu bertambah
The number of reactant particles per unit volume increases
- C** Tenaga pengaktifan zarah-zarah bahan tindak balas bertambah
The activation energy of the reactant particles increases
- D** Jumlah luas permukaan zarah-zarah bahan tindak balas bertambah
The total surface area of reactant particles increases

17. Rajah 7 menunjukkan alatan memasak yang diperbuat daripada kaca. Komponen utama kaca ialah silikon dioksida.
Diagram 7 shows a cookware made of glass. The main component of glass is silicon dioxide.



Rajah 7 / Diagram 7

Apakah bahan yang ditambah ke dalam silikon dioksida dan ciri baharu kaca tersebut?
What is the substance added to the silicon dioxide and the new property of the glass?

	Bahan tambah <i>Substance added</i>	Ciri Baharu <i>New property</i>
A	Natrium karbonat dan kalsium karbonat <i>Sodium carbonate and calcium carbonate</i>	Mudah dibentuk <i>Easily remoulded</i>
B	Natrium karbonat dan plumbum(II) oksida <i>Sodium carbonate and lead(II) oxide</i>	Indeks pembiasan yang tinggi <i>High refractive index</i>
C	Argentum klorida dan kuprum(I) klorida <i>Silver chloride and copper(I) chloride</i>	Menyerap sinaran UV <i>Absorb UV ray</i>
D	Boron oksida dan aluminium oksida <i>Boron oxide and aluminium oxide</i>	Pekali pengembangan yang rendah <i>Low expansion coefficient</i>

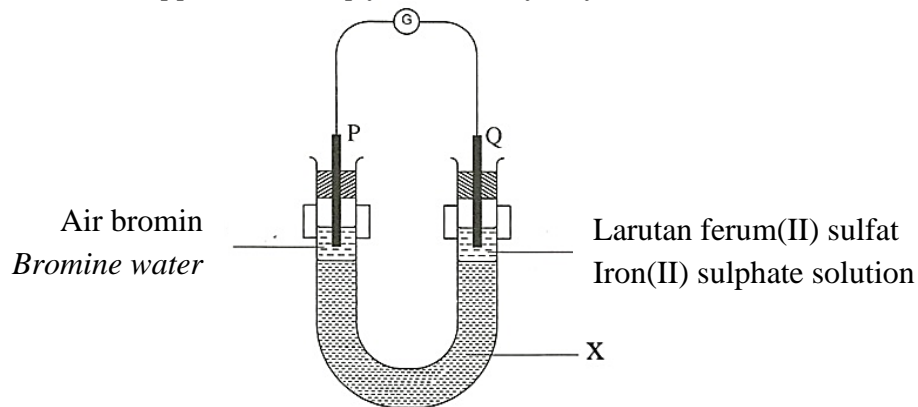
18. Berikut ialah ciri-ciri bahan komposit X:
The following are the characteristics of composite material X.

- Kekuatan mampatan tinggi
High compression strength
- Kekuatan regangan tinggi
High stretching strength
- Tahan kakisan
Resistant to corrosion

Apakah itu X?
What is X?

- | | |
|---|--|
| <p>A Konkrit diperkukuhkan
 <i>Reinforced concrete</i></p> <p>B Superkonduktor
 <i>Superconductor</i></p> | <p>C Gentian kaca
 <i>Fibre glass</i></p> <p>D Gentian optik
 <i>Optical fibre</i></p> |
|---|--|

19. Rajah 8 menunjukkan susunan radas bagi pemindahan elektron pada suatu jarak dalam tiub-U.
Diagram 8 shows the apparatus set-up for the transfer of electrons at a distance in U-tube.

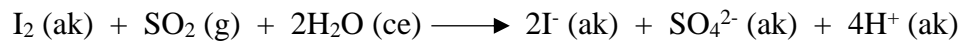


Rajah 8 / Diagram 8

Apakah fungsi bagi X?
What is the function of X?

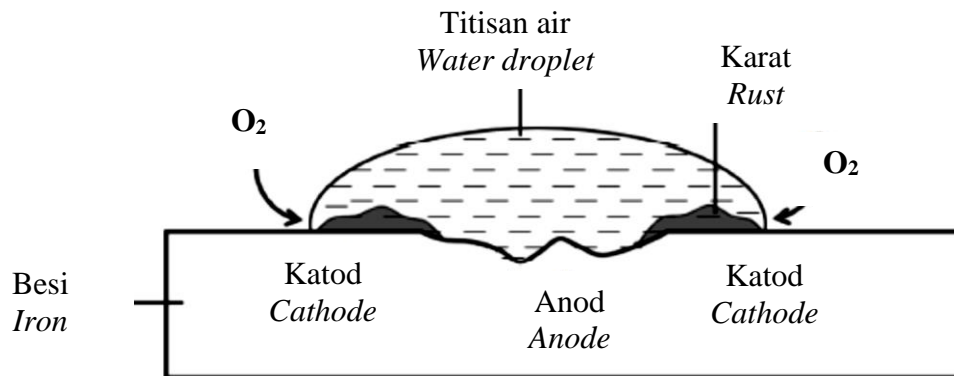
- A** Membenarkan pemindahan elektron dari terminal negatif ke terminal positif
Allow the transfer of electrons from negative terminal to positive terminal
- B** Membenarkan pengaliran ion dari kedua-dua larutan
Allow the flow of ions from both solutions
- C** Menerima elektron dari air bromin
Accept electrons from bromine water
- D** Bertindak sebagai agen pengoksidaan
Act as an oxidizing agent

20. Persamaan ion keseluruhan yang berikut menunjukkan tindak balas antara iodine, I_2 dan sulfur dioksida, SO_2 .
The overall ionic equation below shows the reaction between iodine, I_2 and sulphur dioxide, SO_2 .



Berdasarkan persamaan di atas, namakan agen pengoksidaan dalam tindak balas ini.
Based on the equation above, name the oxidising agent in this reaction.

- | | |
|---|--|
| <p>A Sulfur dioksida
<i>Sulphur dioxide</i></p> <p>B Ion sulfat
<i>Sulphate ion</i></p> | <p>C Iodin
<i>Iodine</i></p> <p>D Air
<i>Water</i></p> |
|---|--|
21. Rajah 9 menunjukkan mekanisme pengaratan besi dengan kehadiran titisan air dan oksigen.
Diagram 9 shows the mechanism of rusting with the presence of water and oxygen.



Rajah 9 / Diagram 9

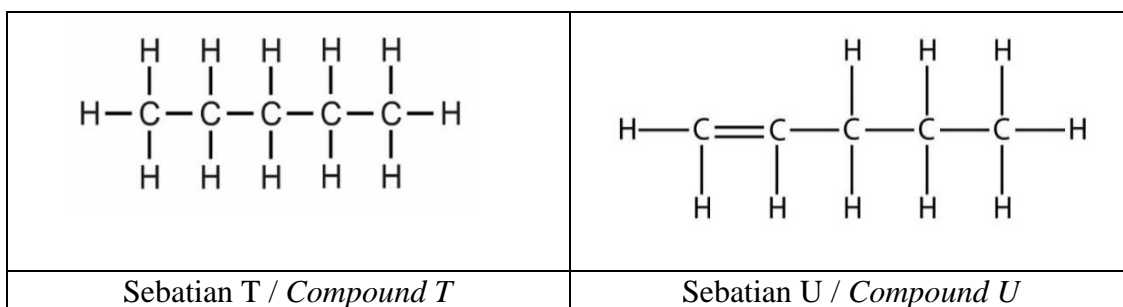
Pasangan persamaan setengah manakah yang berikut mewakili tindak balas kimia yang berlaku di anod dan katod?

Which of the following pairs of half equation represent the chemical reactions that occur at anode and cathode?

	Anod / Anode	Katod / Cathode
A	$O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$	$Fe \rightarrow Fe^{2+} + 2e^-$
B	$Fe \rightarrow Fe^{2+} + 2e^-$	$O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$
C	$O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$	$Fe^{2+} + 2OH^- \rightarrow Fe(OH)_2$
D	$Fe \rightarrow Fe^{2+} + 2e^-$	$Fe(OH)_2 \rightarrow Fe_2O_3 \cdot H_2O$

22. Rajah 10 menunjukkan formula struktur bagi sebatian T dan sebatian U.

Diagram 10 shows the structural formulae of compound T and compound U.




Rajah 10 / Diagram 10

Antara berikut, yang manakah menunjukkan perbandingan yang betul antara sebatian T dan sebatian U?

Which of the following shows the correct comparison between compound T and compound U?

	Sebatian T <i>Compound T</i>	Sebatian U <i>Compound U</i>
A	Bertindak balas dengan air bromin <i>Reacts with bromine water</i>	Tidak bertindak balas dengan air bromin <i>Does not react with bromine water</i>
B	Mempunyai peratusan jisim karbon per molekul yang lebih tinggi <i>Has higher percentage of carbon by mass per molecule</i>	Mempunyai peratusan jisim karbon yang lebih rendah <i>Has lower percentage of carbon by mass per molecule</i>
C	Terbakar dengan nyalaan kuning yang lebih berjelaga <i>Burns with more yellow sooty flame</i>	Terbakar dengan nyalaan kuning yang kurang berjelaga <i>Burns with less yellow sooty flame</i>
D	Tidak bertindak balas dengan larutan kalium manganat(VII) berasid <i>Does not react with acidified potassium manganate(VII) solution</i>	Bertindak balas dengan larutan kalium manganat(VII) berasid <i>Reacts with acidified potassium manganate(VII) solution</i>

23. Rajah 11 menunjukkan perubahan bahan X kepada bahan Y melalui proses Z.
Diagram 11 shows the change of substance X to substance Y through process Z.

<u>Bahan X / Substance X</u>	Proses Z Process Z	<u>Bahan Y / Substance Y</u>
<ul style="list-style-type: none"> • Larut dalam air <i>Soluble in water</i> • Bertindak balas dengan asid karboksilik untuk menghasilkan sebatian berbau wangi <i>Reacts with carboxylic acid to produce sweet smell compound</i> 		<ul style="list-style-type: none"> • Tidak larut dalam air <i>Insoluble in water</i> • Menyahwarnakan warna perang air bromin <i>Decolourise the brown bromine water</i>

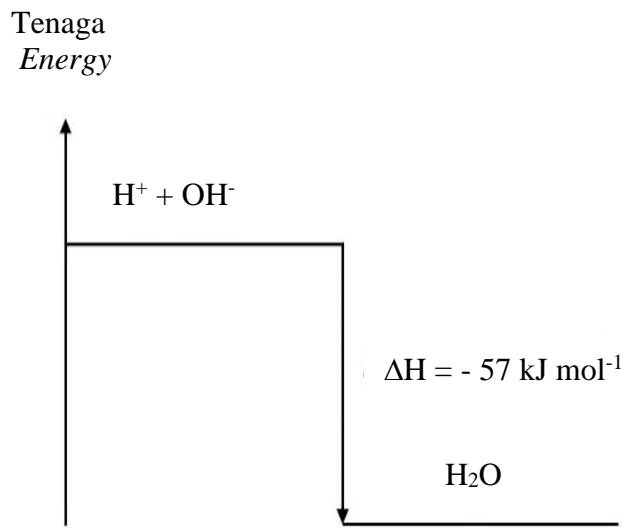
Rajah 11 / Diagram 11

Antara berikut, yang manakah betul tentang proses Z?
Which of the following is correct about process Z?

- A** Dipanaskan dengan gas hidrogen pada 180 °C dengan kehadiran nikel
Heated with hydrogen gas at 180 °C in the presence of nickel
- B** Dialirkan melalui stim pada 300 °C dengan kehadiran asid fosforik
Passes through steam at 300 °C in the presence of phosphoric acid
- C** Dialirkan melalui serpihan porselin panas
Passes through hot porcelain chips
- D** Dipanaskan dengan larutan kalium manganat(VII) berasid
Heated with acidified potassium manganate(VII) solution
24. Antara persamaan berikut, yang manakah boleh menghasilkan bahan yang mempunyai perisa buah-buahan?
Which of the following equations can produce a substance with fruity smell?

- A** $C_2H_5OH + CH_3COOH \rightarrow CH_3COOC_2H_5 + H_2O$
- B** $CH_3COOH + NaOH \rightarrow CH_3COONa + H_2O$
- C** $2CH_3COOH + Mg \rightarrow (CH_3COO)_2Mg + H_2$
- D** $C_2H_5OH + 2[O] \rightarrow CH_3COOH + H_2O$

25. Rajah 12 menunjukkan satu gambar rajah aras tenaga.
Diagram 12 shows the energy level diagram.

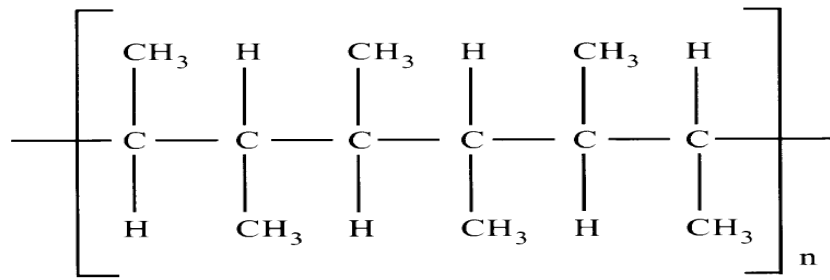


Rajah 12/ Diagram 12

Antara berikut, pernyataan manakah yang benar tentang gambar rajah aras tenaga ini?
Which of the following statements is correct about the energy level diagram?

- A** 57 kJ tenaga diperlukan untuk tindak balas ini
57 kJ of energy is needed for the reaction
- B** Jumlah kandungan tenaga hasil tindak balas lebih tinggi daripada bahan tindak balas
The total energy content of the product is higher than the reactant
- C** Tenaga haba yang diserap untuk memecahkan ikatan dalam bahan tindak balas lebih tinggi daripada tenaga haba yang dibebaskan semasa pembentukan ikatan
The heat energy absorbed to break the bonds in the reactants is higher than the heat energy released during bond formation
- D** Suhu meningkat semasa tindak balas
The temperature increases during reaction

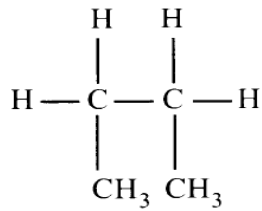
26. Rajah 13 menunjukkan formula struktur bagi suatu polimer.
 Diagram 13 shows the structural formula of a polymer.



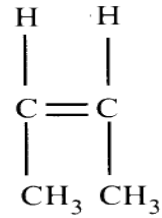
Rajah 13 / Diagram 13

Yang manakah formula struktur berikut adalah monomernya?
 What is the structural formula of its monomer?

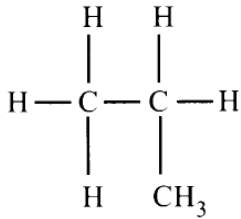
A



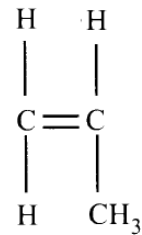
C



B



D



27. Sayyid menjalankan satu eksperimen untuk membandingkan sifat fizik bagi getah X dan getah Y. Jadual 2 menunjukkan keputusan bagi eksperimen itu.
Sayyid conducted an experiment to compare the physical properties of rubber X and Y. Table 2 shows the results of the experiment.

Jenis getah <i>Type of rubber</i>	Panjang kepingan getah sebelum diletakkan pemberat (cm) <i>The length of the rubber sheet before the weight is hung (cm)</i>	Panjang kepingan getah semasa diletakkan pemberat (cm) <i>The length of the rubber sheet during the weight is hung (cm)</i>	Panjang kepingan getah selepas pemberat dialihkan (cm) <i>The length of the rubber sheet after the weight is removed (cm)</i>
Getah X <i>Rubber X</i>	10.0	12.0	10.0
Getah Y <i>Rubber Y</i>	10.0	14.5	12.0

Jadual 2 / Table 2

Berdasarkan keputusan eksperimen, padanan manakah yang betul tentang sifat fizik X dan Y?

Based on the result of the experiment, which of the following is correctly matched about the physical properties X and Y?

	Getah X <i>Rubber X</i>	Getah Y <i>Rubber Y</i>
A	Lembut <i>Soft</i>	Keras <i>Hard</i>
B	Lebih elastik <i>More elastic</i>	Kurang elastik <i>Less elastic</i>
C	Tidak mudah teroksida daripada udara <i>Not easily oxidised by the air</i>	Mudah teroksida daripada udara <i>Easily oxidised by the air</i>
D	Lengai dengan bahan kimia. <i>Inert towards chemicals</i>	Mudah bertindak balas dengan bahan kimia yang lain. <i>Easily reacts with other chemicals.</i>

28. Antara pernyataan berikut, yang manakah menerangkan mengapa detergen ialah agen pencuci yang lebih baik berbanding dengan sabun?
Which of the following statements explains why detergent is a better cleaning agent as compared to soap?

- A** Detergen dapat menanggalkan kotoran darah tetapi sabun tidak dapat.
Detergent can remove blood stains but soap cannot
- B** Detergen adalah biodegradasi tetapi sabun tidak
Detergent is biodegradable but soap is not
- C** Detergen membentuk kekat dalam air liat tetapi sabun tidak
Detergent forms scum in hard water but soap does not
- D** Detergen dapat mengurangkan ketegangan permukaan air tetapi sabun tidak dapat
Detergent can reduce the surface tension of water but soap cannot.

29. Jadual 3 menunjukkan maklumat yang terdapat pada tiga jenis label makanan, X, Y dan Z bahan tambah dalam makanan.

Table 3 shows the information available on three types of food labels, X, Y and Z are food additives.

Jenis makanan <i>Type of food</i>	Sos tomato <i>Tomato sauce</i>	Aiskrim vanilla <i>Vanilla ice cream</i>	Nanas di dalam sirap <i>Pineapple in syrup</i>
Kandungan <i>Ingredients</i>	Tomato, gula, garam, tepung jagung, pewarna tiruan, bahan tambah X <i>Tomatoes, sugar, salt, corn flour, artificial colouring, food additive X</i>	Susu, vanila, gula, pewarna tiruan, bahan tambah Y <i>Milk, vanilla, sugar, artificial colours, food additive Y</i>	Kepingan nanas segar, bahan tambah Z <i>Fresh pineapple slices, food additive Z</i>
Ciri-ciri bahan tambah makanan <i>Properties of food additives</i>	Sedap dan tahan lama <i>Tasty and last longer</i>	Berperisa, lembut dan licin <i>Flavoured, soft and smooth</i>	Manis dan dihasilkan dari sumber asli <i>Sweet and produced from natural sources</i>

Jadual 3 / Table 3

Apakah nama bahan tambah makanan X, Y dan Z?

What is the name of food additives X, Y and Z?

	X	Y	Z
A	Asid benzoik <i>Benzoic acid</i>	Lesitin <i>Lecithin</i>	Gula <i>Sugar</i>
B	Natrium benzoat <i>Sodium benzoate</i>	Kanji <i>Starch</i>	Aspartam <i>Aspartame</i>
C	Natrium nitrit <i>Sodium nitrite</i>	Gelatin <i>Gelatine</i>	Sorbitol <i>sorbitol</i>
D	Asid askorbik <i>Ascorbic acid</i>	Gam xantan <i>Xanthan gum</i>	Stevia <i>Stevia</i>

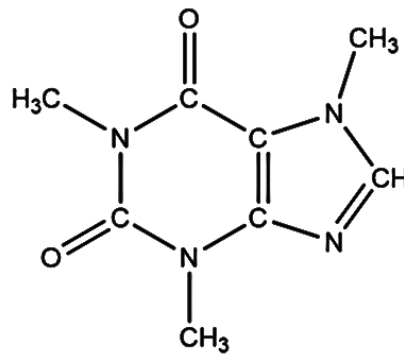
30. Berikut adalah gejala yang ditunjukkan oleh pesakit M.
The following are the symptoms shown by patient M.

- Gejala penyakit mental
Symptom of mental illness
- Mendengar suara dan melihat sesuatu yang tidak nyata
Hearing voices and seeing things that are not real
- Mempercayai perkataan yang tidak nyata
Believe something that is not real

Apakah jenis dan contoh ubat yang perlu diambil oleh pesakit M?
What is the type and example of medicine that should be taken by patient M?

	Jenis ubat <i>Type of medicine</i>	Contoh <i>Example</i>
A	Analgesik <i>Analgesic</i>	Aspirin <i>Aspirin</i>
B	Antialergi <i>Anti allergy</i>	Antihistamin <i>Antihistamine</i>
C	Kortikosteroid <i>Corticosteroids</i>	Prednisolone <i>Prednisolone</i>
D	Ubat psikotik <i>Psychotic drugs</i>	Haloperidol <i>Haloperidol</i>

31. Rajah 14 menunjukkan formula struktur bagi kafein.
Diagram 14 shows structural formula of caffeine.



Rajah 14/ *Diagram 14*

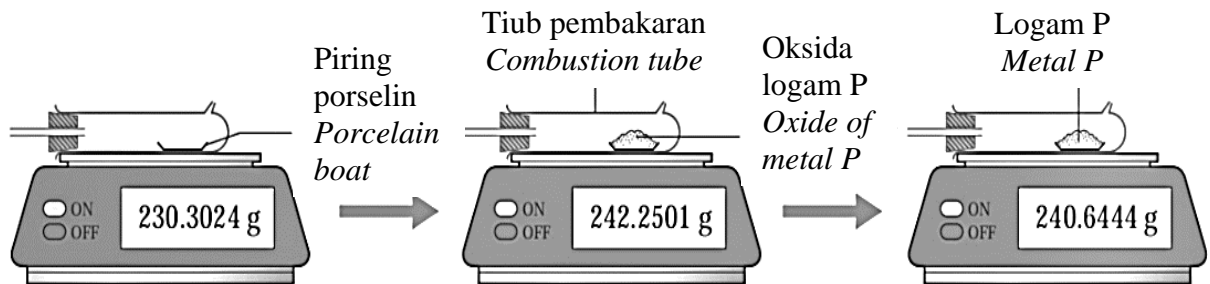
Berapakah jisim bagi 0.25 mol kafein?
What is the mass of 0.25 mol caffeine?

[Jisim atom relatif / *Relative atomic mass*: H = 1; C = 12; O = 16; N = 14]

- | | |
|------------------|------------------|
| A 51.50 g | C 46.00 g |
| B 48.50 g | D 47.50 g |

32. Rajah 15 menunjukkan langkah-langkah penimbangan dalam penentuan formula empirik oksida bagi logam P.

Diagram 15 shows the weighing steps taken in the determination of empirical formula of the oxide of metal P.



Rajah 15 / Diagram 15

Tentukan formula empirik oksida bagi logam P.

Determine the empirical formula of metal P oxide.

[Jisim atom relatif : O = 16, P = 207]

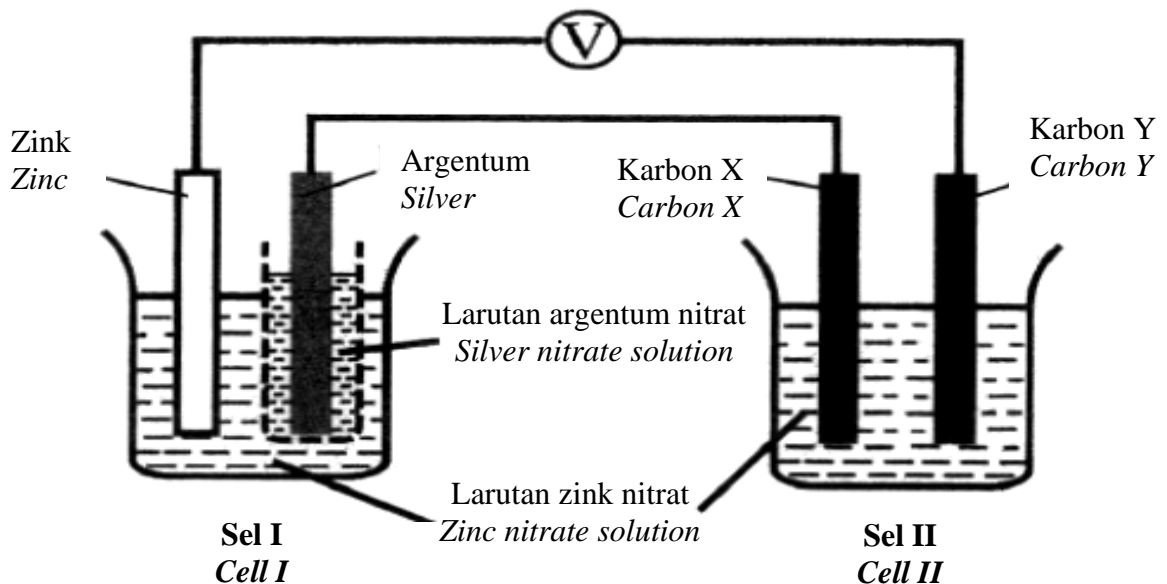
[Relative atomic mass : O = 16, P = 207]

- A** PO
B P₂O

- C** PO₂
D P₂O₄

33. Rajah 16 menunjukkan sel I dan sel II.

Diagram 16 shows Cell I and Cell II.



Rajah 16 / Diagram 16

Diberi nilai keupayaan elektrod piawai berikut.

Given the following standard electrode potential value.

$\text{Zn}^{2+} + 2\text{e}^- \rightarrow \text{Zn}$	$E^\circ = -0.76\text{V}$
$2\text{H}^+ + 2\text{e}^- \rightarrow \text{H}_2$	$E^\circ = 0.00\text{ V}$
$\text{Ag}^+ + \text{e}^- \rightarrow \text{Ag}$	$E^\circ = +0.80\text{ V}$
$\text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^- \rightarrow 4\text{OH}^-$	$E^\circ = +0.40\text{ V}$
$\text{NO}_3^- + 2\text{H}^+ + \text{e}^- \rightarrow \text{NO}_2 + \text{H}_2\text{O}$	$E^\circ = +0.81\text{ V}$

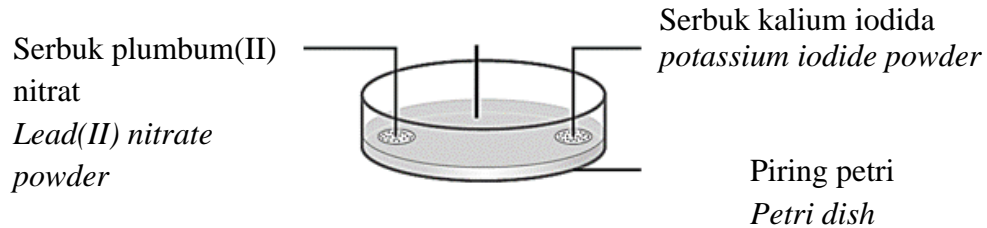
Antara berikut, yang manakah benar?

Which of the following is correct?

	Zn	Ag	Karbon X Carbon X	Karbon Y Carbon Y
A	Elektrod zink menebal <i>Zinc electrode becomes thicker</i>	Elektrod argentum menipis <i>Silver electrode becomes thinner</i>	Tiada perubahan <i>No changes</i>	Gelembung gas tidak berwarna terhasil <i>Bubbles of colourless gas is produced</i>
B	Elektrod zink menipis <i>Zinc electrode becomes thinner</i>	Elektrod argentum menebal <i>Silver electrode Becomes thicker</i>	Gelembung gas tidak berwarna terhasil <i>Bubbles of colourless gas is produced</i>	Tiada perubahan <i>No changes</i>
C	Ion zink menerima elektron <i>Zinc ion gains electron</i>	Atom argentum menyingkirkan elektron <i>Silver atom donates electron</i>	Ion nitrat mengalami pengoksidaan <i>Nitrate ion undergoes oxidation</i>	Ion zink mengalami penurunan <i>Zinc ion undergoes reduction</i>
D	Atom zink menyingkirkan elektron <i>Zinc atom donates electron</i>	Ion argentum menerima elektron <i>Silver ion gains electron</i>	Ion hidroksida mengalami pengoksidaan <i>Hydroxide ion undergoes oxidation</i>	Ion hidrogen mengalami penurunan <i>Hydrogen ion undergoes reduction</i>

36. Rajah 18 menunjukkan tindak balas antara 0.02 mol serbuk plumbum(II) nitrat dan 0.03 mol serbuk kalium iodida untuk menghasilkan mendakan kuning. Masa untuk tindak balas lengkap ialah 1 minit.

Diagram 18 shows the reaction between 0.02 mol of lead(II) nitrate powder and 0.03 mol of potassium iodide powder to form a yellow precipitate. The time taken for the reaction to complete is 1 minute.



Rajah 18 / Diagram 18

Apakah kadar pembentukan mendakan kuning?

What is the rate of formation of the yellow precipitate?

[Jisim atom relatif / Relative atomic mass: I = 127; Pb = 207]

- | | | | |
|----------|--------------------------|----------|--------------------------|
| A | 0.2305 g s ⁻¹ | C | 0.1153 g s ⁻¹ |
| B | 0.1537 g s ⁻¹ | D | 0.0768 g s ⁻¹ |
37. Berapakah peratus komposisi jisim bagi air dalam aluminasilikat terhidrat, Al₂O₃.2SiO₂.2H₂O?

What is the percentage composition by mass of water in hydrated aluminosilicate, Al₂O₃.2SiO₂.2H₂O?

[Jisim atom relatif / Relative atomic mass: Si = 28; Al = 27; O = 16; H = 1]

- | | | | |
|----------|-------|----------|--------|
| A | 6.98% | C | 8.85% |
| B | 7.75% | D | 13.95% |
38. Persamaan termokimia mewakili tindak balas antara larutan natrium hidroksida dan larutan kuprum(II) nitrat.

The thermochemical equation represents the reaction between sodium hydroxide solution and copper(II) nitrate solution.



Berapakah suhu tertinggi larutan campuran apabila 25 cm³ larutan kuprum(II) nitrat, 1.0 mol dm⁻³ dicampurkan kepada 50 cm³ larutan natrium hidroksida, 1.0 mol dm⁻³ dengan suhu awal kedua-dua larutan adalah 29.0 °C.

[Muatan haba tentu larutan = 4.2 J g⁻¹ °C⁻¹; ketumpatan larutan = 1.0 g cm⁻³]

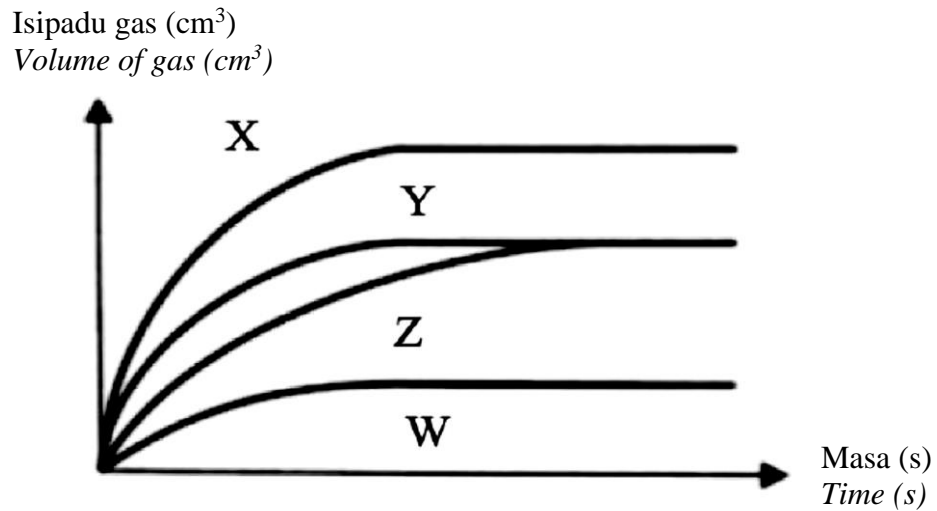
What is the highest temperature of the mixture when 25 cm³ of 1.0 mol dm⁻³ copper(II) nitrate solution is added to 50 cm³ of 1.0 mol dm⁻³ sodium hydroxide solution with the initial temperature for both solutions is 29.0 °C.

[Specific heat capacity of solution = 4.2 J g⁻¹ °C⁻¹; density of solution = 1.0 g cm⁻³]

- | | | | |
|----------|---------|----------|---------|
| A | 33.8 °C | C | 29.0 °C |
| B | 38.5 °C | D | 4.76 °C |

39. Rajah 19 menunjukkan graf apabila suatu pita magnesium ditambahkan kepada 25 cm³ asid sulfurik 1.0 mol dm⁻³ pada suhu bilik. Eksperimen ini diulang dengan menggunakan suhu yang lebih tinggi.

Diagram 19 shows a graph when a magnesium ribbon is added to 25 cm³ of 1.0 mol dm⁻³ sulphuric acid at room temperature. The experiment is repeated using a higher temperature.



Rajah 19 / Diagram 19

Antara berikut, graf manakah menunjukkan isi padu gas yang terkumpul pada sela masa tertentu untuk kedua-dua eksperimen ini?

Which of the following graphs show the volume of gas collected at regular interval time for the two experiments?

	Eksperimen pertama <i>First experiment</i>	Eksperimen ulangan <i>Repeated experiment</i>
A	W	Y
B	W	X
C	Z	X
D	Z	Y

40. Jadual 4 menunjukkan pemerhatian ujian kimia bagi larutan X.
Table 4 shows the observations of a chemical test on solution X.

Ujian kimia <i>Chemical test</i>	Pemerhatian <i>Observation</i>
Tambah larutan natrium hidroksida sehingga berlebihan <i>Add sodium hydroxide solution until in excess</i>	Mendakan putih tidak larut dalam larutan natrium hidroksida berlebihan <i>White precipitate insoluble in excess sodium hydroxide solution</i>
Tambah larutan ammonia sehingga berlebihan <i>Add ammonia solution until in excess</i>	Mendakan putih tidak larut dalam larutan ammonia berlebihan <i>White precipitate insoluble in excess ammonia solution</i>
Tambah asid nitrik cair diikuti dengan larutan barium nitrat <i>Add dilute nitric acid followed by barium nitrate solution</i>	Mendakan putih terbentuk <i>White precipitate formed</i>

Jadual 4 / *Table 4*

Apakah larutan X?
What is solution X?

- | | |
|--|--|
| A Zink sulfat
<i>Zinc sulphate</i> | C Plumbum(II) klorida
<i>Lead(II) chloride</i> |
| B Magnesium sulfat
<i>Magnesium sulphate</i> | D Aluminium klorida
<i>Aluminium chloride</i> |

**SKEMA JAWAPAN
PRAKTIS KIMIA 4541/1
SET 1**

1	B	11	D	21	B	31	B
2	A	12	C	22	D	32	C
3	D	13	A	23	C	33	D
4	B	14	C	24	A	34	B
5	C	15	C	25	D	35	A
6	C	16	B	26	C	36	C
7	A	17	D	27	B	37	D
8	A	18	A	28	A	38	A
9	D	19	B	29	A	39	D
10	B	20	C	30	D	40	B

LAMPIRAN

(Untuk rujukan guru)

JADUAL SPESIFIKASI UJIAN (JSU)

• PRAKTIS KIMIA 4541/1: SET 1

Chapter	Sub-chapter	Remembering			Understanding			Applying			Analyzing			Total
		E	M	H	E	M	H	E	M	H	E	M	H	
1. Introduction to chemistry [F4]	1.1 Development in chemistry field and its importance in daily life													
	1.2 Scientific investigation in chemistry													
	1.3 Usage, management and handling of apparatus and materials													
2. Matter and the Atomic Structure [F4]	2.1 Basic concepts of matter	1												1
	2.2 The development of the atomic model													
	2.3 Atomic structure				2									1
3. The Mole Concept, Chemical Formula and Equation [F4]	2.4 Isotopes and its uses	4												1
	3.1 Relative atomic mass and relative molecular mass		3							37				1
	3.2 Mole concept									31				1
	3.3 Chemical formula									32				1
4. The Periodic Table of Elements [F4]	3.4 Chemical equation													
	4.1 The development of The Periodic Table of Elements													
	4.2 The arrangement in The Periodic Table of Elements													
	4.3 Elements in Group 18	5												1
	4.4 Elements in Group 1						6							1
	4.5 Elements in Group 17													
	4.6 Elements in Period 3			7										1
5. Chemical Bond [F4]	4.7 Transition elements													
	5.1 Basics of compound formation													
	5.2 Ionic bond							8						1
	5.3 Covalent bond													
	5.4 Hydrogen bond													
	5.5 Dative bond													
	5.6 Metallic bond							9						
6. Acid, Base and Salt [F4]	5.7 Properties of ionic and covalent compounds		10											1
	6.1 The role of water in showing acidic and alkaline properties				11									1
	6.2 pH value													
	6.3 Strength of acids and alkalis													
	6.4 Chemical properties of acids and alkalis													
	6.5 Concentration of aqueous solution													
	6.6 Standard solution							34						1
	6.7 Neutralisation								14					1
	6.8 Salts, crystals and their uses in daily life													
	6.9 Preparation of salts						12							1
	6.10 Effect of heat on salts													
7. Rate of Reaction [F4]	6.11 Qualitative analysis				13							40	2	
	7.1 Determining rate of reaction								36				1	
	7.2 Factors affecting rate of reaction						15						39	
	7.3 Application of factors that affect the rate of reaction in daily life													
8. Manufactured Substances in Industry [F4]	7.4 Collision theory						16							1
	8.1 Alloy and its importance													
	8.2 Composition of glass and its uses	17												1
	8.3 Composition of ceramics and its uses													
9. Redox equilibrium [F5]	8.4 Composite materials and its importance						18							1
	9.1 Oxidation and reduction					19	20							2
	9.2 Standard electrode potential													
	9.3 Voltaic cell								33					
	9.4 Electrolytic cell													
	9.5 Extraction of metal from its ore													
10. Carbon compound [F5]	9.6 Rusting						21							
	10.1 Types of carbon compound													
	10.2 Homologous series								22					1
	10.3 Chemical properties and interconversion of compounds between homologous series						24				23			2
11. Thermochemistry [F5]	10.4 Isomers and naming based on IUPAC nomenclature													
	11.1 Heat change in reactions													
	11.2 Heat of reaction						25			38				2
	11.3 Application of endothermic and exothermic reactions in daily life									35				1
12. Polymer Chemistry [F5]	12.1 Polymer						26							1
	12.2 Natural rubber						27							
	12.3 Synthetic rubber													
13. Consumer and Industrial Chemistry [F5]	13.1 Oils and fats													
	13.2 Cleaning agents								28					1
	13.3 Food additives										29			1
	13.4 Medicines and cosmetics	30												1
	13.5 Application of nanotechnology in industry													
	13.6 Application of green technology in industrial waste management													
Total		5	3	0	4	6	7	1	3	7	0	2	2	40
Ratio of E:M:H														
Level of Difficulty		E : Easy M : Medium H : Hard												

**PROGRAM
MODUL KENYALANG CEMERLANG
SPM 5.0
TAHUN 2024**

JABATAN PENDIDIKAN NEGERI SARAWAK

**KIMIA
(4541/2)**

**PRAKTIS KERTAS 2
SET 1**

PENGENALAN

Program Semarak Kasih yang dilaksanakan pada tahun 2020 telah mendapat sambutan yang menggalakkan daripada warga pendidik dan murid, khususnya calon SPM 2020. Sehubungan dengan itu, pada tahun 2024 ini, Sektor Pembelajaran, Jabatan Pendidikan Negeri Sarawak mengadakan **Modul Kenyalang Cemerlang** untuk membantu guru dan calon SPM menghadapi peperiksaan SPM 2024.

Modul yang dihasilkan disertakan dengan sampel Jadual Spesifikasi Ujian (JSU) dan sampel item/soalan mengikut format baharu peperiksaan SPM mulai 2021 untuk dijadikan bahan panduan dan rujukan guru-guru dan juga sebagai bahan latihan/ulangkaji kepada calon-calon SPM 2024 di semua sekolah menengah di negeri Sarawak.

OBJEKTIF PROGRAM

1. Memastikan calon SPM menguasai format baharu Peperiksaan SPM 2024.
2. Memastikan calon SPM mempunyai bahan pembelajaran yang berfokus ke arah peperiksaan SPM.
3. Meningkatkan pencapaian akademik calon SPM 2024.
4. Melonjakkan keputusan SPM 2024 Negeri Sarawak

SENARAI KANDUNGAN

Bil.	Perkara	Muka surat
1	Format Kertas Peperiksaan SPM Mulai Tahun 2021	2
2	Latihan - Praktis Kimia 4541/2: Set 1	3 - 25
3	Skema Jawapan/Pemarkahan	26 - 37
4	LAMPIRAN: Sampel Jadual Spesifikasi Ujian (JSU) untuk Praktis Kimia 4541/2: Set 2	38

SENARAI AHLI PANEL PEMBINA MODUL KENYALANG CEMERLANG SPM

Bil.	Nama Guru	Sekolah	PPD
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**FORMAT INSTRUMEN PEPERIKSAAN SPM MULAI TAHUN 2021
BAGI MATA PELAJARAN KIMIA (KOD: 4541)**

BIL	PERKARA	KERTAS 1 (4541/1)	KERTAS 2 (4541/2)	KERTAS 3 (4541/3)
1	Jenis Instrumen	Ujian Bertulis		Ujian Amali
2	Jenis Item	Objektif Aneka Pilihan	<ul style="list-style-type: none"> • Subjektif Berstruktur • Subjektif Respons Terhad • Subjektif Respons Terbuka 	Subjektif Berstruktur
3	Bilangan Soalan	40 soalan (40 markah) (Jawab semua soalan)	Bahagian A: <ul style="list-style-type: none"> • 8 soalan (60 Markah) (Jawab semua soalan) Bahagian B: (20 Markah) <ul style="list-style-type: none"> • 2 soalan (Jawab 1 soalan) Bahagian C: (20 Markah) <ul style="list-style-type: none"> • 1 soalan 	3 item (Jawab mengikut subjek yang didaftar)
4	Jumlah Markah	40 markah	100 markah	15 markah bagi setiap item
5	Konstruk	<ul style="list-style-type: none"> • Mengingat • Memahami • Mengaplikasi • Menganalisis 	<ul style="list-style-type: none"> • Mengingat • Memahami • Mengaplikasi • Menganalisis • Menilai • Mencipta 	Kemahiran proses sains
6	Tempoh Ujian	1 jam 15 minit	2 jam 30 minit	40 minit + 5 minit setiap item (5 minit: sesi merancang) (40 minit: masa menjawab soalan)
7	Cakupan Konteks	Standard kandungan dan standard pembelajaran dalam Dokumen Standard Kurikulum dan Pentaksiran (DSKP) KSSM (Tingkatan 4 dan 5)		
8	Aras Kesukaran	Rendah : Sederhana : Tinggi 5 : 3 : 2		
9	Kaedah Penskoran	Dikotomus	Analitikal	
10	Alat Tambahan	Kalkulator saintifik		

PRAKTIS KIMIA 4541/2 SET 1

BAHAGIAN A
Section A

1. Kerusi dan baldi mengandungi polimer X. Formula struktur bagi polimer X ditunjukkan dalam Rajah 1.
The chair and pails contain polymer X. The structural formula of polymer X is shown in Diagram 1.



Rajah 1 / Diagram 1

Berdasarkan Rajah 1,
Based on Diagram 1,

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

.....
.....

[1 markah /1 mark]

- (ii) Nyatakan jenis pempolimeran yang terlibat.
State the type of polymerisation involved.

.....
.....

[1 markah /1 mark]

- (iii) Nyatakan nama monomer bagi polimer dalam Rajah 1.
State the name of the monomer for the polymer in Diagram 1.

.....
.....

[1 markah /1 mark]

- (iv) Lukis formula struktur monomer dalam (a)(iii).
Draw the structural formula of monomer in (a)(iii).

[1 markah /1 mark]

- (b) Nyatakan **satu** ciri polimer X yang menjadikannya sesuai untuk menghasilkan produk dalam Rajah 1.
*State **one** characteristic of the polymer X that makes it suitable for producing the products in Diagram 1.*

.....
[1 markah /1 mark]

2. Jadual 1 menunjukkan maklumat unsur dalam Jadual Berkala Unsur.
Table 1 shows the information of elements in Periodic Table of Elements.

Unsur <i>Element</i>	Na	Mg	Al	Si	P	S	Cl
Susunan elektron <i>Electron arrangement</i>	2.8.1	2.8.2	2.8.3	2.8.4	2.8.5	2.8.6	2.8.7
Jejari atom <i>Atomic radius</i>	186	160	143	118	110	104	100

Jadual 1 / *Table 1*

- (a) Apakah yang dimaksudkan dengan kala?

What is meant by period?

.....
 [1 markah / 1 mark]

- (b) (i) Kala yang manakah unsur itu terletak?

Which period are the elements placed?

.....
 [1 markah / 1 mark]

- (ii) Beri **satu** sebab bagi jawapan di 1(b)(i).

*Give **one** reason for the answer in 1(b)(i).*

.....
 [1 markah / 1 mark]

- (c) Nyatakan unsur yang wujud sebagai molekul dwiatom.

State the element that exists as diatomic molecule.

.....
 [1 markah / 1 mark]

- (d) Unsur yang manakah ialah separa logam?

Which element is a semi-metal?

.....
 [1 markah / 1 mark]

3. Rajah 2 menunjukkan tiga contoh bahan buatan dalam industri.
Diagram 2 shows three examples of manufactured substances in industry.



P



Q



R

Rajah 2 / *Diagram 2*

- (a) (i) P diperbuat daripada duralumin. Kuprum adalah salah satu unsur dalam duralumin. Namakan **satu** unsur lain dalam duralumin.
*P is made of from duralumin. Copper is one of the elements in duralumin. Name **one** other element in duralumin.*

.....
 [1 markah / 1 mark]

- (ii) Nyatakan perbezaan dari segi kekerasan antara duralumin dan logam tulennya.
State the difference in hardness between duralumin and its pure metal.

.....
 [1 markah / 1 mark]

- (b) (i) Q dan R adalah dua jenis seramik. Apakah jenis seramik R?
Q and R are two types of ceramics. What is the type of ceramic R?

.....
 [1 markah / 1 mark]

- (ii) Nyatakan **satu** persamaan antara seramik Q dan R.
*State **one** similarity between ceramic Q and R.*

.....
 [1 markah / 1 mark]

- (c) Jadual 2 menunjukkan maklumat tentang dua jenis kaca X dan Y.
Table 2 shows the information of two types of glasses X and Y.

Jenis kaca <i>Type of glass</i>	Komposisi <i>Composition</i>	Kegunaan <i>Uses</i>
X	Silika, natrium karbonat, kalsium karbonat <i>Silica, sodium carbonate, calcium carbonate</i>	Tingkap kaca <i>Window glass</i>
Y	Silika, argentum klorida, kalsium karbonat <i>Silica, silver chloride, calcium carbonate</i>	Tingkap kaca <i>Window glass</i>

Jadual 2 / *Table 2*

Encik Ali ingin memasang tingkap kaca di rumahnya yang dapat menghalang sinar ultraungu. Antara kaca X dan Y, kaca jenis manakah yang akan Encik Ali pilih? Berikan alasan anda.

Mr Ali wish to install a glass window at his house that is able to prevent the ultraviolet rays. Between glass X and Y, which type of glass will Mr Ali chose? Give your reason.

.....
.....

[2 markah / 2 marks]

4. Jadual 3 menunjukkan takat lebur dan takat didih bahan P, Q, R, S dan T.
Table 3 shows the melting and boiling point of substance P, Q, R, S and T.

Bahan Substance	Takat lebur (°C) Melting point (°C)	Takat didih (°C) Boiling point (°C)
P	-111.0	-46.0
Q	-83.0	44.0
R	90.8	873.0
S	841.0	1713.0

Jadual 3 / Table 3

Berdasarkan Jadual 3,
Based on Table 3,

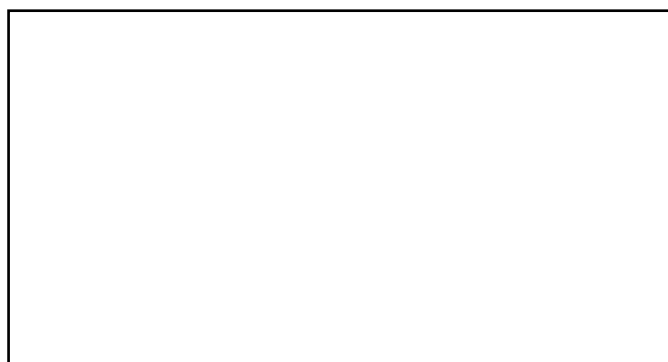
- (a) (i) Nyatakan **satu** bahan yang wujud dalam keadaan gas pada suhu bilik.
*State **one** substance that exists in a gas state at room temperature.*

.....
 [1 markah /1 mark]

- (ii) Bahan manakah yang akan melalui proses pendidihan apabila diletakkan dalam kukus air yang mempunyai suhu 100.0 °C?
Which substance will undergoes the boiling process when placed in steaming water that has a temperature of 100.0 °C?

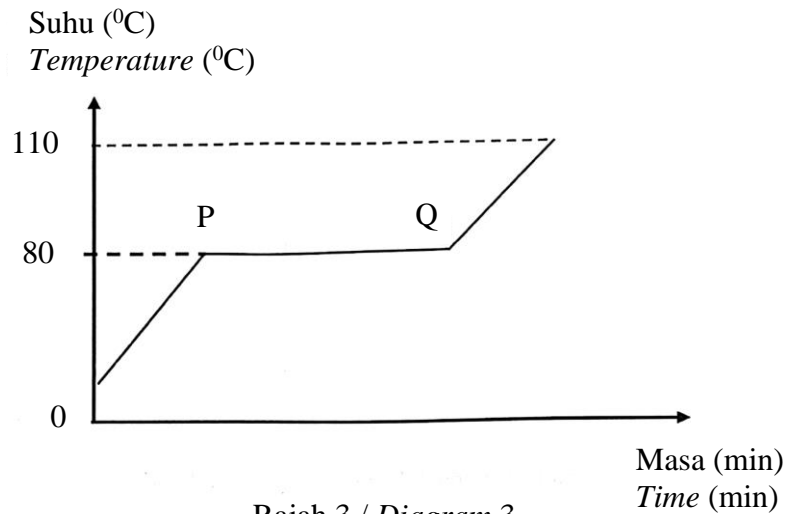
.....
 [1 markah /1 mark]

- (iii) Lukis susunan zarah bagi bahan Q pada suhu -10.0 °C.
Draw the arrangement of particles in substance Q at temperature of -10.0 °C.



[1 markah /1 mark]

- (b) Rajah 3 menunjukkan graf suhu melawan masa bagi pemanasan naftalena, $C_{10}H_8$.
 Diagram 3 shows a graph of temperature against time for heating of naphthalene, $C_{10}H_8$.



Rajah 3 / Diagram 3

- (i) Berdasarkan Rajah 3, didapati tiada perubahan suhu berlaku dari P ke Q. Terangkan jawapan anda.
 Based on Diagram 3, it is found that no change in temperature occurs from P to Q. Explain your answer.

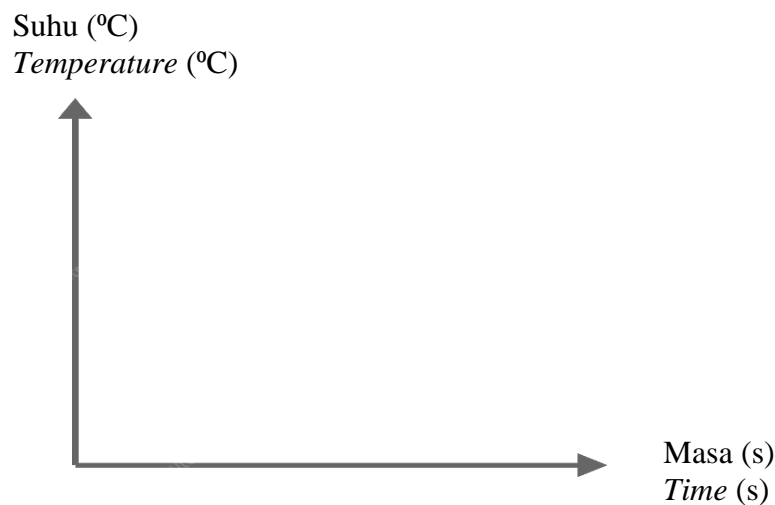
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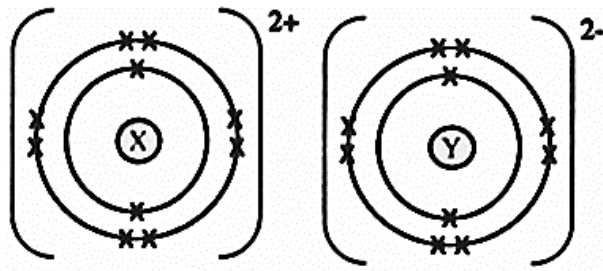
[2 markah / 2 marks]

- (ii) Cecair naftalena kemudiannya disejukkan kepada suhu bilik. Lakarkan graf suhu melawan masa bagi penyejukan naftalena dan tandakan takat bekunya pada graf tersebut.
 Naphtahlene liquid is then cooled to the room temperature. Sketch a graph of temperature against time for the cooling of naphthalene and mark its freezing point on the graph.



[2 markah / 2 marks]

5. Rajah 4 menunjukkan susunan elektron bagi sebatian yang terbentuk daripada tindak balas antara unsur X dan unsur Y.
Diagram 4 shows an electron arrangement of compound formed between the reaction of element X and element Y.



Rajah 4 / Diagram 4

Berdasarkan Rajah 4,
Based on Diagram 4,

- (a) (i) Tuliskan susunan elektron bagi atom X.
Write the electron arrangement of atom X.

 [1 markah /1 mark]
- (ii) Nyatakan jenis daya tarikan antara zarah-zarah dalam sebatian tersebut.
State the type of forces of attraction between particles in the compound.

 [1 markah /1 mark]
- (iii) Tuliskan persamaan kimia bagi pembentukan sebatian tersebut.
Write the chemical equation for the formation of the compound.

 [1 markah /1 mark]
- (iv) Hitung jisim sebatian yang dihasilkan apabila 0.1 mol X bertindak balas dengan unsur Y yang berlebihan.
[Jisim atom relatif: Y=16; X=24]
Calculate the mass of compound produced when 0.1 mol X reacts with excess element Y.
[Relative atomic mass: Y = 16, X = 24]

[2 markah /2 marks]

- (b) Puan Lee meletakkan pepejal putih ke dalam almari untuk menghalau lipas. Sifat fizik pepejal putih itu adalah seperti berikut:

Puan Lee puts a white solid in a cupboard to keep the cockroach away. The physical properties of the white solid are as follows:

- Tidak boleh mengalirkan arus elektrik dalam semua keadaan
Cannot conduct electricity in any states
- Takat lebur dan takat didih yang rendah
Low melting and boiling point

Berdasarkan maklumat di atas, kenal pasti jenis sebatian pepejal putih itu dan terangkan ciri-cirinya.

Based on the above information, identify the type of compound of the white solid and explain each property.

.....

.....

.....

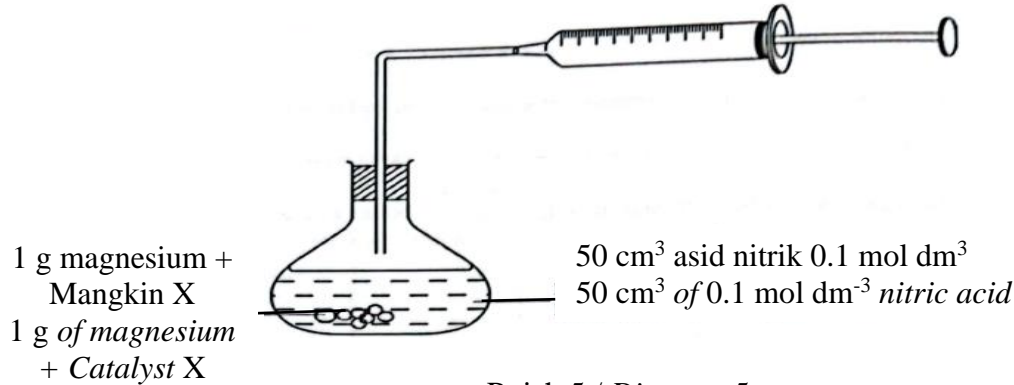
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[3 markah / 3 marks]

6. Rajah 5 menunjukkan susunan radas bagi satu eksperimen untuk mengkaji kadar tindak balas antara magnesium dan asid nitrik. Dalam eksperimen ini, 1.0 g magnesium ditambahkan kepada 50 cm³ asid nitrik 0.1 mol dm⁻³.

Diagram 5 shows the apparatus set-up for an experiment to study the rate of reaction between of magnesium and nitric acid. In this experiment, 1.0 g of magnesium is added to 50 cm³ of 0.1 mol dm⁻³ nitric acid.



Rajah 5 / Diagram 5

Jadual 4 menunjukkan isi padu gas yang terkumpul pada setiap sela masa 1 minit apabila mangkin X ditambah dalam eksperimen ini.

Table 4 shows the volume of gas collected at 1 minute interval when catalyst X is added in this experiment.

Masa (min) Time (min)	0.0	1.0	2.0	3.0	4.0	5.0
Isi padu gas (cm ³) Volume of gas (cm ³)	0.0	18.2	34.8	51.1	60.0	60.0

Jadual 4 / Table 4

- (a) (i) Apakah yang dimaksudkan dengan mangkin?
What is the meaning of catalyst?

.....

.....

[1 markah / 1 mark]

- (ii) Nyatakan nama bagi mangkin X yang boleh digunakan dalam eksperimen ini.
State the name of catalyst X that can be used in this experiment.

.....

[1 markah / 1 mark]

- (b) Tulis persamaan kimia bagi tindak balas dalam eksperimen ini.
Write the chemical equation for the reaction in this experiment.

.....

[2 markah / 2 marks]

(c) Hitung :
Calculate :

(i) Bilangan mol magnesium yang digunakan.
The number of mole of magnesium used.

[1 markah / 1 mark]

(ii) Bilangan mol bagi asid nitrik.
The number of mole of nitric acid.

[1 markah / 1 mark]

(d) Berdasarkan jawapan di 6(c)(i) dan 6(c)(ii), namakan bahan tindak balas yang menentukan isi padu gas yang terbentuk pada akhir tindak balas itu.
Based on the answer in 6(c)(i) and 6(c)(ii), name the reactant which determines the volume of gas produced at the end of the reaction.

.....
[1 markah / 1 mark]

(e) Dengan menggunakan teori perlanggaran, terangkan bagaimana faktor mangkin meningkatkan kadar tindak balas.
By using the collision theory, explain how the catalyst factor increases the rate of reaction.

.....
.....
.....
[2 markah / 2 marks]

7. Rajah 6.1 menunjukkan ramuan bagi aiskrim buatan sendiri yang dibuat oleh Puan Patricia. Diagram 6.1 shows the ingredients of a homemade ice cream which made by Madam Patricia.



Ramuan:

Keju krim, susu penuh krim, gula tebu, ekstrak vanila, garam laut, gam xanthan.

Ingredients:

Cream cheese, full cream milk, cane sugar, vanilla extract, sea salt, xanthan gum

Rajah 6.1 / Diagram 6.1

- (a) (i) Lemak ialah salah satu bahan yang terdapat dalam aiskrim. Nyatakan keadaan fizikal lemak pada suhu bilik.
One of the ingredients in the ice cream is fats. State the physical state of fats at room temperature.

.....
[1 markah /1 mark]

- (ii) Gam xanthan diguna secara meluas dalam makanan seperti sos cili dan aiskrim. Nyatakan jenis bahan tambah makanan dan fungsi gam xanthan tersebut.
Xanthan gum is widely used in foods such as chili sauce and ice cream. State the type of food additive and the function of xanthan gum.

.....
.....
.....
[2 markah /2 marks]

- (iii) Puan Patricia ialah seorang penghidap kencing manis. Cadang dan terangkan alternatif lain bagi Puan Patricia untuk menikmati aiskrim tanpa memudaratkan kesihatannya.
Madam Patricia is a diabetic. Suggest and explain another alternative for Madam Patricia to enjoy the ice cream without harming her health.

.....
.....
.....
[2 markah /2 marks]

- (iv) Wajarkan penggunaan bahan tambah makanan dalam kehidupan seharian.
Justify the use of food additives in daily life.

.....

.....

.....

[2 markah /2 marks]

- (b) Rajah 6.2 menunjukkan suatu iklan yang mempromosikan garam nano di laman web beli-belah dalam talian yang dilayari oleh Puan Patricia. Iklan tersebut menyatakan bahawa garam nano merupakan satu produk nanoteknologi. Puan Patricia ingin membelinya untuk menggantikan garam laut dalam pembuatan aiskrim. *Diagram 6.2 shows an advertisement promoting nano salt on an online shopping website which visited by Madam Patricia. The advertisement claims that nano salt is a nanotechnology product. Madam Patricia wants to buy it to replace the sea salt in making ice cream.*



Rajah 6.2 / Diagram 6.2

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

.....

.....

[1 markah /1 mark]

- (ii) Penggunaan garam nano adalah lebih sihat berbanding garam laut. Terangkan.
The use of nano salt is healthier than sea salt. Explain.

.....

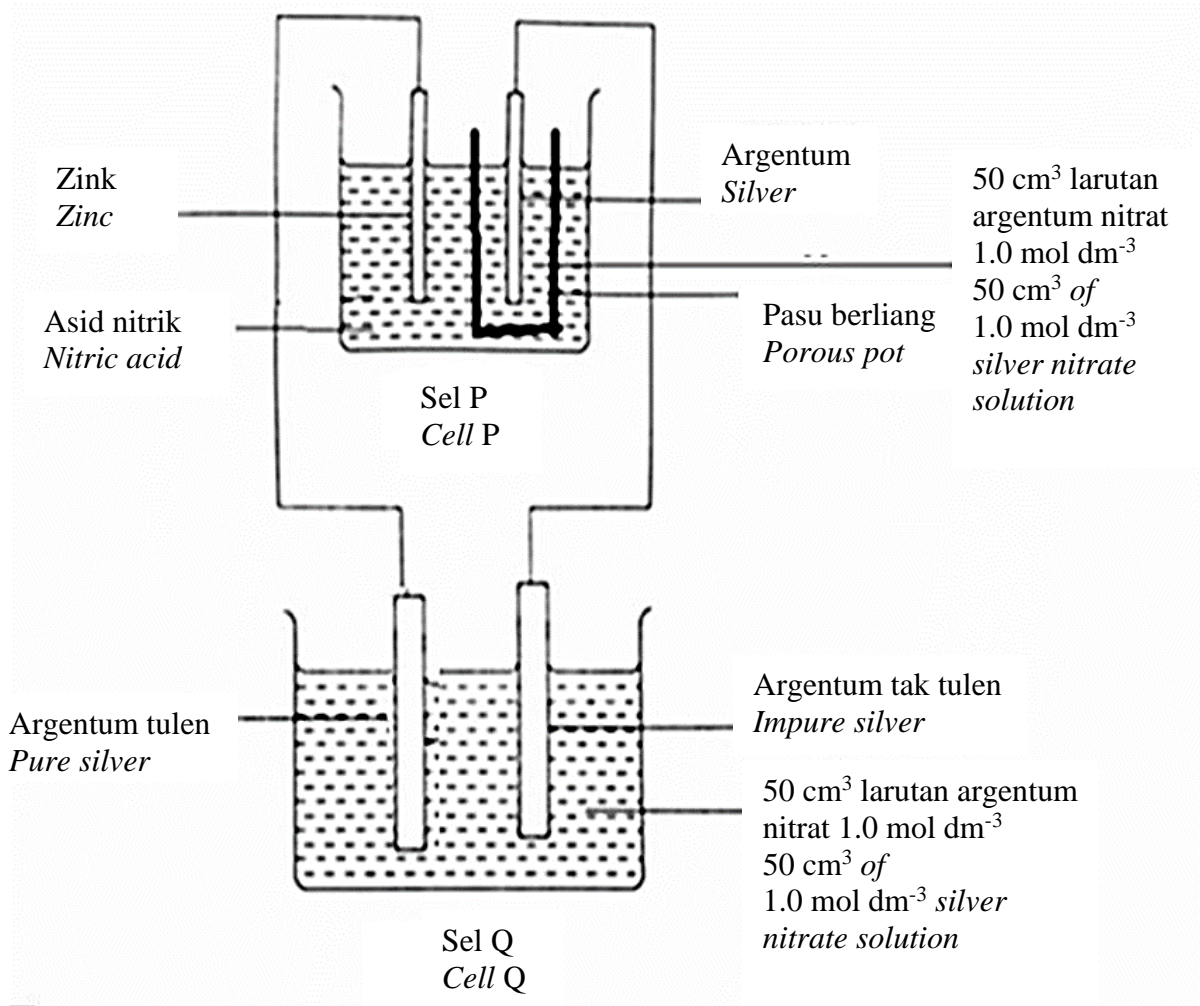
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[2 markah /2 marks]

8. Rajah 7 menunjukkan susunan radas bagi penulenan argentum tak tulen.
 Diagram 7 shows the apparatus set up to purify the impure silver.



Rajah 7 / Diagram 7

Berdasarkan Rajah 7,
 Based on Diagram 7,

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

[1 markah /1 mark]

- (b) Nyatakan anod dan katod pada Sel Q.
 State the anode and cathode in Cell Q.
 Anod / Anode:

Katod / Cathode:

[2 markah /2 marks]

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

.....
 [1 markah /1 mark]

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

[3 markah /3 marks]

- (e) Faridah mendapati kunci besinya telah berkarat. Dengan menggunakan pengetahuan tentang elektrolisis,
Faridah found out that her keys are rusted. 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.

.....
 [1 markah /1 mark]

- (ii) Lukiskan susunan radas berlabel yang sesuai bagi membantu Faridah menjalankan proses tersebut di dalam makmal.
Draw a suitable labelled apparatus set-up to help Faridah carry out the process in the laboratory.

[2 markah / 2 marks]

BAHAGIAN B / SECTION B
[20 markah / 20 marks]

Bahagian ini mengandungi **dua** soalan. Jawab nama-mana **satu** soalan.

9. Jadual 5 menunjukkan maklumat bagi empat sebatian organik P, Q, R dan S.
Table 5 shows the information of four organic compounds P, Q, R and S.

Sebatian organik <i>Organic compound</i>	Maklumat <i>Information</i>
P	<ul style="list-style-type: none"> • Mempunyai 3 atom karbon <i>Has 3 carbon atoms</i> • Larut dalam air <i>Soluble in water</i> • Bakar dengan nyalaan biru dan tiada jelaga <i>Burns with blue flame without soot</i>
Q	<ul style="list-style-type: none"> • Mempunyai 3 atom karbon <i>Has 3 carbon atoms</i> • Mengandungi karbon dan hidrogen sahaja <i>Contains carbon and hydrogen only</i> • Menyahwarnakan warna perang air bromin <i>Decolourises the brown colour of bromine water</i>
R	<ul style="list-style-type: none"> • Mempunyai 2 atom karbon <i>Has 2 carbon atoms</i> • Larut dalam air <i>Soluble in water</i> • Bertindak balas dengan kalsium karbonat menghasilkan gas karbon dioksida <i>Reacts with calcium carbonate to produce carbon dioxide gas</i>
S	<ul style="list-style-type: none"> • Mempunyai 4 atom karbon <i>Has 4 carbon atoms</i> • Mengandungi karbon dan hidrogen sahaja <i>Contains carbon and hydrogen only</i> • Tidak menyahwarnakan warna perang air bromin <i>Does not decolourise the brown colour of bromine</i>

Jadual 5 / Table 5

Berdasarkan maklumat dalam Jadual 5,
Based on the information in Table 5,

- (a) Tentukan formula molekul bagi sebatian P, Q, R dan S. Nyatakan nama siri homolog bagi setiap sebatian itu.
Determine the molecular formula of compounds P, Q, R and S. State the name of the homologous series for each compound.

[8 markah / 8 marks]

- (b) Dalam proses peretakan, sebatian X dipanaskan pada suhu dan tekanan yang tinggi menghasilkan sebatian Q dan S.

Kenalpasti sebatian X. Tuliskan persamaan kimia proses peretakan sebatian X. Hitungkan jisim sebatian Q jika 2400 dm^3 sebatian X digunakan dalam tindak balas ini. *In the cracking process, compound X is heated at high temperature and pressure to produce compounds Q and S. Identify the compound X.*

Write the chemical equation for the cracking process of compound X. Calculate the mass of compound Q if 2400 dm^3 of compound X is used in the reaction.

[Jisim atom relatif: H = 1; C = 12. 1 mol gas menempati 24 dm^3 pada keadaan bilik]

[Relative atomic mass: H=1; C = 12. 1 mole of gas occupies 24 dm^3 at room temperature]

[5 markah / 5 marks]

- (c) Sebatian P boleh ditukar kepada sebatian organik Q melalui proses T. Namakan proses T. Lukis gambar rajah yang berlabel untuk menunjukkan cara menyediakan dan mengumpul sebatian Q.

Compound P can be converted to organic compound Q through process T. Name process T. Draw a labelled diagram to show how to prepare and collect compound Q.

[3 markah / 3 marks]

- (c) Sebuah kilang gula ingin mengeluarkan gula-gula berperisa baru. Satu sampel ester Z boleh disediakan melalui pengesteran antara sebatian P dan R. Tulis persamaan kimia untuk tindak balas ini. Lukis formula struktur dan namakan ester Z.

A factory wants to manufacture a new flavoured candy. A sample of ester Z is prepared through the esterification between compound P and R. Write the chemical equation for the reaction. Draw the structural formula and name the ester Z.

[4 markah / 4 marks]

10. (a) Persamaan termokimia berikut mewakili tindak balas penyesaran antara zink dan larutan kuprum(II) sulfat.

The following thermochemical equation represents the reaction between zinc and copper(II) sulphate solution.



- (i) Berdasarkan persamaan termokimia di atas, nyatakan maksud haba penyesaran.
Based on the above thermochemical equation, state the meaning of heat of displacement.

[1 markah /1 mark]

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

[1 markah /1 mark]

- (iii) Apakah yang akan berlaku kepada nilai ΔH apabila logam zink digantikan dengan logam magnesium?
Jelaskan jawapan anda.
What will happen to ΔH value when zinc metal is replaced with magnesium metal? Explain your answer.

[2 markah /2 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. 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. 65.5 kJ of heat energy is released when 1 mol of silver chloride precipitated.

- (i) Tulis persamaan ion bagi pembentukan argentum klorida.
Write the ionic equation for the formation of silver chloride.

[1 markah /1 mark]

- (ii) Kira haba yang dibebaskan dalam tindak balas ini.
Calculate the heat released in the reaction.

[3 markah /3 marks]

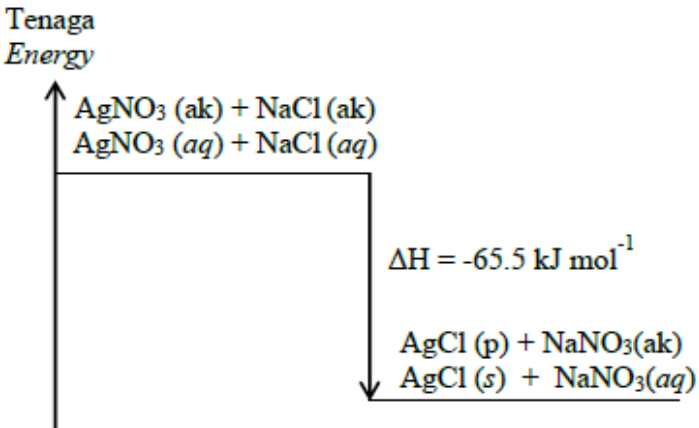
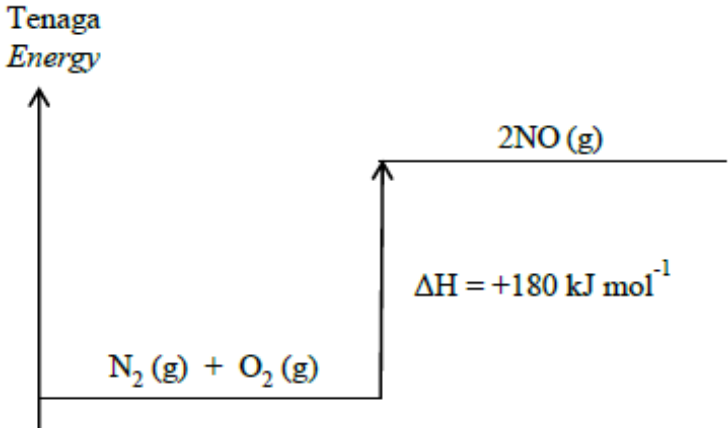
- (iii) Apakah perubahan suhu dalam campuran ini?
[Muatan haba tentu larutan = 4.2 J g⁻¹ °C⁻¹; ketumpatan larutan: 1 g cm⁻³]
What is the temperature change in the mixture?
[Specific heat capacity of solution = 4.2 J g⁻¹ °C⁻¹; density of solution: 1 g cm⁻³]

[2 markah /2 marks]

- (iv) Nilai haba yang terbebas semasa tindak balas penyesaran logam selalunya lebih rendah daripada nilai teori. Terangkan mengapa dan nyatakan langkah berjaga-jaga yang perlu diambil semasa menjalankan eksperimen ini.
The value of heat released during displacement of metal reaction is usually lower than theoretical value. Explain why and state the precautionary steps to be taken during the experiment.

[2 markah /2 marks]

- (c) Jadual 6 menunjukkan gambar rajah aras tenaga bagi dua jenis tindak balas, Tindak Balas I dan Tindak Balas II.
Diagram 6 shows the energy profile diagram for two types of reactions, Reaction I and Reaction II.

Tindak Balas <i>Reaction</i>	Gambar rajah aras tenaga <i>Energy profile diagram</i>
I	 <p>Tenaga Energy</p> <p>AgNO₃ (ak) + NaCl (ak) AgNO₃ (aq) + NaCl (aq)</p> <p>$\Delta H = -65.5 \text{ kJ mol}^{-1}$</p> <p>AgCl (p) + NaNO₃ (ak) AgCl (s) + NaNO₃ (aq)</p>
II	 <p>Tenaga Energy</p> <p>2NO (g)</p> <p>$\Delta H = +180 \text{ kJ mol}^{-1}$</p> <p>N₂ (g) + O₂ (g)</p>

Jadual 6/ Table 6

Berdasarkan Jadual 6, bandingkan Tindak balas I dan Tindak balas II dari segi:

- jenis tindak balas
- perubahan haba semasa tindak balas
- perubahan suhu semasa tindak balas
- jumlah kandungan tenaga bahan tindak balas dan hasil tindak balas
- perubahan tenaga haba sewaktu pemutusan dan pembentukan ikatan

Based on Table 6, compare Reaction I and Reaction II in terms of:

- *the type of reactions*
- *heat change during reactions*
- *temperature change during reactions*
- *total energy content of reactants and products*
- *change of heat energy during the breaking and formation of bonds*

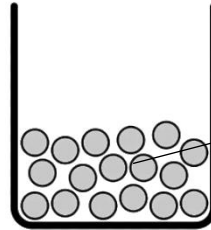
[8 markah /8 marks]

BAHAGIAN C / SECTION C

[20 markah / 20 marks]

Soalan ini **wajib** dijawab.

- 11 (a) Rajah 8 menunjukkan satu bikar mengandungi campuran garam zink yang diberikan kepada peserta semasa pertandingan 'COOL SCIENCE CHALLENGE' dalam aktiviti Minggu Sains. *Diagram 8 shows a beaker contains a mixture of zinc salts that is given to participants during 'COOL SCIENCE CHALLENGE' competition in Science Week activity.*



Campuran garam zink nitrat dan zink karbonat
Mixture of zinc nitrate and zinc carbonate salts

Rajah 8 / Diagram 8

- (i) Nyatakan keterlarutan bagi kedua-dua garam. Huraikan secara ringkas bagaimana kedua-dua garam dapat diasingkan
State the solubility of the two salts. Describe briefly how both salts can be separated.

[6 markah / 6 marks]

- (ii) Banding dan bezakan kedua-dua garam apabila terurai oleh haba. Tulis persamaan kimia bagi tindak balas penguraian bagi kedua-dua garam tersebut,
Compare and contrast both salts when decomposed by heat. Write the chemical equation for the decomposition reaction for both salts.

[7 markah / 7 marks]

- (b) Anda diberikan tiga bahan yang digunakan untuk menyediakan garam sulfat seperti yang ditunjukkan dalam Jadual 7.

You are given three substances used to prepare zinc sulphate as shown in Table 7.

<p>Asid sulfurik, H_2SO_4, zink nitrat, $Zn(NO_3)_2$, natrium karbonat, Na_2CO_3 <i>Sulphuric acid, H_2SO_4, zinc nitrate, $Zn(NO_3)_2$, sodium carbonate, Na_2CO_3</i></p>

Jadual 7 / Table 7

Dengan menggunakan bahan-bahan dalam Jadual 7, huraikan bagaimana garam zink sulfat dapat disediakan di dalam makmal.

By using the substances in Table 7, describe how to prepare zinc sulphate salt in the laboratory.

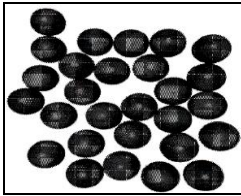
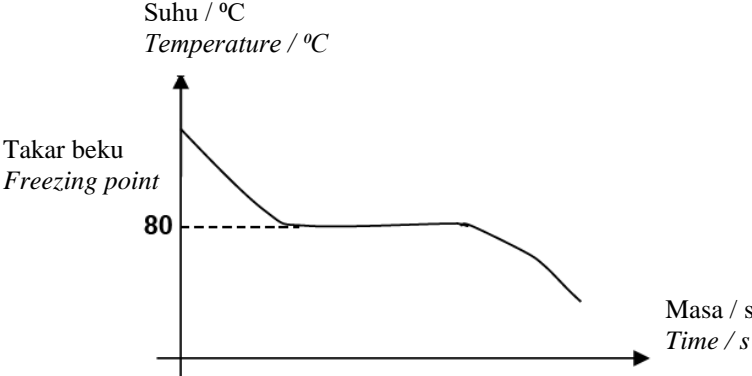
[7 markah / 7 marks]

SKEMA JAWAPAN / PEMARKAHAN
PRAKTIS KIMIA 4541/2
SET 1

Soalan Question			Jawapan Answer	Markah Marks	
				Sub	Total
1	(a)	(i)	Rantai panjang molekul yang diperbuat daripada gabungan banyak unit asas // monomer <i>A long chain molecule that is made from a combination of many basic units // monomers</i>	1	1
		(ii)	Pempolimeran penambahan <i>Addition polymerisation</i>	1	1
		(iii)	Propena <i>Propene</i>	1	1
		(iv)	$ \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}=\text{C} \\ \quad \quad \\ \text{H} \quad \quad \text{H} \end{array} $	1	1
	(b)		Tahan lasak <i>Durable</i>	1	1
Jumlah / Total				5	

Soalan Question			Jawapan Answer	Markah Marks	
				Sub	Total
2	(a)		Baris mengufuk unsur dalam Jadual Berkala Unsur. <i>Horizontal rows of elements in the Periodic Table of Elements.</i>	1	1
	(b)	(i)	Kala 3 <i>Period 3</i>	1	1
		(ii)	Unsur-unsur mempunyai 3 petala berisi elektron. <i>Elements has 3 shells filled with electrons.</i>	1	1
	(c)		Klorin // Cl ₂ <i>Chlorine // Cl₂</i>	1	1
	(d)		Silikon // Si <i>Silicon // Si</i>	1	1
Jumlah / Total				5	

Soalan Question			Jawapan Answer	Markah Marks	
				Sub	Total
3	(a)	(i)	Aluminium <i>Aluminium</i>	1	1
		(ii)	Duralumin lebih keras berbanding logam tulennya /aluminium <i>Duralumin is harder than its pure metal/aluminium</i>	1	1
	(b)	(i)	Seramik termaju <i>Advanced ceramics</i>	1	1
		(ii)	Lengai secara kimia / Keras dan kuat / Rintangan haba tinggi <i>Chemically inert / Hard and strong /High thermal resistant</i>	1	1
	(c)		1. Y // Kaca fotokromik <i>Y // Photochromic glass</i> 2. Menyerap sinar ultraungu // Peka dengan keamatan cahaya <i>Absorb ultraviolet rays // Sensitive to light intensity</i>	1 1	2
			Jumlah / Total	6	

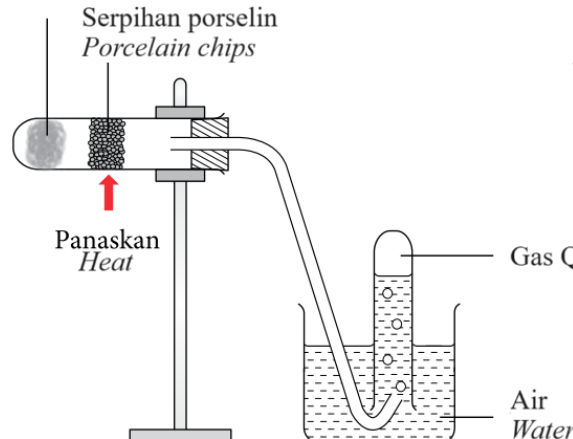
Soalan Question			Jawapan Answer	Markah Marks	
				Sub	Total
4	(a)	(i)	P	1	
		(ii)	Q	1	1
		(iii)		1	1
	(b)	(i)	1. Haba diserap <i>Heat is absorbed</i> 2. untuk mengatasi daya tarikan antara zarah-zarah / molekul <i>to overcome the attractive force between particles / molecules</i>	1 1	2
		(ii)	1. Bentuk lengkung yang betul <i>Correct shape of curve</i> 2. Tanda takat beku dengan betul <i>Mark freezing point</i> Suhu / °C <i>Temperature / °C</i>  Masa / s <i>Time / s</i>	1 1	2
			Jumlah / Total	7	

Soalan Question			Jawapan Answer	Markah Marks	
				Sub	Total
5	(a)	(i)	2.8.2	1	1
		(ii)	Daya tarikan elektrostatik <i>Electrostatic forces of attraction</i>	1	1
		(iii)	$2X + Y_2 \rightarrow 2XY$ // $2Mg + O_2 \rightarrow 2MgO$	1	1
		(iv)	1. Nisbah mol <i>Mole ratio</i> 2. Jisim XY dengan unit yang betul <i>Mass of XY with correct unit</i> 2 mol X : 2 mol XY 0.1 mol X : 0.1 mol XY Jisim XY / <i>Mass of XY</i> = 0.1 x (24+16) = 4 g	1 1	2
	(b)		1. Sebatian kovalen <i>Covalent compound</i> 2. Mengandungi molekul neutral // tiada ion yang bebas bergerak <i>Consists of neutral molecule // no free moving ion present</i> 3. Daya tarikan antara molekul yang lemah // daya van der Waals yang lemah <i>Weak attraction forces between molecules // weak van der Waals force between molecules // weak intermolecular forces of attraction</i>	1 1 1	3
Jumlah / Total				8	

Soalan Question			Jawapan Answer	Markah Marks	
				Sub	Total
6	(a)	(i)	Bahan kimia yang mengubah kadar tindak balas tanpa mengalami sebarang perubahan kimia pada akhir tindak balas. <i>Chemical substance that alters the rate of reaction without undergoing any chemical changes at the end of the reaction.</i>	1	1
		(ii)	Kuprum(II) sulfat <i>Copper(II) sulphate</i>	1	1
	(b)		1. Formula kimia bahan dan hasil tindak balas <i>Chemical formula of reactants and products</i> 2. Seimbang <i>Balanced</i> $\text{Mg} + 2\text{HNO}_3 \longrightarrow \text{Mg}(\text{NO}_3)_2 + \text{H}_2$	1 1	2
	(c)	(i)	Bilangan mol / <i>Number of moles</i> , Mg $= 1 \text{ g} \div 24 \text{ g mol}^{-1}$ $= 0.042 \text{ mol}$	1	1
		(ii)	Bilangan mol / <i>Number of moles</i> , HNO ₃ $= (0.5 \text{ mol dm}^{-3} \times 10 \text{ cm}^3) \div 1000$ $= 0.005 \text{ mol}$	1	1
	(d)		Asid nitrik <i>Nitric acid</i>	1	1
	(e)		1. Mungkin menyediakan lintasan alternatif dengan merendahkan tenaga pengaktifan. <i>Catalyst provides an alternative pathway by lowering the activation energy.</i> 2. Lebih banyak ion hidrogen/H ⁺ dan atom magnesium/Mg dapat mencapai tenaga pengaktifan itu // Frekuensi perlanggaran berkesan antara ion hidrogen/H ⁺ dan atom magnesium/Mg bertambah. <i>More hydrogen/H⁺ ions and magnesium/Mg atoms can achieve the activation energy //</i> <i>The frequency of effective collisions between hydrogen/H⁺ and magnesium/Mg atoms increases.</i>	1 1	2
			Jumlah / Total		9

Soalan Question			Jawapan Answer	Markah Marks	
				Sub	Total
7	(a)	(i)	Pepejal <i>Solid</i>	1	1
		(ii)	1. Pemekat <i>Thickeners</i> 2. Memekatkan cecair <i>To thicken liquids</i>	1 1	2
		(iii)	1. Aspartam / sorbitol / stevia <i>Aspartame / sorbitol / stevia</i> 2. Tidak meningkatkan paras gula darah <i>Does not raise the blood sugar</i>	1 1	2
		(iv)	Kelebihan: Bahan tambahan makanan boleh memanjangkan hayat makanan / meningkatkan penampilan / meningkatkan rasa makanan <i>Advantage: Food additives can prolong the life span of food / enhance the appearance / improve the taste of food</i> Keburukan: Bahan tambahan makanan boleh menyebabkan kanser / alahan / saraf angguan / asma / ruam / hiperaktif pada kanak-kanak <i>Disadvantage: Food additives can cause cancer / allergies / nerve disorder / asthma / rashes / hyperactivity in children</i>	1 1	2
	(b)	(i)	Nanoteknologi ialah pembangunan bahan atau peranti dengan memanfaatkan ciri-ciri zarah nano <i>Nanotechnology is a development of substances or gadgets using the properties of nanoparticles.</i>	1	1
		(ii)	1. Garam nano mempunyai saiz yang jauh lebih kecil daripada garam laut. <i>Nano salt has a much smaller size than sea salt.</i> 2. Lebih sedikit kuantiti garam nano yang digunakan untuk menghasilkan rasa yang sama. <i>Less quantity of nano salt is consumed to produce the same taste.</i>	1 1	2
Jumlah / Total				10	

Soalan Question		Jawapan Answer	Markah Marks	
			Sub	Total
8	(a)	Melengkapkan litar dengan membenarkan pergerakan ion-ion menerusinya // Mengasingkan larutan argentum nitrat daripada asid nitrik <i>Completes a circuit by allowing the movement of ions through it // Separate a solution of silver nitrate from nitric acid</i>	1	1
	(b)	Anod / Anode: argentum tak tulen / <i>impure silver</i> Katod / Cathode: Argentum tulen / <i>pure silver</i>	1 1	2
	(c)	Pepejal kelabu berkilat terenap / elektrod argentum menebal <i>Shiny grey solid deposited / silver electrode becomes thicker</i>	1	1
	(d)	1. Bilangan mol ion Ag^+ <i>Number of moles of ion Ag^+</i> 2. Nisbah mol <i>Mole ratio</i> 3. Jisim argentum <i>Mass of silver</i> Bilangan mol ion Ag^+ / <i>No. of mole Ag^+ ion</i> = $(50 \times 1.0)/1000$ = 0.05 mol $1 \text{ mol } \text{Ag}^+ : 1 \text{ mol Ag}$ $0.05 \text{ mol } \text{Ag}^+ : 0.05 \text{ mol Ag}$ Jisim Ag / <i>Mass of Ag</i> = 0.05×108 = 5.4 g	1 1 1	3
	(e)	(i) Penyaduran logam <i>Electroplating of metal</i>	1	1

Question Soalan		Answers Jawapan	Marks Markah															
9.	(a)	<table border="1"> <thead> <tr> <th>Sebatian <i>Compound</i></th> <th>Formula kimia <i>Molecular formula</i></th> <th>Siri homolog <i>Homologous series</i></th> </tr> </thead> <tbody> <tr> <td>P</td> <td>C₃H₇OH</td> <td>Alkohol <i>Alcohol</i></td> </tr> <tr> <td>Q</td> <td>C₃H₆</td> <td>Alkena <i>Alkene</i></td> </tr> <tr> <td>R</td> <td>CH₃COOH</td> <td>Asid karboksilik <i>Carboxylic acid</i></td> </tr> <tr> <td>S</td> <td>C₄H₁₀</td> <td>Alkana <i>Alkane</i></td> </tr> </tbody> </table>	Sebatian <i>Compound</i>	Formula kimia <i>Molecular formula</i>	Siri homolog <i>Homologous series</i>	P	C ₃ H ₇ OH	Alkohol <i>Alcohol</i>	Q	C ₃ H ₆	Alkena <i>Alkene</i>	R	CH ₃ COOH	Asid karboksilik <i>Carboxylic acid</i>	S	C ₄ H ₁₀	Alkana <i>Alkane</i>	<p>1+1</p> <p>1+1</p> <p>1+1</p> <p>1+1</p>
Sebatian <i>Compound</i>	Formula kimia <i>Molecular formula</i>	Siri homolog <i>Homologous series</i>																
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S	C ₄ H ₁₀	Alkana <i>Alkane</i>																
	(b)	<p>1. Sebatian X : Heptana / <i>Heptane</i> / C₇H₁₆ <i>Compound X</i></p> <p>2. Persamaan kimia : C₇H₁₆ → C₃H₆ + C₄H₁₀ <i>Chemical equation</i></p> <p>3. Bilangan mol sebatian X <i>Number of moles of compound X</i></p> <p>4. Nisbah mol <i>Mole ratio</i></p> <p>5. Jisim sebatian Q dengan unit yang betul <i>Mass of compound Q with correct unit</i></p> $\text{Mol, X} = \frac{2400}{24} = 100 \text{ mol}$ <p>1 mol C₇H₁₆ : 1 mol C₃H₆ 100 mol C₇H₁₆ : 100 mol C₃H₆</p> <p>Jisim Q / <i>Mass of Q</i> = 100 × [3(12) + 6(1)] = 42 g</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>															
	(c)	<p>1. Pendehidratan / <i>Dehydration</i></p> <p>2. Gambar rajah berfungsi / <i>Functional diagram</i></p> <p>3. Label / <i>Label</i></p> <p>Wul kaca direndam dengan P <i>Glass wool soaked with P</i></p>  <p>Serpihan porselin <i>Porcelain chips</i></p> <p>Panaskan <i>Heat</i></p> <p>Gas Q</p> <p>Air <i>Water</i></p>	<p>1</p> <p>1</p> <p>1</p>															

	(d)	<p>1. Formula kimia bahan dan hasil tindak balas <i>Chemical formulae of reactants and products</i></p> <p>2. Seimbang <i>Balance</i></p> $\text{CH}_3\text{COOH} + \text{C}_3\text{H}_7\text{OH} \rightarrow \text{CH}_3\text{COOC}_3\text{H}_7 + \text{H}_2\text{O}$ <p>3. Formula struktur / <i>Structural formula</i></p> $ \begin{array}{ccccccc} & \text{H} & \text{O} & & \text{H} & \text{H} & \text{H} \\ & & & & & & \\ \text{H} & - \text{C} & - \text{C} & - \text{O} & - \text{C} & - \text{C} & - \text{C} - \text{H} \\ & & & & & & \\ & \text{H} & & & \text{H} & \text{H} & \text{H} \end{array} $ <p>4. Propil ethanoate / <i>Propyl ethanoate</i></p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>Jumlah / Total 20</p>
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Question Soalan			Answers Jawapan	Marks Markah
10.	(a)	(i)	Haba yang dibebaskan / berubah apabila 1 mol kuprum disesarkan daripada larutan kuprum(II) sulfat oleh zink. <i>Heat released / change when 1 mol of copper is displaced from copper(II) sulphate solution by zinc.</i>	1
		(ii)	Biru// <i>Blue</i>	1
		(iii)	1. ΔH akan bertambah. <i>ΔH increases.</i> 2. Logam magnesium lebih elektropositif daripada logam zink // <i>Magnesium metal is more electropositive than zinc metal.</i>	1 1
	(b)	(i)	$\text{Ag}^+ + \text{Cl}^- \rightarrow \text{AgCl}$	1
		(ii)	1. Bil mol $\text{Ag}^+ / \text{Cl}^-$ <i>Number of mol of $\text{Ag}^+ / \text{Cl}^-$</i> 2. Nisbah mol / <i>Mole ratio</i> 3. Haba yang dibebaskan / <i>Heat released</i> Bil mol $\text{Ag}^+ / \text{Number of mol of } \text{Ag}^+$ $= 2(50) / 1000$ $= 0.1 \text{ mol}$ <i>Atau/ or</i> Bil mol $\text{Cl}^- / \text{Number of mol of } \text{Cl}^-$ $= 2(50) / 1000$ $= 0.1 \text{ mol}$ Bil. Mol $\text{AgCl} / \text{Number of mol } \text{AgCl} = 0.1 \text{ mol}$ 1 mol AgCl terbentuk membebaskan 65.5 kJ / <i>1 mol AgCl formed release 65.5 kJ</i> 0.1 mol AgCl formed release 65.5 x 0.1 Haba yang dibebaskan/ <i>Heat released = 6.55 kJ</i>	1 1 1
		(iii)	$\Delta H = mc$ $6550 = 100 \times 4.2 \times$ $= 6550 / 100(4.2)$ $= 15.6^\circ\text{C}$	1 1
		(iv)	1. Sebab / <i>Reason</i> 2. Langkah berjaga-jaga / <i>Precautionary steps (any one)</i> Sebab: Haba dibebaskan ke persekitaran/ sebahagian haba diserap oleh cawan polistirena. <i>Reason:</i> <i>Heat is loss to the surrounding/ some heat has been absorbed by the polystyrene cup..</i> Langkah berjaga-jaga (mana-mana satu): <i>Precautionary steps (any one):</i> • Serbuk logam ditambah dengan cepat ke dalam larutan untuk tindak balas penyesanan	1 1

		<p><i>Metal powder must be added quickly into the solution for displacement of metal reaction</i></p> <ul style="list-style-type: none"> • Guna cawan polistirena bagi mengurangkan haba terbebas ke persekitaran. <i>Polystyrene cup is used to reduce heat loss to the surroundings (r: to prevent heat loss)</i> • Campuran tindak balas mesti dikacau sepanjang eksperimen to pemanasan sekata. <i>The reaction mixture must be stirred throughout the experiment to ensure even heating.</i> 													
	(c)	<table border="1"> <thead> <tr> <th>Tindak balas I Reaction I</th> <th>Tindak balas II Reaction II</th> </tr> </thead> <tbody> <tr> <td>Tindak balas eksotermik// <i>Exothermic reaction</i></td> <td>Tindak balas endotermik// <i>Endothermic reaction</i></td> </tr> <tr> <td>Haba terbebas // <i>Heat is released</i></td> <td>Haba diserap // <i>Heat is absorbed</i></td> </tr> <tr> <td>Suhu meningkat// <i>Temperature increased</i></td> <td>Suhu menurun// <i>Temperature decreased</i></td> </tr> <tr> <td>Jumlah kandungan tenaga bahan tindak balas lebih tinggi dari jumlah kandungan tenaga hasil tindak balas// <i>Total energy content of reactants is higher than total energy content of products</i></td> <td>Jumlah kandungan tenaga hasil tindak balas lebih tinggi dari jumlah kandungan tenaga bahan tindak balas// <i>Total energy content of products is higher than total energy content of reactants</i></td> </tr> <tr> <td>Tenaga haba yang dibebaskan semasa pembentukan ikatan dalam hasil tindak balas lebih besar berbanding tenaga haba yang diserap untuk memutuskan ikatan dalam bahan tindak balas.// <i>Heat energy released during bond formation for products is higher than heat energy absorbed during breaking of bonds in reactants</i></td> <td>Tenaga haba yang diserap untuk memutuskan ikatan dalam bahan tindak balas lebih besar berbanding tenaga haba yang dibebaskan semasa pembentukan ikatan dalam hasil tindak balas // <i>Heat energy absorbed during the bond breaking of reactants is higher than heat energy released during formation of bonds in products</i></td> </tr> </tbody> </table>	Tindak balas I Reaction I	Tindak balas II Reaction II	Tindak balas eksotermik// <i>Exothermic reaction</i>	Tindak balas endotermik// <i>Endothermic reaction</i>	Haba terbebas // <i>Heat is released</i>	Haba diserap // <i>Heat is absorbed</i>	Suhu meningkat// <i>Temperature increased</i>	Suhu menurun// <i>Temperature decreased</i>	Jumlah kandungan tenaga bahan tindak balas lebih tinggi dari jumlah kandungan tenaga hasil tindak balas// <i>Total energy content of reactants is higher than total energy content of products</i>	Jumlah kandungan tenaga hasil tindak balas lebih tinggi dari jumlah kandungan tenaga bahan tindak balas// <i>Total energy content of products is higher than total energy content of reactants</i>	Tenaga haba yang dibebaskan semasa pembentukan ikatan dalam hasil tindak balas lebih besar berbanding tenaga haba yang diserap untuk memutuskan ikatan dalam bahan tindak balas.// <i>Heat energy released during bond formation for products is higher than heat energy absorbed during breaking of bonds in reactants</i>	Tenaga haba yang diserap untuk memutuskan ikatan dalam bahan tindak balas lebih besar berbanding tenaga haba yang dibebaskan semasa pembentukan ikatan dalam hasil tindak balas // <i>Heat energy absorbed during the bond breaking of reactants is higher than heat energy released during formation of bonds in products</i>	<p>1+1</p> <p>1</p> <p>1</p> <p>1+1</p> <p>1+1</p>
Tindak balas I Reaction I	Tindak balas II Reaction II														
Tindak balas eksotermik// <i>Exothermic reaction</i>	Tindak balas endotermik// <i>Endothermic reaction</i>														
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Suhu meningkat// <i>Temperature increased</i>	Suhu menurun// <i>Temperature decreased</i>														
Jumlah kandungan tenaga bahan tindak balas lebih tinggi dari jumlah kandungan tenaga hasil tindak balas// <i>Total energy content of reactants is higher than total energy content of products</i>	Jumlah kandungan tenaga hasil tindak balas lebih tinggi dari jumlah kandungan tenaga bahan tindak balas// <i>Total energy content of products is higher than total energy content of reactants</i>														
Tenaga haba yang dibebaskan semasa pembentukan ikatan dalam hasil tindak balas lebih besar berbanding tenaga haba yang diserap untuk memutuskan ikatan dalam bahan tindak balas.// <i>Heat energy released during bond formation for products is higher than heat energy absorbed during breaking of bonds in reactants</i>	Tenaga haba yang diserap untuk memutuskan ikatan dalam bahan tindak balas lebih besar berbanding tenaga haba yang dibebaskan semasa pembentukan ikatan dalam hasil tindak balas // <i>Heat energy absorbed during the bond breaking of reactants is higher than heat energy released during formation of bonds in products</i>														
		Total Jumlah	20												

Soalan <i>Question</i>			Jawapan <i>Answer</i>	Markah <i>Mark</i>
11	(a)	(i)	1. Zink nitrat – Garam terlarutkan <i>Zinc nitrate – Soluble salt</i> 2. Zink karbonat – Garam tak terlarutkan <i>Zinc carbonate – Insoluble salt</i> 3. Tambah air suling ke dalam campuran dan kacau <i>Add distilled water into the mixture and stir</i> 4. Turas campuran <i>Filter the mixture</i> 5. Bilas campuran <i>Rinse the mixture</i> 6. Baki turasan ialah zink karbonat dan hasil turasan ialah zink nitrat <i>The residue is zinc carbonate and the solution is zinc nitrate</i>	1 1 1 1 1 1
		(ii)	1. Warna baki : Kuning semasa panas dan putih semasa sejuk <i>Colour of the residue : Yellow when hot and white when cool</i> 2. Zink nitrat : Gas perang dibebaskan // Gas tidak berwarna yang menyala semula kayu uji berbara dibebaskan <i>Zinc nitrate : Brown gas is released// Colourless gas that rekindles glowing wooden splinter is released</i> 3. Zink karbonat : Gas tidak berwarna yang menukarkan air kapur keruh dibebaskan <i>Zinc carbonate: Colourless gas that turns limewater cloudy is released</i> 4. Formula bahan dan hasil tindak balas betul <i>Formula of reactants and products correct</i> 5. Persamaan kimia seimbang <i>Balance chemical equation</i> $\text{ZnCO}_3 \rightarrow \text{ZnO} + \text{CO}_2$ 6. Formula bahan dan hasil tindak balas betul <i>Formula of reactants and products correct</i> 7. Persamaan kimia seimbang <i>Balance chemical equation</i> $2\text{Zn}(\text{NO}_3)_2 \rightarrow 2\text{ZnO} + 4\text{NO}_2 + \text{O}_2$ $\text{Zn}(\text{NO}_3)_2 \rightarrow \text{ZnO} + 2\text{NO}_2 + \frac{1}{2}\text{O}_2$	1 1 1 1 1 1 1

(b)	1. Tuang / Tambah [20 – 100] cm ³ [0.1 – 2.0] mol dm ⁻³ larutan natrium karbonat ke dalam bikar <i>Pour / Add [20-100] cm³ of [0.1-2.0] mol dm⁻³ sodium carbonate solution in a beaker.</i>	1
	2. Tambah [20-100] cm ³ [0.1 – 2.0] mol md ⁻³ larutan zink nitrat. <i>Add [20-100] cm³ of [0.1-2.0] mol dm⁻³ zinc nitrate solution.</i>	1
	3. Turas dan bilas <i>Filter and rinse.</i>	1
	4. Tambah zink karbonat sehingga berlebihan ke dalam asid sulfurik <i>Add zinc carbonate until excess into sulphuric acid</i>	1
	5. Turas <i>Filter</i>	1
	6. Panas hasil turasan sehingga tepu <i>Heat the filtrate until saturated.</i>	1
	7. Sejuk dan turas <i>Cool and filter.</i>	1
	Jumlah /Total	20

LAMPIRAN

(Untuk rujukan guru)

JADUAL SPESIFIKASI UJIAN (JSU) PRAKTIS KIMIA 4541/2: SET 1

Chapter	Sub-chapter	Remembering			Understanding			Applying			Analyzing			Evaluating			Creating			Total
		E	M	H	E	M	H	E	M	H	E	M	H	E	M	H	E	M	H	
1. Introduction to chemistry [F4]	1.1 Development in chemistry field and its importance in daily life																			
	1.2 Scientific investigation in chemistry																			
	1.3 Usage, management and handling of apparatus and materials																			
2. Matter and the Atomic Structure [F4]	2.1 Basic concepts of matter	1			1	2		1	2											7
	2.2 The development of the atomic model																			
	2.3 Atomic structure																			
	2.4 Isotopes and its uses																			
3. The Mole Concept, Chemical Formula and	3.1 Relative atomic mass and relative molecular mass																			
	3.2 Mole concept																			
	3.3 Chemical formula																			
	3.4 Chemical equation																			
4. The Periodic Table of Elements [F4]	4.1 The development of The Periodic Table of Elements																			
	4.2 The arrangement in The Periodic Table of Elements																			
	4.3 Elements in Group 18																			
	4.4 Elements in Group 1																			
	4.5 Elements in Group 17																			
	4.6 Elements in Period 3	1		2	1	1														5
	4.7 Transition elements																			
5. Chemical Bond [F4]	5.1 Basics of compound formation																			
	5.2 Ionic bond	1			1			3												5
	5.3 Covalent bond	1									2									3
	5.4 Hydrogen bond																			
	5.5 Dative bond																			
	5.6 Metallic bond																			
	5.7 Properties of ionic and covalent compounds																			
6. Acid, Base and Salt [F4]	6.1 The role of water in showing acidic and alkaline properties																			
	6.2 pH value																			
	6.3 Strength of acids and alkalis																			
	6.4 Chemical properties of acids and alkalis																			
	6.5 Concentration of aqueous solution																			
	6.6 Standard solution																			
	6.7 Neutralisation																			
	6.8 Salts, crystals and their uses in daily life																	4		6
	6.9 Preparation of salts					2														7
	6.10 Effect of heat on salts								2	5										14
	6.11 Qualitative analysis																			
7. Rate of Reaction [F4]	7.1 Determining rate of reaction																			
	7.2 Factors affecting rate of reaction	1			1			2	2	1	2									9
	7.3 Application of factors that affect the rate of reaction in daily life																			
	7.4 Collision theory																			
8. Manufactured Substances in Industry [F4]	8.1 Alloy and its importance	1			1															2
	8.2 Composition of glass and its uses							2												2
	8.3 Composition of ceramics and its uses		1			1														2
	8.4 Composite materials and its importance																			
9. Redox equilibrium [F5]	9.1 Oxidation and reduction																			
	9.2 Standard electrode potential																			
	9.3 Voltaic cell	1									1									2
	9.4 Electrolytic cell				1			3	2		2									8
	9.5 Extraction of metal from its ore																			
	9.6 Rusting																			
10. Carbon compound [F5]	10.1 Types of carbon compound							4	1											5
	10.2 Homologous series										8									8
	10.3 Chemical properties and interconversion of compounds between homologous series							1	6											7
	10.4 Isomers and naming based on IUPAC nomenclature																			
11. Thermochemistry [F5]	11.1 Heat change in reactions																			
	11.2 Heat of reaction	2				2		1	5		2	8								20
	11.3 Application of endothermic and exothermic reactions in daily life																			
12. Polymer Chemistry [F5]	12.1 Polymer	1	1	1	1	1														5
	12.2 Natural rubber																			
	12.3 Synthetic rubber																			
13. Consumer and	13.1 Oils and fats		1			2														3
	13.2 Cleaning agents																			
	13.3 Food additives									2	2				2					6
	13.4 Medicines and cosmetics industry	1																		1
	13.6 Application of green technology in industrial waste management																			
Total		11	3	3	9	9	0	11	27	6	3	23	2	0	0	2	4	0	7	120
Ratio of E:M:H																				
Level of Difficulty		E : Easy M : Medium H : Hard																		

**MODUL
KENYALANG CEMERLANG SPM
TAHUN 2024**

JABATAN PENDIDIKAN NEGERI SARAWAK

**KIMIA
(4541/1)**

**PRAKTIS KERTAS 1
SET 2**

PENGENALAN

Program Semarak Kasih yang dilaksanakan pada tahun 2020 telah mendapat sambutan yang menggalakkan daripada warga pendidik dan murid, khasnya calon SPM 2020. Sehubungan dengan itu, pada tahun 2024 ini, Sektor Pembelajaran, Jabatan Pendidikan Negeri Sarawak mengadakan **Program Modul Kenyalang Cemerlang Kimia SPM 2024** untuk membantu guru dan calon SPM menghadapi peperiksaan SPM 2024.

Modul yang dihasilkan disertakan dengan sampel Jadual Spesifikasi Ujian (JSU) dan sampel item/soalan mengikut format baharu peperiksaan SPM mulai 2021 untuk dijadikan bahan panduan dan rujukan guru-guru dan juga sebagai bahan latihan/ulangkaji kepada calon-calon SPM 2024 di semua sekolah menengah di negeri Sarawak.

OBJEKTIF PROGRAM

1. Memastikan calon SPM menguasai format baharu Peperiksaan SPM 2024.
2. Memastikan calon SPM mempunyai bahan pembelajaran yang berfokus ke arah peperiksaan SPM.
3. Meningkatkan pencapaian akademik calon SPM 2024.
4. Melonjakkan keputusan SPM 2024 Negeri Sarawak

SENARAI KANDUNGAN

Bil.	Perkara	Muka surat
1	Format Kertas Peperiksaan SPM Mulai Tahun 2021	3
2	Latihan - Praktis Kimia 4541/1: Set 2	4 – 25
3	Skema Jawapan/Pemarkahan	25
4	LAMPIRAN: Sampel Jadual Spesifikasi Ujian (JSU) untuk Praktis Kimia 4541/1: Set 2	26-27

SENARAI AHLI PANEL PEMBINA MODUL KENYALANG CEMERLANG SPM 2024

Bil.	Nama Guru	Sekolah	PPD
1.	Francisca Lau Siew Hsia (Ketua)	SMK Methodist	SIBU
2.	Chien Hui Siong	SMK Tinggi Sarikei	SARIKEI
3.	Law Hui Nong	SMK Tinggi Sarikei	SARIKEI
4.	Fun Ngiik Ngon	SMK Bandar Sibu	SIBU
5.	Goh Leh Ling	SMK Sacred Heart	SIBU
6.	Bella Mahony Sie	SMK Luar Bandar Sibu	SIBU
7.	Ling Teck Ping	SMK Tung Hua	SIBU
8.	Wong Kee Ping	SMK Bukit Assek	SIBU
9.	Yap Liew Ying	SMK Tiong Hin	SIBU
10.	Ling Mee Ling	SMK St Elizabeth	SIBU
11.	Victoria Petrus	SMK Tun Abdul Razak	SERIAN
12.	Catherine Law Fong Fong	SMK Deshon Sibu	SIBU
13.	Dalimawaty binti Ahmad	SMK Santubong	KUCHING

PENYELARAS

Bil.	Nama Pegawai	Stesen Bertugas
1	Evelin anak Medong	Unit Sains dan Matematik, JPN Sarawak
2	Haslina binti Marzoki	Unit Sains dan Matematik, JPN Sarawak

**FORMAT INSTRUMEN PEPERIKSAAN SPM MULAI TAHUN 2021
BAGI MATA PELAJARAN KIMIA (KOD: 4541)**

BIL	PERKARA	KERTAS 1 (4541/1)	KERTAS 2 (4541/2)	KERTAS 3 (4541/3)
1	Jenis Instrumen	Ujian Bertulis		Ujian Amali
2	Jenis Item	Objektif Aneka Pilihan	<ul style="list-style-type: none"> • Subjektif Berstruktur • Subjektif Respons Terhad • Subjektif Respons Terbuka 	Subjektif Berstruktur
3	Bilangan Soalan	40 soalan (40 markah) (Jawab semua soalan)	Bahagian A: <ul style="list-style-type: none"> • 8 soalan (60 Markah) (Jawab semua soalan) Bahagian B: (20 Markah) <ul style="list-style-type: none"> • 2 soalan (Jawab 1 soalan) Bahagian C: (20 Markah) <ul style="list-style-type: none"> • 1 soalan 	3 item (Jawab mengikut subjek yang didaftar)
4	Jumlah Markah	40 markah	100 markah	15 markah bagi setiap item
5	Konstruk	<ul style="list-style-type: none"> • Mengingat • Memahami • Mengaplikasi • Menganalisis 	<ul style="list-style-type: none"> • Mengingat • Memahami • Mengaplikasi • Menganalisis • Menilai • Mencipta 	Kemahiran proses sains
6	Tempoh Ujian	1 jam 15 minit	2 jam 30 minit	40 minit + 5 minit setiap item (5 minit: sesi merancang) (40 minit: masa menjawab soalan)
7	Cakupan Konteks	Standard kandungan dan standard pembelajaran dalam Dokumen Standard Kurikulum dan Pentaksiran (DSKP) KSSM (Tingkatan 4 dan 5)		
8	Aras Kesukaran	Rendah : Sederhana : Tinggi 5 : 3 : 2		
9	Kaedah Penskoran	Dikotomus	Analitikal	
10	Alat Tambahan	Kalkulator saintifik		

PRAKTIS KIMIA 4541/1

SET 2

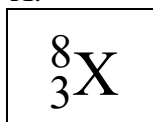
1. Bahan manakah yang mengalami pemejalwapan apabila dipanaskan?
Which substance undergoes sublimation when heated?

- | | |
|---|--|
| <p>A Etanol
<i>Ethanol</i></p> <p>B Iodin
<i>Iodine</i></p> | <p>C Natrium klorida
<i>Sodium chloride</i></p> <p>D Bromin
<i>Bromine</i></p> |
|---|--|

2. Antara yang berikut, pasangan nama kimia dan formula kimia manakah adalah betul?
Which of the following chemical name and chemical formulae are correctly matched?

	Nama Kimia <i>Chemical name</i>	Formula kimia <i>Chemical formula</i>
A	Natrium oksida <i>Sodium oxide</i>	NaO
B	Magnesium klorida <i>Magnesium chloride</i>	MgCl
C	Ammonium fosfat <i>Ammonium phosphate</i>	(NH ₄) ₃ PO ₄
D	Plumbum(II) bromida <i>Lead (II) bromide</i>	Pb ₂ Br

3. Rajah 1 menunjukkan simbol bagi unsur X.
Diagram 1 shows the symbol of element X.



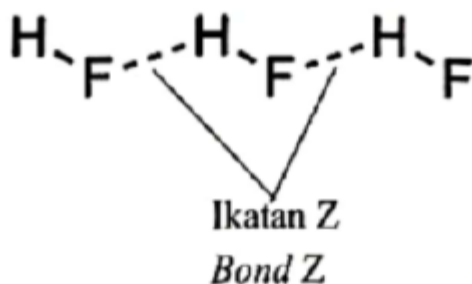
Rajah 1
Diagram 1

Unsur X terletak pada Kumpulan 1 dan Kala 2 dalam Jadual Berkala Unsur. Apakah faktor yang menentukan kedudukan unsur X dalam Jadual Berkala Unsur?

Element X is placed at Group 1 and Period 2 in the Periodic Table of Elements. What are the factors that determine the position of element X in the Periodic Table of Elements?

	Kumpulan <i>Group</i>	Kala <i>Period</i>
A	Nombor nukleon <i>Nucleon number</i>	Nombor proton <i>Proton number</i>
B	Nombor proton <i>Proton number</i>	Nombor nukleon <i>Nucleon number</i>
C	Bilangan petala berisi electron <i>Number of shells filled with electrons</i>	Bilangan elektron valens <i>Number of valence electrons</i>
D	Bilangan elektron valens <i>Number of valence electrons</i>	Bilangan petala berisi electron <i>Number of shells filled with electrons</i>

4. Rajah 2 menunjukkan pembentukan ikatan Z.
Diagram 2 shows the formation of bond Z.

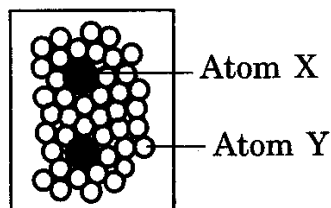


Rajah 2
Diagram 2

Apakah ikatan Z?
What is bond Z?

- | | |
|---|--|
| <p>A Datif
 <i>Dative</i></p> <p>B Kovalen
 <i>Covalent</i></p> | <p>C Logam
 <i>Metallic</i></p> <p>D Hidrogen
 <i>Hydrogen</i></p> |
|---|--|
5. Antara yang berikut, manakah alkali lemah?
Which of the following is a weak alkali?
- A** Litium hidroksida, LiOH
Lithium hydroxide, LiOH
- B** Natrium hidroksida, NaOH
Sodium hydroxide, NaOH
- C** Ammonium hidroksida, NH₄OH
Ammonium hydroxide, NH₄OH
- D** Barium hidroksida, Ba(OH)₂
Barium hydroxide, Ba(OH)₂
6. Antara bahan tindak balas berikut, yang manakah menghasilkan kadar tindak balas paling tinggi dengan serbuk zink?
Which of the following reactants produces the highest rate of reaction with zinc powder?
- A** 30 cm³ asid sulfurik 0.1 mol dm⁻³
30 cm³ of 0.1 mol dm⁻³ sulphuric acid
- B** 30 cm³ asid etanoik 0.1 mol dm⁻³
30 cm³ of 0.1 mol dm⁻³ ethanoic acid
- C** 30 cm³ asid nitrik 0.1 mol dm⁻³
30 cm³ of 0.1 mol dm⁻³ nitric acid
- D** 30 cm³ asid hidroklorik 0.1 mol dm⁻³
30 cm³ of 0.1 mol dm⁻³ hydrochloric acid

7. Rajah 3 menunjukkan susunan atom bagi loyang.
Diagram 3 shows the arrangement of atoms in brass.



Rajah 3
 Diagram 3

Yang manakah berikut mungkin atom X dan Y?
Which of the following could be atoms X and Y?

	X	Y
A	Zink <i>Zinc</i>	Kuprum <i>Copper</i>
B	Kuprum <i>Copper</i>	Zink <i>Zinc</i>
C	Ferum <i>Iron</i>	Carbon <i>Karbon</i>
D	Kuprum <i>Copper</i>	Stanum <i>Tin</i>

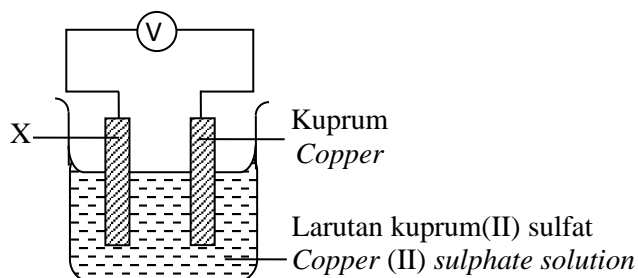
8. Antara persamaan kimia yang berikut, yang manakah menunjukkan bahawa kuprum telah diturunkan?
Which of the following chemical equation shows that copper is reduced?

Which of the following chemical equation shows that copper is reduced?

- A** $\text{Cu} + 2\text{AgNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + 2\text{Ag}$
- B** $2\text{Cu} + \text{O}_2 \rightarrow 2\text{CuO}$
- C** $\text{CuSO}_4 + \text{Ba}(\text{NO}_3)_2 \rightarrow \text{Cu}(\text{NO}_3)_2 + \text{BaSO}_4$
- D** $\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$

9. Rajah 4 menunjukkan satu sel voltan ringkas.

Diagram 4 shows a simple voltaic cell.



Rajah 4

Diagram 4

Bahan yang manakah sesuai digunakan sebagai elektrod X?

Which material is suitable to be used as electrode X?

A Kalium
Potassium

B Karbon
Carbon

C Kuprum
Copper

D Zink
Zinc

10. Rajah 5 menunjukkan peralatan perubatan pensterilan

Diagram 5 shows a sterilising medical equipment.



Rajah 5

Diagram 5

Yang manakah isotop berikut digunakan untuk mensterilkan peralatan perubatan?

Which of the following isotope is used to sterile medical equipment ?

A Uranium-235
Uranium-235

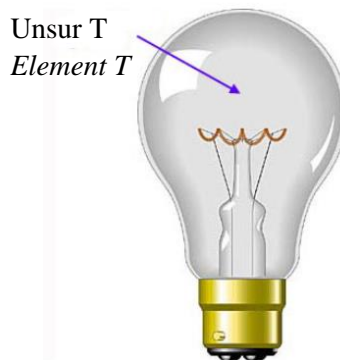
B Kobalt-60
Cobalt-60

C Fosforus-32
Phosporus-32

D Plumbum-210
Lead-210

11. Unsur T dan Helium terletak dalam kumpulan yang sama dalam Jadual Berkala Unsur. Rajah 6 menunjukkan gas helium digunakan dalam tangki oksigen penyelam dan gas unsur T dalam mentol elektrik.

Element T and Helium are placed in the same group as in the Periodic Table of Elements. Diagram 6 shows the Helium gas used in the oxygen tanks of divers and gas of element T used to fill electric bulb.



Rajah 6
Diagram 6

Pernyataan yang manakah paling tepat menerangkan mengapa atom T dan atom Helium sesuai digunakan bagi tujuan tersebut?

Which statement best explains why the atom T and atom Helium are suitable to be used for that purpose?

- A Unsur T dan Helium wujud sebagai gas monoatom
Element T and Helium exist as monoatomic gas
 - B Atom T dan atom Helium mempunyai bilangan elektron valens yang sama
T atom and Helium atom have same number of valence electrons
 - C Atom T dan atom Helium telah mencapai susunan elektron oktet
T atom and Helium atom had achieved octet electron arrangement
 - D Atom T dan atom Helium mempunyai petala valens yang telah penuh diisi elektron
T atom and Helium atom have the valence shells that are fully filled with electrons
12. Susunan elektron bagi atom P ialah 2.8.1 dan susunan elektron bagi atom Q ialah 2.6. Unsur P dan Q bertindak balas untuk membentuk sebatian. Antara berikut, yang manakah benar tentang tindak balas tersebut?

The electron arrangement of an atom of P is 2.8.1 and the electron arrangement of an atom of Q is 2.6. Element P and Q react to form a compound. Which of the following is true about the reaction?

- A Atom Q menderma 2 elektron
Atom Q donates 2 electrons
- B Atom P menerima 1 elektron
Atom P receives 1 electron
- C Suatu sebatian ion terhasil
An ionic compound is formed
- D Sebatian yang terbentuk mempunyai formula kimia PQ_2
The compound formed has chemical formula PQ_2

13.



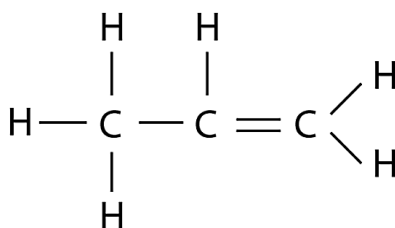
Siti ingin memasang tingkap kaca di rumah yang dapat menghalang sinar ultraungu, kaca tingkap tersebut perlu mengandungi bahan P. Apakah bahan P?

Siti wish to install a glass window at her house that is able to block the ultraviolet rays. The window glass should contain substance P. What is substance P?

- | | | | |
|----------|---|----------|--|
| A | Plumbum(II) oksida
<i>Lead(II) oxide</i> | C | Argentum klorida
<i>Silver chloride</i> |
| B | Boron oksida
<i>Boron oxide</i> | D | Kalsium karbonat
<i>Calcium carbonate</i> |

14. Rajah 7 menunjukkan formula struktur sebatian P.

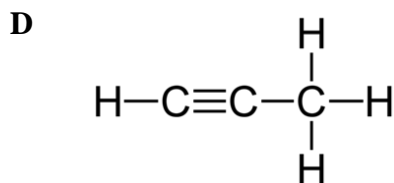
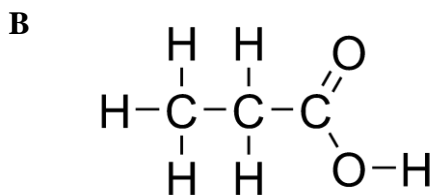
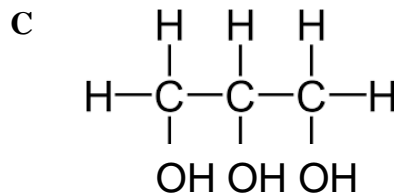
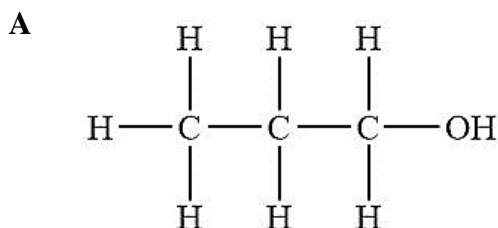
Diagram 7 shows the structural formula of compound P.



Rajah 7
Diagram 7

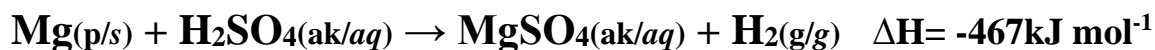
Antara berikut, yang manakah adalah struktur kimia hasil tindak balas yang betul selepas sebatian P dan stim dialirkan melalui fosforik asid pekat pada 300°C, 60 atm?

Which of the following structural formula of product is correct after passing compound P and steam through concentrated phosphoric acid at 300°C, 60 atm?



15. Rajah 8 menunjukkan persamaan termokimia bagi tindak balas antara magnesium dan asid sulfurik.

Diagram 8 shows a thermochemical equation for reaction between magnesium and sulphuric acid.



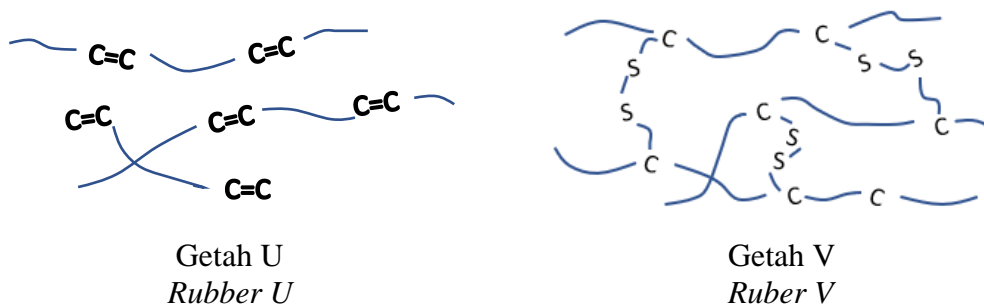
Rajah 8

Diagram 8

Manakah antara pernyataan berikut adalah benar?

Which of the following statement is correct?

- A** Tindak balas antara magnesium dan asid sulfurik ialah tindak balas endotermik.
The reaction between magnesium and sulphuric acid is an endothermic reaction.
- B** 467 kJ tenaga haba dibebaskan apabila 1 mol gas hidrogen disesarkan oleh magnesium.
467 kJ of heat energy is released when 1 mol of hydrogen gas is displaced by magnesium.
- C** Jumlah kandungan tenaga dalam hasil tindak balas lebih tinggi berbanding bahan tindak balas.
The total energy content in the products is higher than the reactants.
- D** Tenaga haba yang diserap untuk memutuskan ikatan lebih besar berbanding tenaga haba yang dibebaskan semasa pembentukan ikatan.
The heat energy absorbed to break the bonds is greater than the heat energy released during the formation of the bonds.
16. Rajah 9 menunjukkan struktur bagi Getah U dan Getah V.
Diagram 9 shows the structure of Rubber U and Rubber V.



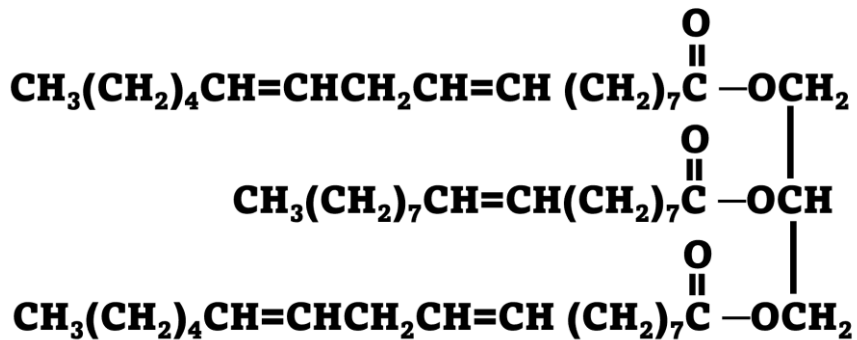
Rajah 9
Diagram 9

Pilih pasangan yang betul antara Getah U dan Getah V.

Choose the correct match between Rubber U and Rubber V.

	Getah U <i>Rubber U</i>	Getah V <i>Rubber V</i>
A	Lebih elastik <i>More elastic</i>	Kurang elastik <i>Less elastic</i>
B	Senang dioksidakan <i>Easily oxidised</i>	Sukar dioksidakan <i>Difficult to oxidised</i>
C	Takat didih yang tinggi <i>High melting point</i>	Takat didih yang rendah <i>Low melting point</i>
D	Kuat dan keras <i>Stronger and harder</i>	Lemah dan lembut <i>Weaker and softer</i>

17. Rajah 10 menunjukkan formula struktur bagi molekul minyak kelapa sawit.
Diagram 10 shows the structural formula of palm oil molecule.



Rajah 10
Diagram 10

Manakah antara pasangan tindak balas dan bahan tindak balas yang sepadan boleh digunakan untuk menukarkan minyak sawit kepada marjerin?
Which of the following pair of reaction and its corresponding reactants can be used to convert palm oil into solid margarine?

	Tindak balas <i>Reaction</i>	Bahan tindak balas <i>Reactant</i>
A	Penghidrogenan <i>Hydrogenation</i>	Gas hidrogen, H ₂ <i>Hydrogen gas, H₂</i>
B	Penghidratan <i>Hydration</i>	Stim, H ₂ O <i>Steam, H₂O</i>
C	Pengoksidaan <i>Oxidation</i>	Gas oksigen, O ₂ <i>Oxygen gas, O₂</i>
D	Penurunan <i>Reduction</i>	Nikel, Ni <i>Nickel, Ni</i>

18. Sendi kaki seorang murid bengkak dan berasa sakit.
Apakah ubat yang sesuai diberikan kepada murid itu?
The joint of a student's leg is swollen and painful.
What medicine is suitable to be given to the student?

- | | | | |
|---|-----------------------------------|---|----------------------------------|
| A | Parasetamol
<i>Paracetamol</i> | C | Barbiturat
<i>Barbiturate</i> |
| B | Penisillin
<i>Penicilin</i> | D | Insulin
<i>Insulin</i> |

19. Jadual 1 menunjukkan pemerhatian apabila oksida bagi unsur-unsur dalam Kala 3 bagi Jadual Berkala ditambah kepada larutan natrium hidroksida dan asid nitrik.

X, Y dan Z bukan simbol sebenar bagi unsur-unsur itu.

Table 1 shows the observation when oxides of elements in Period 3 of the Periodic Table is added to sodium hydroxide solution and nitric acid.

X, Y and Z are not the actual symbols of the elements.

Oksida bagi unsur dalam Kala 3 <i>Oxide of element in Period 3</i>	Pemerhatian <i>Observation</i>	
	Larutan natrium hidroksida <i>Sodium hydroxide solution</i>	Asid Nitrik <i>Nitric Acid</i>
XO ₃	Larut membentuk larutan tak berwarna <i>Dissolves to form a colourless solution</i>	Tiada perubahan <i>No changes</i>
YO	Tiada perubahan <i>No changes</i>	Larut membentuk larutan tak berwarna <i>Dissolves to form a colourless solution</i>
Z ₂ O ₃	Larut membentuk larutan tak berwarna <i>Dissolves to form a colourless solution</i>	Larut membentuk larutan tak berwarna <i>Dissolves to form a colourless solution</i>

Jadual 1

Table 1

Apakah susunan yang betul mengikut pertambahan nombor proton unsur-unsur itu?

What is the correct arrangement in increasing proton number of the elements?

A X, Y, Z

C Z, Y, X

B X, Z, Y

D Y, Z, X

20. Antara sebatian yang berikut, yang manakah mempunyai ikatan datif?

Which of the following compounds contain dative bond?

A Magnesium hidroksida
Magnesium hydroxide

C Karbon dioksida
Carbon dioxide

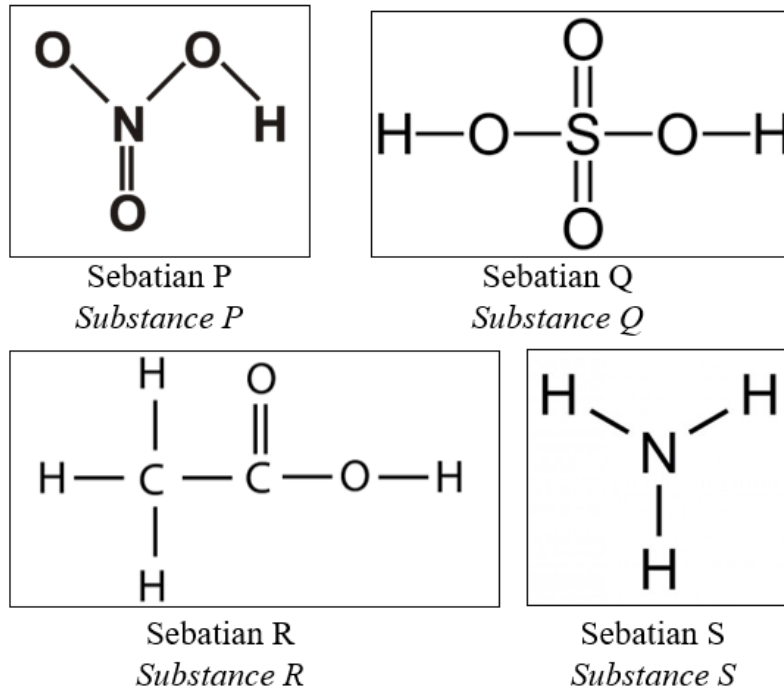
B Ammonium klorida
Ammonium chloride

D Silikon dioksida
Silicon dioxide

21. Ferum dan larutan ferum(II) klorida mengkonduksikan elektrik. Pasangan ikatan yang manakah membezakan kekonduksian elektrik dalam ferum dan larutan ferum(II) klorida?
Iron and iron(II) chloride solution conduct electricity. Which pair of bonds distinguish the electrical conductivity of iron and iron(II) chloride solution?

	Ferum <i>Iron</i>	Larutan ferum(II) klorida <i>Iron(II) chloride</i>
A		
B		
C		
D		

22. Rajah 11 menunjukkan formula struktur empat jenis sebatian yang dapat mengion dalam air dan menghasilkan larutan yang mengandungi ion-ion bebas bergerak.
 Diagram 11 shows the structural formulae of four chemical substances that can ionise in water to produce a solution containing free moving ions.

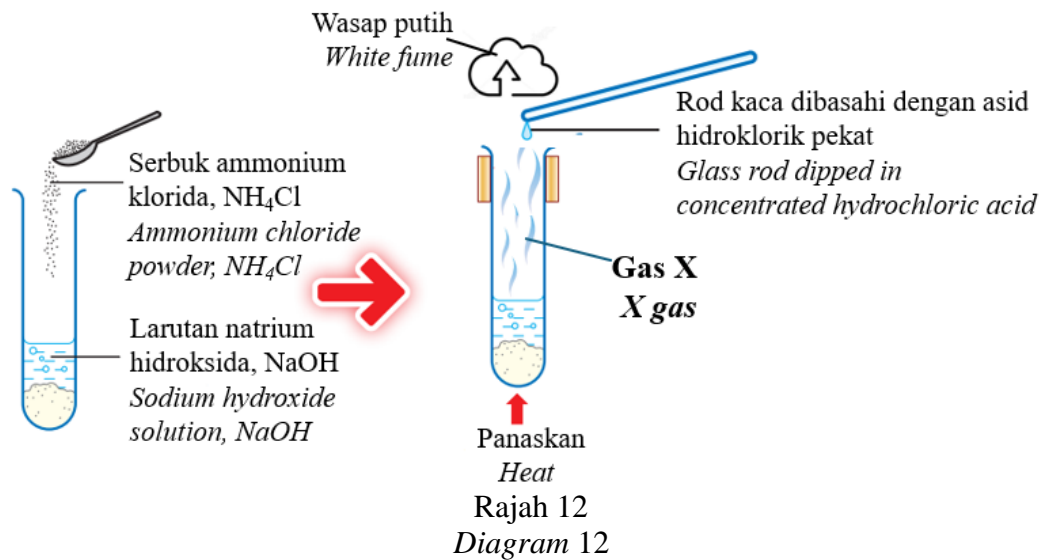


Rajah 11
Diagram 11

Manakah antara berikut ialah urutan larutan dalam nilai pH meningkat yang betul?
 Which of the following is the order of the solution in ascending order of pH value?

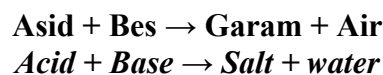
- | | |
|---|---|
| <p>A P, Q, R, S</p> <p>B Q, P, R, S</p> | <p>C R, S, P, Q</p> <p>D S, R, P, Q</p> |
|---|---|

23. Rajah 12 menunjukkan susunan radas yang digunakan dan pemerhatian yang diperolehi oleh seorang murid semasa mengkaji sifat kimia larutan natrium hidroksida.
 Diagram 12 shows the apparatus set-up used and observation obtained by a student when investigating the chemical properties of sodium hydroxide solution.



Apakah nama gas X yang dibebaskan?
 What is the name of gas X released?

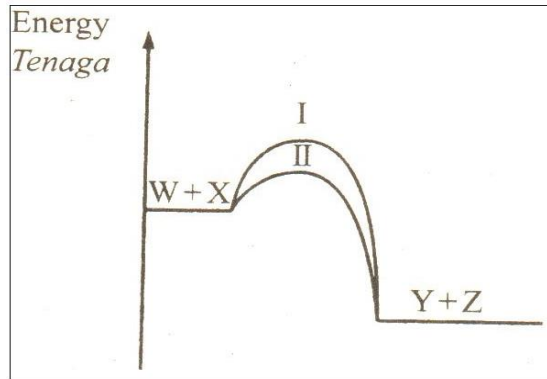
- | | |
|---|---|
| <p>A Ammonia
Ammonia</p> <p>B Hidrogen
Hydrogen</p> | <p>C Ammonium klorida
Ammonium chloride</p> <p>D Hidrogen klorida
Hydrogen chloride</p> |
|---|---|
24. Persamaan berikut mewakili suatu tindak balas peneutralan.
 The following equation represents a neutralisation reaction.



Pasangan manakah adalah bahan tindak balas peneutralan?
 Which pairs are reactants in neutralisation reaction?

- | | |
|--|---|
| <p>I Asid sulfurik + Kalium hidroksida
Sulphuric acid + Potassium hydroxide</p> <p>II Asid hidroklorik + Pepejal kuprum(II) oksida
Hydrochloric acid + Solid copper(II) oxide</p> <p>III Asid sulfurik + Pepejal kalsium karbonat
Sulphuric acid + Solid calcium carbonate</p> <p>IV Asid hidroklorik + Larutan natrium karbonat
Hydrochloric acid + Sodium carbonate solution</p> | <p>A I dan II sahaja
I and II only</p> <p>B I dan IV sahaja
I and IV only</p> <p>C II dan III sahaja
II and III only</p> <p>D III dan IV sahaja
III and IV only</p> |
|--|---|

25. Rajah 13 menunjukkan gambar rajah profil tenaga bagi suatu tindak balas.
 Diagram 13 shows the energy profile diagram of a reaction.



Rajah 13
 Diagram 13

Berdasarkan Teori Perlanggaran, pernyataan manakah menerangkan perubahan lengkungan I kepada lengkungan II?

Based on the Collision Theory, which statement explains the change of curve I to curve II?

- A Jumlah luas permukaan pepejal bahan tindak balas meningkat
The total surface area of the solid reactants increases
 - B Tenaga kinetik zarah-zarah bahan tindak balas berkurangan
The kinetic energy of the particles of reactant decreases
 - C Bilangan mol per unit isipadu zarah-zarah meningkat
The number of moles per unit volume of particles increases
 - D Mangkin ditambah untuk mengurangkan tenaga pengaktifan tindak balas.
Catalyst is added to lower the activation energy of the reaction
26. Jadual 2 menunjukkan nilai E° bagi tindak balas sel setengah.
 Table 2 shows the E° value for half-cell equations.

Tindak balas sel setengah <i>Half-cell equations</i>	Nilai E° (V) <i>E° value (V)</i>
$R + e^{-} \rightleftharpoons R^{-}$	+0.83
$S^{2+} + e^{-} \rightleftharpoons S^{+}$	-0.56
$T^{3+} + e^{-} \rightleftharpoons T^{2+}$	-0.77

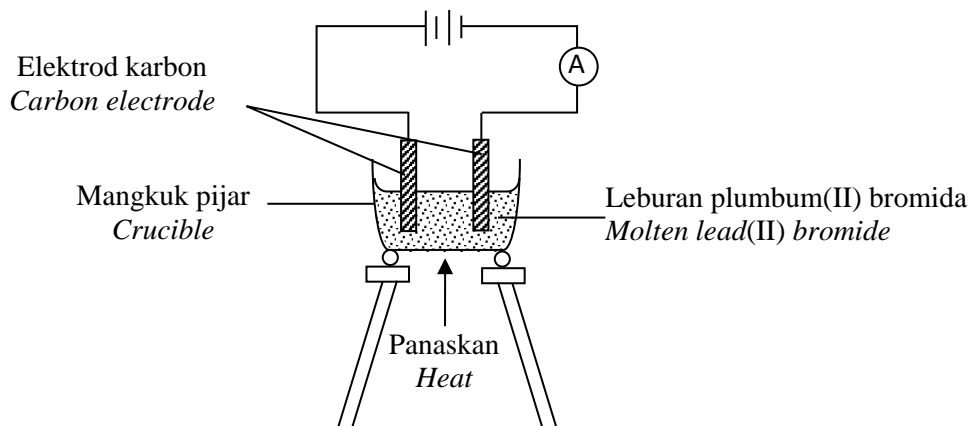
Jadual 2
 Table 2

Antara yang berikut, yang manakah agen penurunan yang paling kuat?
 Which of the following is the strongest reducing agent?

- A S^{2+}
- B R
- C R^{-}
- D T^{2+}

27. Rajah 14 menunjukkan susunan radas bagi elektrolisis leburan plumbum(II) bromida menggunakan elektrod karbon.

Diagram 14 shows the apparatus set-up for the electrolysis of molten lead(II) bromide using carbon electrodes.



Rajah 14
Diagram 14

Persamaan setengah yang manakah menunjukkan tindak balas di anod?

Which half-equation shows the reaction at the anode?

- A $\text{Pb} \rightarrow \text{Pb}^{2+} + 2\text{e}^-$ C $\text{Br}_2 + 2\text{e}^- \rightarrow 2\text{Br}^-$
 B $\text{Pb}^{2+} + 2\text{e}^- \rightarrow \text{Pb}$ D $2\text{Br}^- \rightarrow \text{Br}_2 + 2\text{e}^-$

28. Manakah antara berikut merupakan formula struktur dan nama yang betul bagi isomer C_5H_{10} ?

Which of the following is the correct structural formulae and its name for the isomer of C_5H_{10} ?

	Formula struktur <i>Structural formula</i>	Nama <i>Name</i>
I	$ \begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \quad \quad \\ \text{H}-\text{C}=\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array} $	2-metilbut-1-ena 2-methylbut-1-ene
II	$ \begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{H} \\ \quad \\ \text{H}-\text{C}=\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array} $	3-metilbut-3-ena 3-methylbut-3-ene
III	$ \begin{array}{c} \text{H} \quad \quad \quad \text{H} \quad \text{H} \\ \quad \quad \quad \quad \\ \text{H}-\text{C}-\text{C}=\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array} $	Pent-2-ena Pent-2-ene
IV	$ \begin{array}{c} \text{H} \quad \quad \quad \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \quad \quad \\ \text{H}-\text{C}=\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array} $	Pent-1-ena Pent-1-ene

- | | | | |
|----------|-------------------------------|----------|---------------------------------|
| A | I dan II
<i>I and II</i> | C | II dan IV
<i>II and IV</i> |
| B | I dan III
<i>I and III</i> | D | III dan IV
<i>III and IV</i> |

29. Ekoprena merupakan sejenis getah termaju yang berjaya dibangunkan oleh Lembaga Getah Malaysia yang mempunyai ciri-ciri istimewa serta bersumberkan bahan mesra alam.
Ekoprena is a type of advanced rubber developed by the Malaysian Rubber Board. They have distinctive characteristics and are sourced from environmentally friendly materials.

Rajah 15 menunjukkan kenderaan yang menggunakan tayar getah Ekoprena di Malaysia.
Diagram 15 shows a vehicle using Ekoprena tyre in Malaysia.



Rajah 15
Diagram 15

Getah Ekoprena
Ekoprena rubber

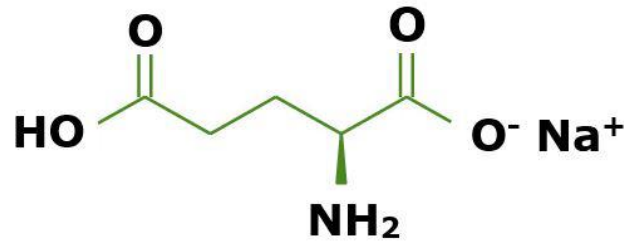
- diperolehi melalui pengoksidaan lateks getah asli.
Obtained from oxidation of latex from natural rubber.
- adalah sejenis getah sintetik yang dikategorikan sebagai bahan hijau atau getah mesra alam.
is a type of synthetic rubber categorised as green material or green rubber that is an environment friendly rubber.
- dicampur dengan bahan pengisi nano seperti grafen dan silika untuk menghasilkan sebatian telapak tayar kenderaan.
mixed with nanofiller such a graphene and silica to manufacture tyre tread compound.

Antara pernyataan yang berikut, manakah menerangkan dengan tepat sebab getah Ekoprena dikelaskan sebagai getah sintetik?

Which of the following statements correctly explain why Ekoprena rubber is classified as a synthetic rubber?

- | | |
|----------|--|
| A | Getah Ekoprena boleh terbiodegradasi
<i>Ekoprena rubber is biodegradable</i> |
| B | Getah Ekoprena ialah molekul berantai panjang yang terhasil daripada pencantuman banyak ulangan unit asas.
<i>Ekoprena rubber is a long chain molecule that is made from a combination of many repeating basic units.</i> |
| C | Getah yang dihasilkan melalui penghasilan rangkaian silang antara rantai polimer.
<i>Rubber produced through the production of cross-links between polymer chain</i> |
| D | Getah Ekoprena adalah polimer elastomer yang bersifat kenyal.
<i>Ekoprena rubber is an elastomer polymer which is elastic in nature.</i> |

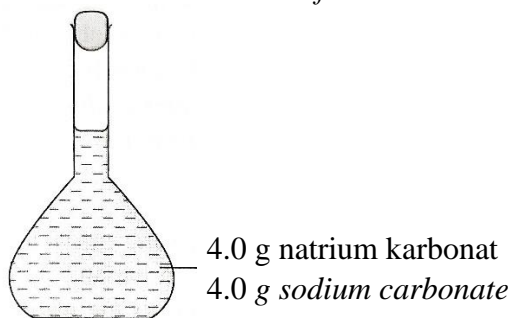
30. Mononatrium glutamat, MSG pertama kali disediakan pada tahun 1908 oleh ahli biokimia Jepun. Gambar rajah 16 menunjukkan formula struktur MSG.
Monosodium glutamate, MSG was first prepared in 1908 by Japanese biochemist. Diagram 16 shows the structural formula of MSG.



Rajah 16
 Diagram 16

Apakah jenis bahan tambah makanan bagi mononatrium glutamat?
What is the type of food additives of monosodium glutamate?

- | | |
|---------------------------------------|---|
| A Perisa
<i>Flavourings</i> | C Penstabil
<i>Stabilizer</i> |
| B Pemekat
<i>Thickeners</i> | D Pewarna
<i>Dyes</i> |
31. Antara gas berikut, yang manakah mengandungi 0.6 mol atom pada suhu dan tekanan bilik?
 [1 mol gas menepati isi padu sebanyak 24 dm³ pada suhu dan tekanan bilik]
Which of the following gases contains 0.6 mol of atoms at room temperature and pressure?
 [1 mol of gas occupies the volume of 24 dm³ at room temperature and pressure]
- | | |
|---|--|
| A 7.2 dm ³ He | C 7.2 dm ³ SO ₃ |
| B 7.2 dm ³ H ₂ | D 7.2 dm ³ CO ₂ |
32. Rajah 17 menunjukkan suatu larutan piawai dalam kelalang volumetrik 250 cm³.
Diagram 17 shows a standard solution in a 250 cm³ volumetric flask.

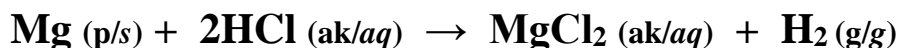


Rajah 17
 Diagram 17

Berapakah kepekatan larutan piawai yang dihasilkan?
What is the concentration of the standard solution produced?
 [Jisim atom relatif: C=12; O=16; Na=23]
 [Relative atomic mass: C=12; O=16; Na=23]

- | | |
|-------------------------------------|-------------------------------------|
| A 0.085 mol dm ⁻³ | C 0.194 mol dm ⁻³ |
| B 0.151 mol dm ⁻³ | D 0.208 mol dm ⁻³ |

37. Persamaan kimia berikut mewakili tindak balas antara magnesium dengan asid hidroklorik.
The following equation represents the reaction between magnesium and hydrochloric acid.



Berapakah isi padu gas hidrogen yang terhasil apabila 2.4 g magnesium bertindak balas dengan 100 cm³ asid hidroklorik 1 mol dm⁻³ pada suhu dan tekanan piawai STP?

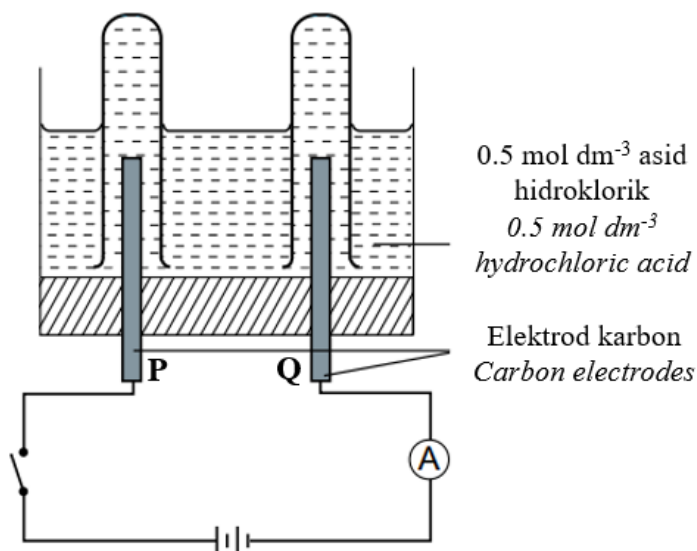
[Jisim atom relatif : Mg = 24, H = 1 ; Isi padu molar gas pada STP = 22.4 dm³ mol⁻¹]

What is the volume of hydrogen gas produced when 2.4 g of magnesium reacts with 100 cm³ of 1 mol dm⁻³ hydrochloric acid at standard temperature and pressure (STP)?

[Relative atomic mass: Mg = 24, H = 1: Molar volume of gas at STP = 22.4 dm³ mol⁻¹]

- | | |
|-------------------------------|-------------------------------|
| A 2.24 dm ³ | C 0.10 dm ³ |
| B 1.12 dm ³ | D 4.48 dm ³ |

38. Rajah 19 menunjukkan sel elektrolisis yang digunakan oleh seorang murid untuk mengkaji kesan elektrolisis ke atas nilai pH asid hidroklorik.
Diagram 19 shows an electrolytic cell used by a student to study the effect of electrolysis on the pH value of hydrochloric acid.



Rajah 19
 Diagram 19

Murid menuangkan 500 cm³ asid ke dalam sel elektrolisis dan menghidupkan suis selama 30 minit. Diberi 0.075 mol elektron telah bergerak daripada elektrod P ke Q melalui wayar penyambung.

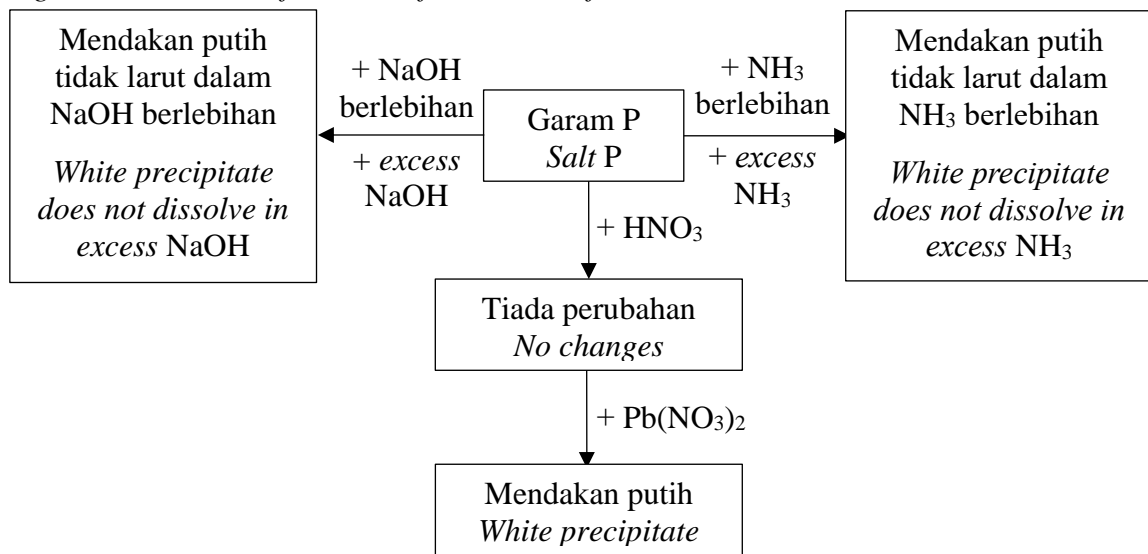
The student poured 500 cm³ acid into the electrolytic cell and turned on the switch for 30 minutes. Given 0.075 mol of electrons had moved from electrode P to Q through the connecting wire.

Apakah nilai pH asid hidroklorik dalam sel elektrolisis selepas 30 minit?

What is the pH value of the hydrochloric acid in the electrolytic cell after 30 minutes?

- | | |
|----------------|----------------|
| A 0.301 | C 0.398 |
| B 0.347 | D 0.456 |

39. Rajah 20 menunjukkan carta alir bagi satu siri tindak balas ke atas garam P.
 Diagram 20 shows the flow chart for a series of reaction on salt P.



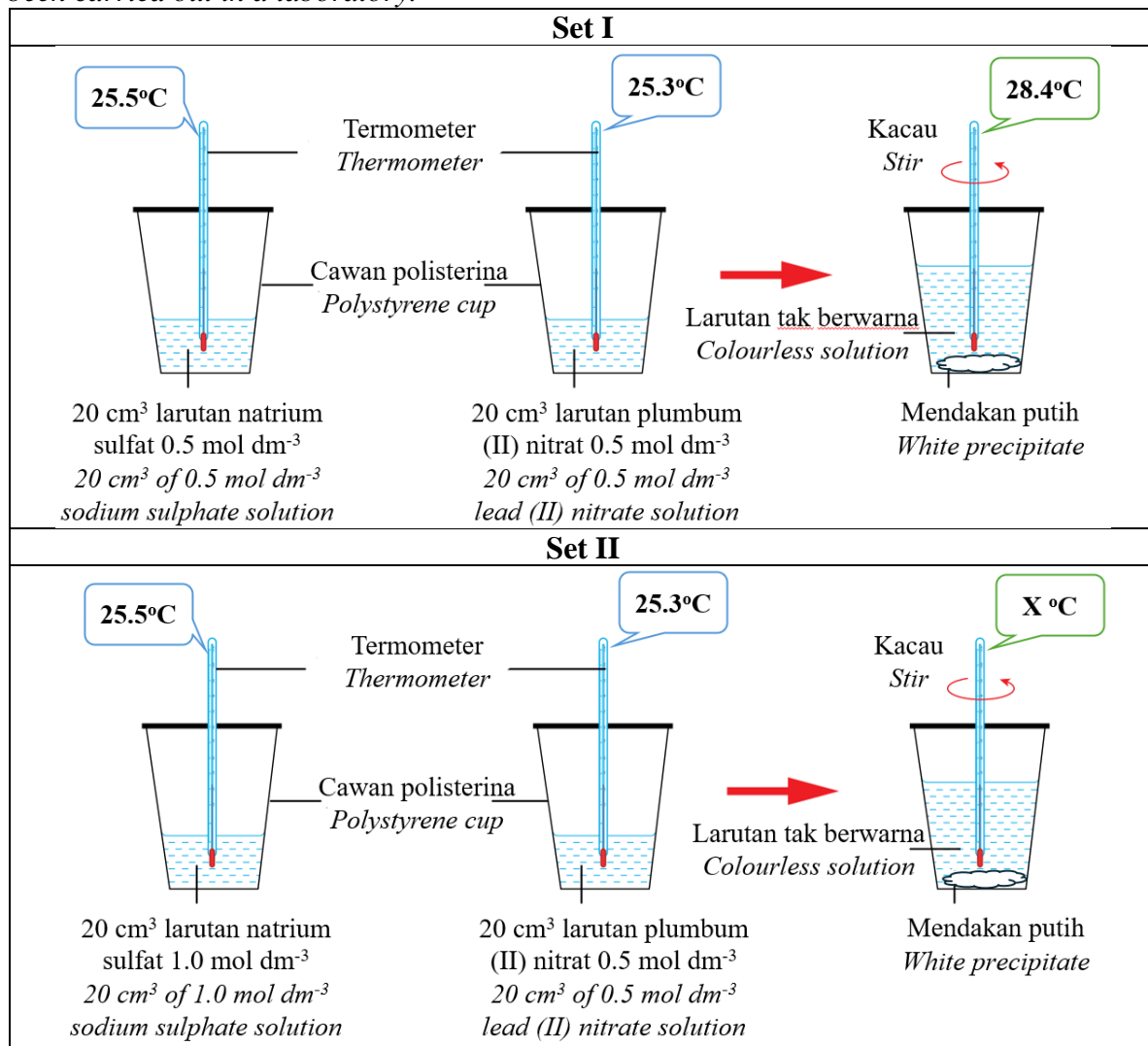
Rajah 20
 Diagram 20

Berdasarkan keputusan eksperimen, apakah garam P?
 Based on the results of the experiment, what is salt P?

- | | |
|---|---|
| <p>A Zink klorida
 <i>Zinc chloride</i></p> <p>B Kalsium klorida
 <i>Calcium chloride</i></p> | <p>C Magnesium sulfat
 <i>Magnesium sulphate</i></p> <p>D Ammonium sulfat
 <i>Ammonium sulphate</i></p> |
|---|---|

40. Rajah 21 menunjukkan susunan radas dan pemerhatian bagi dua set eksperimen yang telah dijalankan di makmal.

Diagram 21 shows the apparatus set-up and the observations of two experiments that had been carried out in a laboratory.



Rajah 21
Diagram 21

Eksperimen diulang dengan mengubah kepekatan natrium sulfat kepada 1.0 mol dm⁻³.

The experiment is repeated by changing the concentration of sodium sulphate solution to 1.0 mol dm⁻³.

Apakah X?

[Muatan haba tentu larutan = 4.2 Jg⁻¹ °C⁻¹]

What X?

[Specific heat capacity = 4.2 Jg⁻¹ °C⁻¹]

A 16.9 °C

C 29.9 °C

B 28.4 °C

D 31.4 °C

KERTAS PEPERIKSAAN TAMAT

END OF QUESTION PAPER

**SKEMA JAWAPAN
PRAKTIS KIMIA 4541/1
SET 2**

1	B	11	D	21	C	31	B
2	C	12	C	22	B	32	B
3	D	13	C	23	A	33	A
4	D	14	A	24	A	34	C
5	C	15	B	25	D	35	B
6	A	16	B	26	D	36	D
7	A	17	A	27	D	37	B
8	D	18	A	28	B	38	C
9	D	19	D	29	D	39	C
10	B	20	B	30	A	40	B

JADUAL SPESIFIKASI UJIAN (JSU)
PRAKTIS KIMIA SET 1 (4541/1)

Chapter	Sub-chapter	Remembering			Understanding			Applying			Analyzing			Total
		E	M	H	E	M	H	E	M	H	E	M	H	
1. Introduction to chemistry [F4]	1.1 Development in chemistry field and its importance in daily life													
	1.2 Scientific investigation in chemistry													
	1.3 Usage, management and handling of apparatus and materials													
2. Matter and the Atomic Structure [F4]	2.1 Basic concepts of matter	1												
	2.2 The development of the atomic model													
	2.3 Atomic structure													
	2.4 Isotopes and its uses				10									
3. The Mole Concept, Chemical Formula and Equation [F4]	3.1 Relative atomic mass and relative molecular mass													
	3.2 Mole concept								31					
	3.3 Chemical formula	2								36				
	3.4 Chemical equation									37				
4. The Periodic Table of Elements [F4]	4.1 The development of The Periodic Table of Elements													
	4.2 The arrangement in The Periodic Table of Elements	3												
	4.3 Elements in Group 18				11									
	4.4 Elements in Group 1													
	4.5 Elements in Group 17													
	4.6 Elements in Period 3					19								
	4.7 Transition elements													
5. Chemical Bond [F4]	5.1 Basics of compound formation				12									
	5.2 Ionic bond													
	5.3 Covalent bond													
	5.4 Hydrogen bond	4												
	5.5 Dative bond					20								
	5.6 Metallic bond					21								
	5.7 Properties of ionic and covalent compounds													
6. Acid, Base and Salt [F4]	6.1 The role of water in showing acidic and alkaline properties													
	6.2 pH value					22								
	6.3 Strength of acids and alkalis	5												
	6.4 Chemical properties of acids and alkalis					23								
	6.5 Concentration of aqueous solution								32					
	6.6 Standard solution													
	6.7 Neutralisation					24								
	6.8 Salts, crystals and their uses in daily life													
	6.9 Preparation of salts													
	6.10 Effect of heat on salts													
	6.11 Qualitative analysis											39		
7. Rate of Reaction [F4]	7.1 Determining rate of reaction								33					
	7.2 Factors affecting rate of reaction	6												
	7.3 Application of factors that affect the rate of reaction in daily life													
	7.4 Collision theory					25								
8. Manufactured Substances in Industry [F4]	8.1 Alloy and its importance		7											
	8.2 Composition of glass and its uses													
	8.3 Composition of ceramics and its uses													
	8.4 Composite materials and its importance					13								

Chapter	Sub-chapter	Knowledge			Understanding			Application			Analysis			Total
		E	M	H	E	M	H	E	M	H	E	M	H	
9. Redox equilibrium [F5]	9.1 Oxidation and reduction		8							35				
	9.2 Standard electrode potential					26								
	9.3 Voltaic cell		9							34				
	9.4 Electrolytic cell					27				38				
	9.5 Extraction of metal from its ore													
	9.6 Rusting													
10. Carbon compound [F5]	10.1 Types of carbon compound													
	10.2 Homologous series					10								
	10.3 Chemical properties and interconversion of compounds between homologous series					14								
	10.4 Isomers and naming based on IUPAC nomenclature					28								
11. Thermochemistry [F5]	11.1 Heat change in reactions					15								
	11.2 Heat of reaction												40	
	11.3 Application of endothermic and exothermic reactions in daily life													
12. Polymer Chemistry [F5]	12.1 Polymer													
	12.2 Natural rubber					16								
	12.3 Synthetic rubber					29								
13. Consumer and Industrial Chemistry [F5]	13.1 Oils and fats					17								
	13.2 Cleaning agents													
	13.3 Food additives									30				
	13.4 Medicines and cosmetics					18								
	13.5 Application of nanotechnology in industry													
	13.6 Application of green technology in industrial waste management													
Total		6	3	0	9	12	0	0	3	5	0	1	1	40
Ratio of E:M:H														
Level of Difficulty E : Easy M : Medium H : Hard														

**MODUL
KENYALANG CEMERLANG SPM
TAHUN 2024**

JABATAN PENDIDIKAN NEGERI SARAWAK

**KIMIA
(4541/2)**

**PRAKTIS KERTAS 2
SET 2**

Pengenalan

Program Semarak Kasih yang dilaksanakan pada tahun 2020 telah mendapat sambutan yang menggalakkan daripada warga pendidik dan murid, khususnya calon SPM 2020. Sehubungan dengan itu, pada tahun 2024 ini, Sektor Pembelajaran, Jabatan Pendidikan Negeri Sarawak mengadakan **Program Modul Kenyalang Cemerlang Kimia SPM 2024** untuk membantu guru dan calon SPM menghadapi peperiksaan SPM 2024.

Modul yang dihasilkan disertakan dengan sampel Jadual Spesifikasi Ujian (JSU) dan sampel item/soalan mengikut format baharu peperiksaan SPM mulai 2021 untuk dijadikan bahan panduan dan rujukan guru-guru dan juga sebagai bahan latihan/ulangkaji kepada calon-calon SPM 2024 di semua sekolah menengah di negeri Sarawak.

OBJEKTIF PROGRAM

1. Memastikan calon SPM menguasai format baharu Peperiksaan SPM 2024.
2. Memastikan calon SPM mempunyai bahan pembelajaran yang berfokus ke arah peperiksaan SPM.
3. Meningkatkan pencapaian akademik calon SPM 2024.
4. Melonjakkan keputusan SPM 2024 Negeri Sarawak

Senarai Kandungan

Bil.	Perkara	Muka surat
1	Format Kertas Peperiksaan SPM Mulai Tahun 2021	2
2	Latihan - Praktis Kimia 4541/2: Set 2	4 – 29
3	Skema Jawapan/Pemarkahan	30 - 41
4	LAMPIRAN: Sampel Jadual Spesifikasi Ujian (JSU) untuk Praktis Kimia 4541/2: Set 2	42-43

Senarai Ahli Panel Pembina Kenyalang Cemerlang SPM 2024

Bil.	Nama Guru	Sekolah	PPD
1.	Francisca Lau Siew Hsia (Ketua)	SMK Methodist	SIBU
2.	Chien Hui Siong	SMK Tinggi Sarikei	SARIKEI
3.	Law Hui Nong	SMK Tinggi Sarikei	SARIKEI
4.	Fun Ngiik Ngon	SMK Bandar Sibu	SIBU
5.	Goh Leh Ling	SMK Sacred Heart	SIBU
6.	Bella Mahony Sie	SMK Luar Bandar Sibu	SIBU
7.	Ling Teck Ping	SMK Tung Hua	SIBU
8.	Wong Kee Ping	SMK Bukit Assek	SIBU
9.	Yap Liew Ying	SMK Tiong Hin	SIBU
10.	Ling Mee Ling	SMK St Elizabeth	SIBU
11.	Victoria Petrus	SMK Tun Abdul Razak	SERIAN
12.	Catherine Law Fong Fong	SMK Deshon Sibu	SIBU
13.	Dalimawaty binti Ahmad	SMK Santubong	KUCHING

Penyelaras

Bil.	Nama Pegawai	Stesen Bertugas
1	Evelin anak Medong	Unit Sains dan Matematik, JPN Sarawak
2	Haslina binti Marzoki	Unit Sains dan Matematik, JPN Sarawak

**FORMAT INSTRUMEN PEPERIKSAAN SPM MULAI TAHUN 2021
BAGI MATA PELAJARAN KIMIA (KOD: 4541)**

BIL	PERKARA	KERTAS 1 (4541/1)	KERTAS 2 (4541/2)	KERTAS 3 (4541/3)
1	Jenis Instrumen	Ujian Bertulis		Ujian Amali
2	Jenis Item	Objektif Aneka Pilihan	<ul style="list-style-type: none"> • Subjektif Berstruktur • Subjektif Respons Terhad • Subjektif Respons Terbuka 	Subjektif Berstruktur
3	Bilangan Soalan	40 soalan (40 markah) (Jawab semua soalan)	Bahagian A: <ul style="list-style-type: none"> • 8 soalan (60 Markah) (Jawab semua soalan) • Bahagian B: (20 Markah) • 2 soalan (Jawab 1 soalan) Bahagian C: (20 Markah) <ul style="list-style-type: none"> • 1 soalan 	3 item (Jawab mengikut subjek yang didaftar)
4	Jumlah Markah	40 markah	100 markah	15 markah bagi setiap item
5	Konstruk	<ul style="list-style-type: none"> • Mengingat • Memahami • Mengaplikasi • Menganalisis 	<ul style="list-style-type: none"> • Mengingat • Memahami • Mengaplikasi • Menganalisis • Menilai • Mencipta 	Kemahiran proses sains
6	Tempoh Ujian	1 jam 15 minit	2 jam 30 minit	40 minit + 5 minit setiap item (5 minit: sesi merancang) (40 minit: masa menjawab soalan)
7	Cakupan Konteks	Standard kandungan dan standard pembelajaran dalam Dokumen Standard Kurikulum dan Pentaksiran (DSKP) KSSM (Tingkatan 4 dan 5)		
8	Aras Kesukaran	Rendah : Sederhana : Tinggi 5 : 3 : 2		
9	Kaedah Penskoran	Dikotomus	Analitikal	
10	Alat Tambahan	Kalkulator saintifik		

PRAKTIS KIMIA 4541/2

SET 2

BAHAGIAN A

Section A

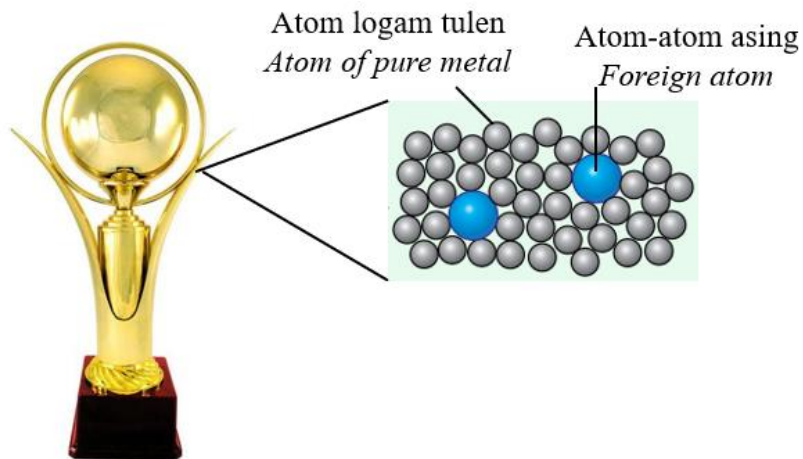
[60 markah]

[60 marks]

Jawab **semua** soalan dalam bahagian ini.

Answer all questions in this section.

1. Rajah 1 menunjukkan sebuah piala aloi buatan Loyang dan susunan zarah dalam aloi loyang.
Diagram 1 shows a brass made alloy trophy and the arrangement of particles in the brass alloy.



Rajah 1
Diagram 1

- (a) Apakah yang dimaksudkan dengan aloi?
What is meant by alloy?

.....
[1 markah / 1 mark]

- (b) Berdasarkan Rajah 1,
Based on Diagram 1,

- (i) Aloi loyang dibina daripada gabungan logam tulen dan logam asing. Nyatakan nama bagi
Brass alloy is built from the mixture of pure metal and foreign metal. State the name for

Logam tulen :
Pure metal

Logam asing :
Foreign metal

[2 markah / 2 marks]

- (ii) Terangkan mengapa aloi Loyang dipilih sebagai bahan buatan piala tetapi bukan logam tulennya.

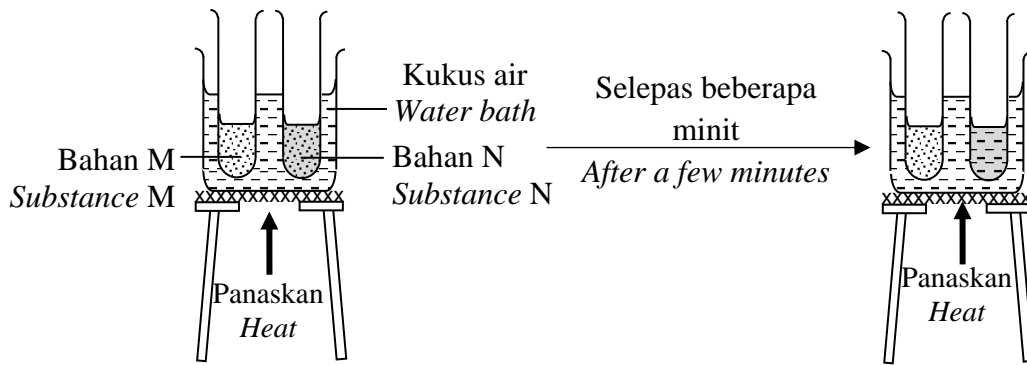
Explain why brass is chosen as material to make the trophy instead of its pure metal.

.....

[2 markah / 2 marks]

2. (a) Rajah 2.1 menunjukkan susunan radas yang digunakan dalam eksperimen untuk membandingkan takat lebur sebatian ionik dan sebatian kovalen. Kedua-dua serbuk pepejal bahan M dan bahan N dipanaskan dalam kukus air dan keadaan fizikal dibandingkan selepas beberapa minit.

Diagram 2.1 shows the apparatus set-up used in an experiment to compare the melting point of ionic compound and covalent compound. Both powdered solid of substances M and N are heated in the water bath and the physical state is compared after a few minutes.



Rajah 2.1
 Diagram 2.1

- (i) Nyatakan maksud takat lebur.
State the meaning of melting point.

.....

[1 markah / 1 mark]

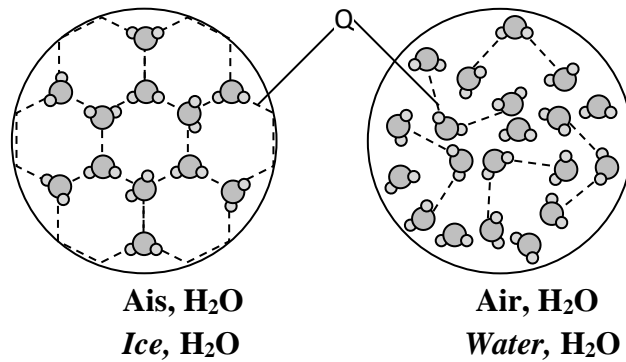
- (ii) Apakah jenis ikatan kimia yang membentuk zarah dalam sebatian N?
 Namakan satu contoh bahan N.
*What is the type of chemical bond that forms particle in substance N?
 Name an example of substance N.*

.....

[2 markah / 2 marks]

(b) Rajah 2.2 menunjukkan susunan molekul air, H₂O dalam keadaan pepejal dan cecair.

Diagram 2.2 shows the arrangement of water molecules, H₂O in solid and liquid states.



Rajah 2.2 / Diagram 2.2

(i) Q ialah sejenis daya tarikan yang wujud di antara atom hidrogen, H dengan atom oksigen, O dari dua molekul air yang bersebelahan. Apakah Q?

Q is a force of attraction that exists between hydrogen atom, H and oxygen atom, O of two nearby water molecules. What is Q?

.....
[1 markah / 1 mark]

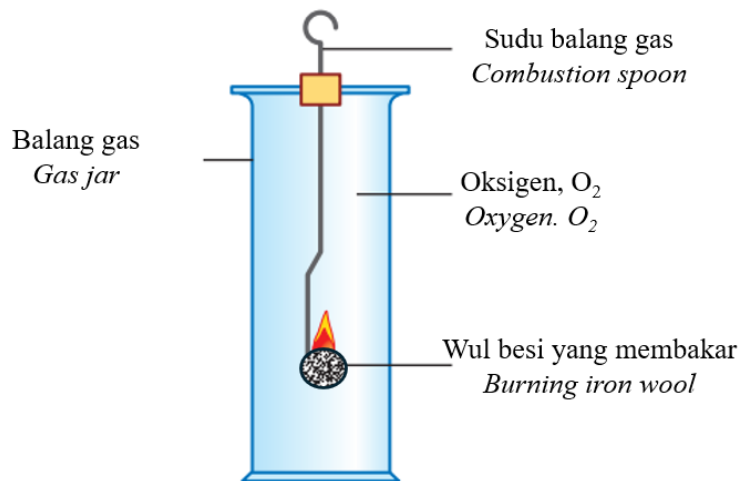
(ii) Berdasarkan Rajah 2.2, nyatakan **satu** kesan Q terhadap sifat fizikal bagi air.

*Based on Diagram 2.2, state **one** effect of Q on the physical property of water.*

.....
[1 markah / 1 mark]

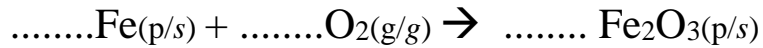
3. Rajah 3 menunjukkan susunan radas yang digunakan untuk mengkaji tindak balas kimia antara wul besi dengan gas oksigen. Wul besi membakar dengan terang dalam oksigen, kemudian baki pepejal berwarna perang terhasil.

Diagram 3 shows the set-up of apparatus used to study the chemical reaction between iron wool and oxygen gas. The iron wool burns brightly in oxygen, then a brown solid residue is produced.



Rajah 3
Diagram 3

- (a) Persamaan di bawah adalah bukan persamaan kimia yang seimbang.
The equation below is not a balanced chemical equation:



Seimbangkan persamaan kimia di atas.
Balance the chemical equation above.

[1 markah / 1 mark]

- (b) Tafsirkan persamaan itu secara kualitatif dan kuantitatif.
Interpret the chemical equation qualitatively and quantitatively.

.....

[2 markah / 2 marks]

- (c) Nyatakan jenis zarah dalam Fe₂O₃.
State the type of particles in Fe₂O₃.

.....

[1 markah / 1 mark]

- (d) Tuliskan formula kation bagi Fe₂O₃?
Write the formula of cation in Fe₂O₃?

.....

[1 markah / 1 mark]

- (e) Hitung jisim formula relatif bagi Fe₂O₃.
 [Jisim atom relatif: O= 16, Fe=56]
Calculate the relative formula mass of Fe₂O₃.
 [Relative atomic mass: O=16, Fe=56]

[1 markah / 1 mark]

4. Jadual 1 menunjukkan maklumat bagi unsur Kala 3 dalam Jadual Berkala Unsur.

Table 1 shows the information of Period 3 elements in the Periodic Table of Elements.

Unsur <i>Element</i>	Na	Mg	Al	Si	P	S	Cl	Ar
Nombor proton <i>Proton number</i>	11	12	13	14	15	16	17	18
Bilangan elektron valens <i>Number of valence electrons</i>	1	2	3	4	5	6	7	8

Jadual 1 / Table 1

(a) (i) Mengapa unsur-unsur ini diletakkan dalam Kala 3?

Why are these elements placed in Period 3?

.....
[1 markah / 1 mark]

(ii) Argon wujud sebagai gas monoatom. Jelaskan.

Argon exists as monoatomic gas. Explain.

.....
.....
[1 markah / 1 mark]

(b) Klorin ditambah ke dalam air kolam renang untuk membersihkan kolam dan membunuh kuman. Hasil tindak balas bagi tindak balas klorin dan air ialah asid hidroklorik dan asid hipoklorus.

Chlorine is added into swimming pool to clean the pool and to kill germs. The products of the reaction of chlorine and water is hydrochloric acid and hypochlorous acid.

(i) Tuliskan persamaan kimia bagi tindak balas antara klorin dengan air kolam renang.
Write a chemical equation for the reaction between chlorine and swimming pool water.

.....
[2 markah / 2 marks]

(ii) Hitung jisim klorin yang perlu dilarutkan dalam 2 500 000 dm³ air kolam renang untuk menghasilkan 0.00004 mol dm⁻³ asid hipoklorus.

[Jisim atom relatif: H=1, O=16, Cl = 35.5]

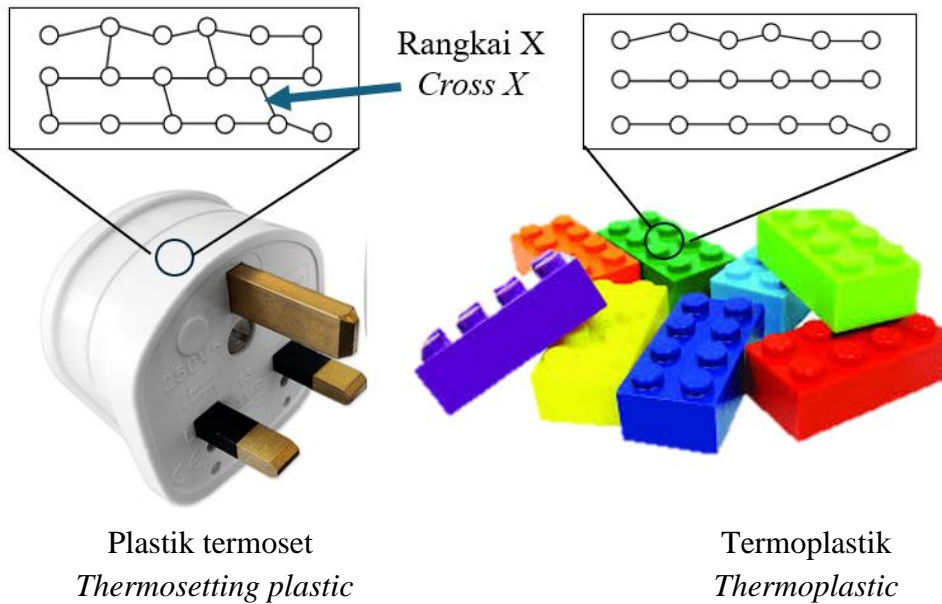
Calculate the mass of chlorine needed to be dissolved in 2 500 000 dm³ of swimming pool water to produce 0.00004 mol dm⁻³ of hypochlorous acid.

[Relative atomic mass: H=1, O=16, Cl = 35.5]

[3 markah / 3 marks]

5. (a) Rajah 4.1 menunjukkan dua contoh bahan buatan serta struktur molekul daripada plastik termoset dan plastik termoplastik.

Diagram 4.1 shows two examples of manufactured substances with their molecular structures from thermosetting plastic and thermoplastic.



Rajah 4.1
Diagram 4.1

- (a) (i) Istilah "plastik" ialah nama umum yang merujuk kepada polimer sintetik. Apakah unit asas plastik?

The term "plastic" is a general name referring to synthetic polymer. What is the basic unit of plastic?

.....
[1 markah / 1 mark]

- (ii) Plastik yang manakah boleh dikitar semula? Nyatakan alasan anda.

Which plastics can be recycled? State your reasons.

.....
.....
[2 markah / 2 marks]

- (ii) Rajah 4.2 menunjukkan poster kempen pengurangan penggunaan plastik yang dilancarkan di Malaysia.

Diagram 4.2 shows a plastic reduction campaign poster that is launched in Malaysia.



Rajah 4.2

Diagram 4.2

Wajarkan pelaksanaan kempen ini

Justify the implementation of the campaign.

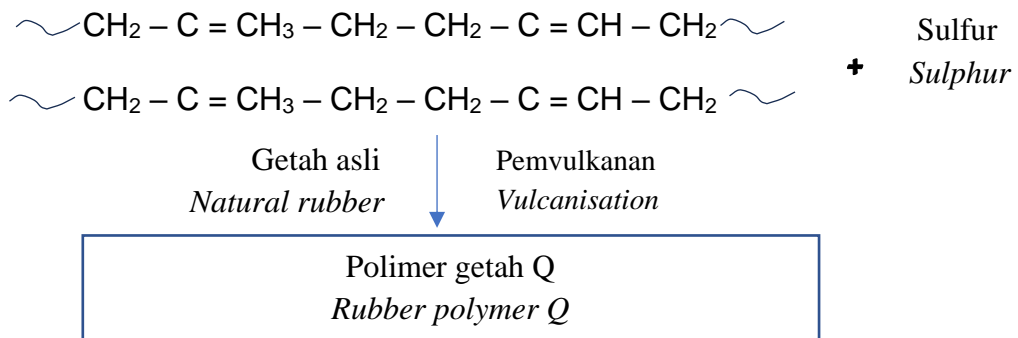
.....

.....

[2 markah / 2 marks]

- (b) Rajah 4.3 menunjukkan proses pemvulkanan getah.

Diagram 4.3 shows the process of vulcanisation of rubber.



Rajah 4.3

Diagram 4.3

- (i) Lukiskan polimer getah Q dalam ruang jawapan di bawah.

Draw the rubber polymer Q in the answer space below.

[1 markah / 1 mark]

- (ii) Rajah 4.4 di bawah menunjukkan tayar kenderaan.
The Diagram 4.4 below shows the car tyres.



Rajah 4.4
Diagram 4.4

Tayar kereta diperbuat daripada getah tervulkan. Pada pendapat anda, mengapakah getah tervulkan lebih sesuai digunakan untuk menghasilkan tayar kereta?

Car tyres are made of vulcanised rubber. In your opinion, why vulcanised rubber is more suitable to be used to manufacture car tyres?

.....

.....

[2 markah / 2 marks]

6. Kalsium karbonat merupakan sejenis garam tak terlarutkan yang terhasil melalui proses pemendakan antara 50 cm³ larutan kalsium nitrat 1.0 mol dm⁻³ dan 50 cm³ larutan X 1.0 mol dm⁻³. Persamaan termokimia berikut menunjukkan pembentukan kalsium karbonat.
Calcium carbonate is a type of insoluble salt that is produced through the precipitation process between 50cm³ of 1.0mol dm⁻³ calcium nitrate solution and 50cm³ of 1.0 mol dm⁻³ X solution. The following thermochemical equation shows the formation of calcium carbonate.

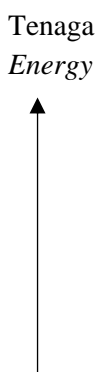


- (a) Nyatakan larutan X.
State solution X.

.....
 [1 markah / 1 mark]

- (b) Berdasarkan persamaan termokimia yang diberi,
Based on the thermochemical equation given,

- (i) lukis gambar rajah aras tenaga bagi tindak balas tersebut pada paksi yang disediakan.
draw the energy level diagram for the reaction on the provided axis.



[2 markah/ 2 marks]

- (ii) Nyatakan satu maklumat yang boleh dideduksikan daripada gambar rajah di 6(b)(i)
State one information that can be deduced from the diagram in 6(b)(i).

.....

 [1 markah/ 1 mark]

- (iii) 24 g kalsium karbonat terhasil dalam aktiviti yang dijalankan. Hitung perubahan haba bagi tindak balas itu.

24 g of calcium carbonate is formed in the activity. Calculate the heat change of the reaction.

[Jisim molar kalsium karbonat = 100 g mol^{-1} , muatan haba tentu air = $4.2 \text{ Jg}^{-1}\text{C}^{-1}$]

[*Molar mass of calcium carbonate = 100 g mol^{-1} , specific heat capacity of solution = $4.2 \text{ Jg}^{-1}\text{C}^{-1}$]*

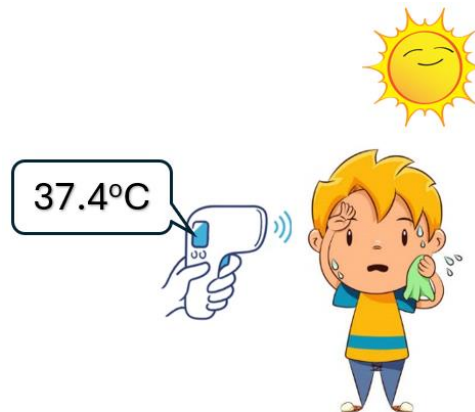
[2 markah / 2 marks]

- (c) Seorang atlet telah mengambil bahagian dalam acara lompat jauh semasa hari sukan sekolah. Suhu badan tertinggi atlet yang dapat dikesan oleh thermometer inframerah semasa pertandingan mencecah 38.6°C .

Rajah 5.1 menunjukkan suhu badan atlet selepas berehat 10 minit.

An athlete who has participated in a long jump event during a school sports day. The highest body temperature of the athlete detected by an infrared thermometer during the game reached 38.6°C .

Diagram 5.1 shows the body temperature of the athlete after resting for 10 minutes.



Rajah 5.1

Diagram 5.1

Perpeluhan menyebabkan badan atlet berasa sejuk. Adakah perpeluhan tindak balas endotermik atau tindak balas eksotermik? Terangkan sebab bagi jawapan anda.

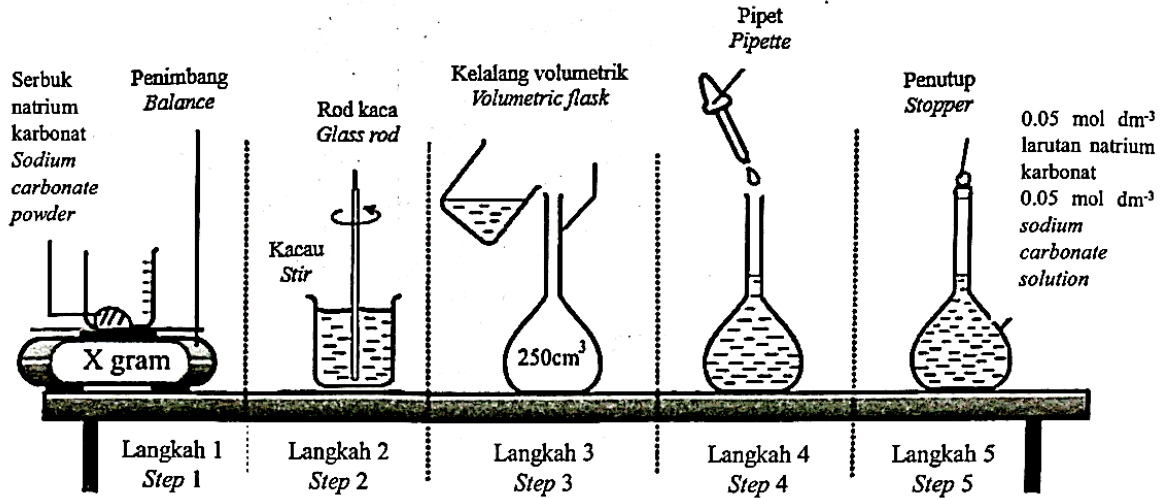
Sweating causes the athlete's body to feel cold. Is sweating an endothermic reaction or an exothermic reaction? Explain the reason for your answer.

.....

.....

[3 markah/ 3 marks]

7. Azmi menyediakan 250 cm³ larutan piawai menggunakan natrium karbonat, Na₂CO₃ 0.05 mol dm⁻³ seperti yang ditunjukkan dalam Rajah 6.1
 Azmi prepared 250 cm³ standard solution using sodium carbonate, Na₂CO₃ as shown in Diagram 6.1



Rajah 6.1
 Diagram 6.1

- (a) (i) Apakah yang dimaksudkan dengan larutan piawai?
 What is meant by standard solution?

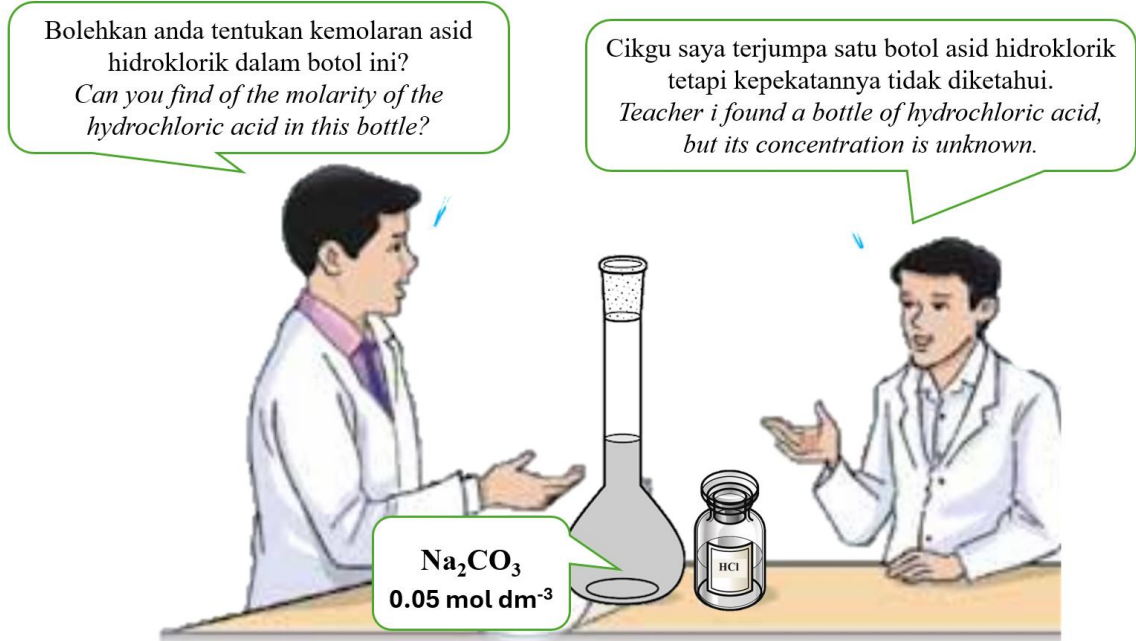
.....

[1 markah / 1 mark]

- (ii) Berdasarkan Rajah 9.1, hitung jisim X natrium karbonat .
 [Jisim relatif natrium karbonat = 106]
 Based on Diagram 9.1, calculate the mass X of sodium carbonate.
 [Relative mass of sodium carbonate = 106]

[2 markah / 2 marks]

- (b) Rajah 6.2 menunjukkan perbualan antara Azmi dengan cikgunya.
Diagram 6.2 shows the conversation between Azmi and his teacher.



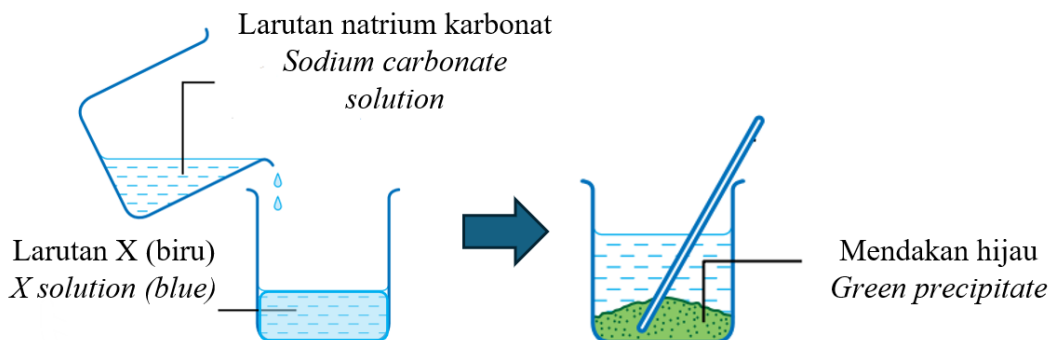
Rajah 6.2
 Diagram 6.2

Lukiskan satu gambar rajah berlabel bagi susunan radas yang boleh digunakan oleh Azmi untuk menentukan kemolaran asid hidroklorik dengan menggunakan larutan piawai yang telah disediakan dalam 7(a).

Draw a labelled diagram for the apparatus set-up that can be used by Azmi to find out the molarity of hydrochloric acid by using the standard solution prepared in 7 (a).

[2 markah / 2 marks]

- (c) Rajah 6.3 menunjukkan pemerhatian apabila larutan natrium karbonat ditambah kepada larutan X yang berwarna biru.
 Diagram 6.3 shows the observation when sodium carbonate solution is added to blue coloured X solution.



Rajah 6.3
 Diagram 6.3

Cadangkan larutan X dan mendakan hijau.
 Suggest solution X and green precipitate.

.....

.....

[2 markah / 2 marks]

- (d) Azmi diberi satu tugas untuk menyediakan 250 cm^3 larutan piawai natrium hidroksida dengan kepekatan 0.05 mol dm^{-3} . Azmi bercadang untuk menggunakan kaedah yang ditunjukkan dalam Rajah 6.1 untuk menyediakan larutan piawai tersebut. Pada pandangan anda, adakah keputusan Azmi betul? Terangkan
 Azmi is given a task to prepare 250 cm^3 standard solution of sodium hydroxide with concentration of 0.05 mol dm^{-3} . Azmi plans to use the method shown in Diagram 6.1 in preparing sodium hydroxide solution.
 In your opinion, do u think Azmi's decision correct? Explain

.....

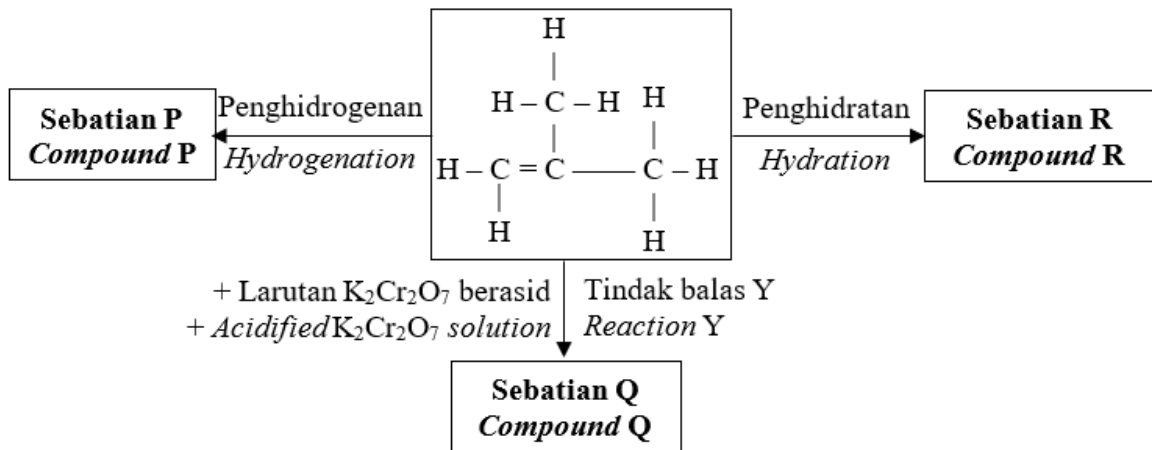
.....

.....

[3 markah / 3 marks]

8. Rajah 7 menunjukkan suatu siri tindak balas bagi suatu isomer butena.

Diagram 7 shows a series of reactions of an isomer of butene.



Rajah 7
Diagram 7

(a) Apakah yang dimaksudkan dengan isomer?

What is the meaning of isomer?

.....

[1 markah / 1 mark]

(b) Isomer butena dalam Rajah 8 boleh mengalami tindak balas pempolimeran penambahan. Lukis formula struktur bagi polimer yang terbentuk.

The isomer of butene in Diagram 8 can undergo addition polymerisation. Draw the structural formula of the polymer formed.

[1 markah / 1 mark]

(c) (i) Pemanasan butena dan gas hidrogen menghasilkan sebatian P. Nyatakan keadaan yang diperlukan untuk penghasilan sebatian P secara optimum.

Heating butene and hydrogen gas produces compound P. State the conditions required for the optimal production of compound P.

.....

[1 markah / 1 mark]

- (ii) Huraikan **satu** ujian kimia secara ringkas untuk membezakan sebatian P dan butena.

*Briefly describe **one** chemical test to differentiate compound P and butene.*

.....

[2 markah / 2 marks]

- (d) (i) Namakan tindak balas Y.

Name reaction Y.

.....

[1 markah / 1 mark]

- (ii) Tulis satu persamaan kimia yang seimbang bagi tindak balas Y.

Write a balanced chemical reaction for reaction Y.

.....

[1 markah / 1 mark]

- (e) (i) Namakan sebatian R berdasarkan penamaan IUPAC.

Name compound R according to IUPAC nomenclature.

.....

[1 markah / 1 mark]

- (ii) Jadual 2 menunjukkan bau haruman bagi sebatian karbon yang berbeza.

Table 2 shows the scents of different carbon compounds.

Jenis sebatian karbon <i>Type of carbon compounds</i>	Bau haruman <i>Scent</i>
Butil metanoat <i>Butyl methanoate</i>	Plum <i>Plum</i>
Metil butanoat <i>Methyl butanoate</i>	Epal <i>Apple</i>
Pentil butirrat <i>Pentyl butyrate</i>	Aprikot <i>Apricot</i>
2-metilpropil metanoat <i>2-methylpropyl methanoate</i>	Raspberi <i>Raspberry</i>

Jadual 2 / Table 2

Berdasarkan Jadual 8, huraikan secara ringkas bagaimana sebatian R boleh digunakan sebagai bahan mentah untuk menghasilkan suatu pewangi dalam bahan kosmetik. Nyatakan bau haruman bagi hasil tindak balas yang terbentuk.

Based on Table 8, briefly explain how compound R can be used as raw material to produce a fragrance in cosmetic products. State the scent of the product formed.

.....

.....

[2 markah / 2 marks]

BAHAGIAN B

Section B

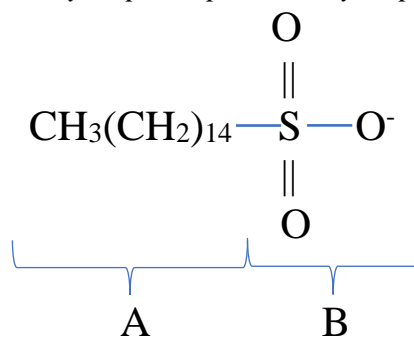
[20 markah]

[20 marks]

Jawab mana-mana **satu** soalan dalam bahagian ini.

Answer any **one** of the questions in this section.

9. (a) (i) Rajah 8.1 menunjukkan formula struktur bagi anion molekul detergen. Struktur ini mengandungi bahagian hidrofilik dan hidrofobik. *Diagram 8.1 shows the structural formula of the anion of detergent molecule. The structure contains hydrophilic part and hydrophobic part.*



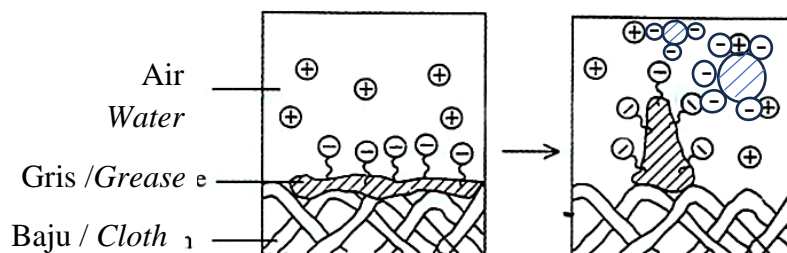
Rajah 8.1 / Diagram 8.1

Berdasarkan rajah 8.1, tentukan bahagian A dan B.

Based on diagram 8.1, identify part A and B

[2 markah / 2 marks]

- (ii) Rajah 8.2 menunjukkan sebahagian tindakan pencucian anion detergen terhadap kotoran bergris pada baju. *Diagram 8.2 shows part of the washing action of anion of detergent towards the grease stain on cloth.*



Rajah 8.2
Diagram 8.2

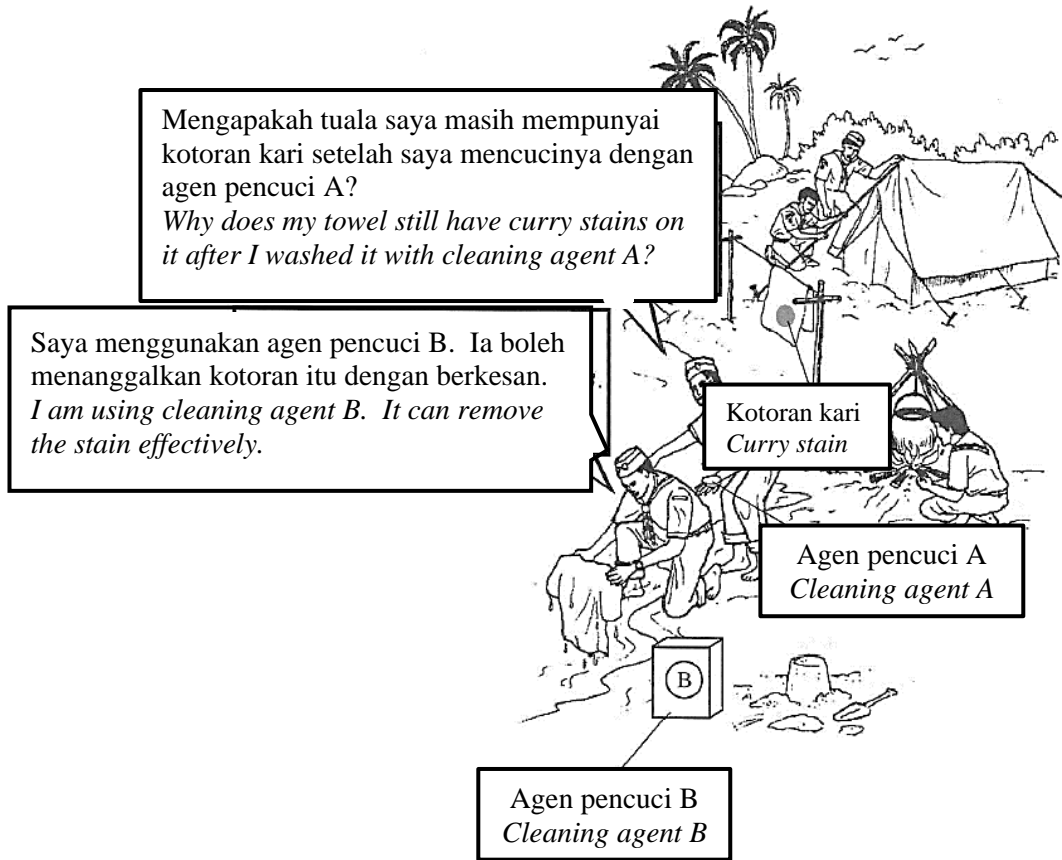
Berdasarkan rajah 8.2, jelaskan tindakan pencucian anion detergen terhadap kesan gris pada baju.

Based on Diagram 8.2, explain the washing action of detergent anion on greasy stain on cloth.

[5 markah / 5 marks]

- (iii) Rajah 8.3 menunjukkan sekumpulan pengakap sedang mendirikan khemah di tepi pantai.

Diagram 8.3 shows a group of scouts setting up a tent by the beach.



Rajah 8.3
 Diagram 8.3

Berdasarkan Rajah 8.3, cadangkan agen pencuci A dan B. Jelaskan perbezaan dalam pemerhatian.

Based on Diagram 8.3, suggest cleaning agent A and B. Explain the difference in observation.

[5 markah / 5 marks]

- (b) Rajah 8.4 menunjukkan pembuangan air sisa dari kilang ke dalam sungai.
Diagram 8.4 shows the wastewater disposal from a factory into river.



Rajah 8.4
 Diagram 8.4

Teknologi hijau digunakan untuk merawat air sisa dari kilang supaya masalah pencemaran sumber air dapat dielakkan.

Apakah maksud teknologi hijau? Nyatakan dua kesan pembuangan air sisa tanpa dirawat ke dalam sungai terhadap persekitaran.

Green technology is applied to treat the wastewater from industries so that water pollution can be prevented.

What is the meaning of green technology? State two effects of untreated wastewater disposal into the river toward the environment.

[3 markah / 3 marks]

- (c) Rajah 8.5 menunjukkan seorang kanak-kanak yang berumur 2 tahun yang sakit demam.
Diagram 8.5 shows a child at age of 2 years having fever.



Saya hanya ada aspirin di rumah.
 Tetapi doktor kata ubat ini tidak
 sesuai bagi budak.
*I only have aspirin at home. But
 doctor says it is not suitable for
 children.*

Rajah 8.5
 Diagram 8.5

- (i) Berdasarkan Rajah 8.5, jelaskan mengapa aspirin tidak sesuai diberikan kepada kanak-kanak. Cadangkan ubat moden yang boleh digunakan untuk merawat budak itu.

*Based on Diagram 8.5, explain why aspirin is not suitable for children.
 Suggest modern medicine that can be used to treat the child.*

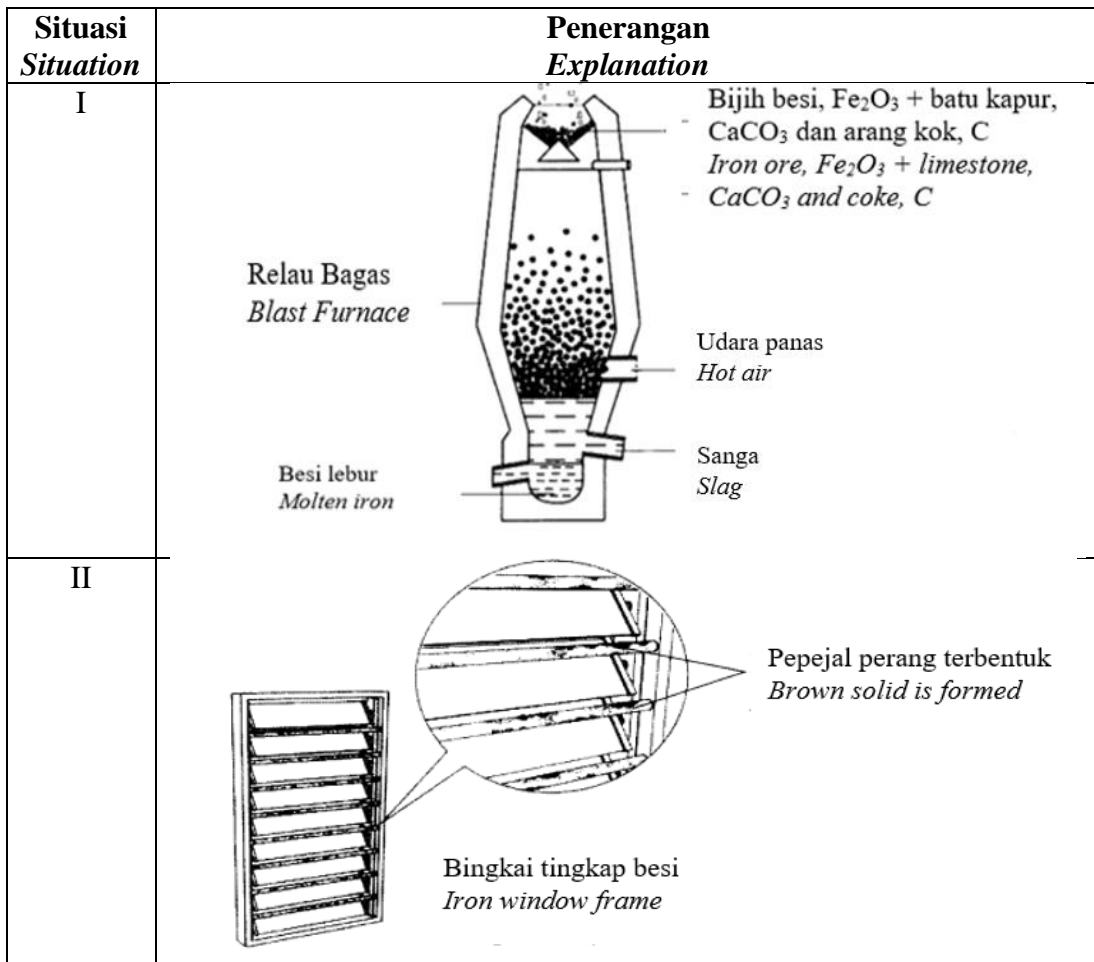
[3 markah / 3 marks]

- (ii) Ubat tradisional seperti teh halia madu boleh digunakan untuk merawat demam. Namun, ia tidak digunakan secara meluas kebelakangan ini berbanding dengan ubat moden. Wajarkan kegunaan ubat tradisional.

Traditional medicines such as honey ginger tea can be used to treat fever. However, it is not widely used nowadays compared to modern medicines. Justify the uses of traditional medicines.

[2 markah / 2 marks]

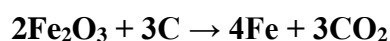
10. Rajah 9.1 menunjukkan proses yang berlaku bagi dua situasi yang berbeza.
 Diagram 9.1 shows the process that occurs for two different situations.



Rajah 9.1
 Diagram 9.1

- (a) Berdasarkan Situasi I, penghasilan besi dalam industri melalui tindak balas antara bijih besi, Fe_2O_3 , dan arang kok, C ditunjukkan dalam persamaan kimia di bawah.

Based on Situation I, the production of iron in industry through the reaction between iron ore, Fe_2O_3 and coke, C is shown in chemical equation below.



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

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

- (i) Tentukan nombor pengoksidaan bagi besi dalam sebatian Fe_2O_3 dan nyatakan nama sebatian itu mengikut penamaan IUPAC.

Determine the oxidation number of iron in compound Fe_2O_3 and state the name of the compound according to the IUPAC nomenclature.

[2 markah /2 marks]

- (ii) Jika kilang tersebut mampu memproses 360 kg bijih besi sehari dengan menggunakan karbon yang berlebihan, hitung jisim besi yang dihasilkan.

If the factory is able to process 360kg iron ore a day by using excess carbon, calculate the mass of the iron produced.

[4 markah /4 marks]

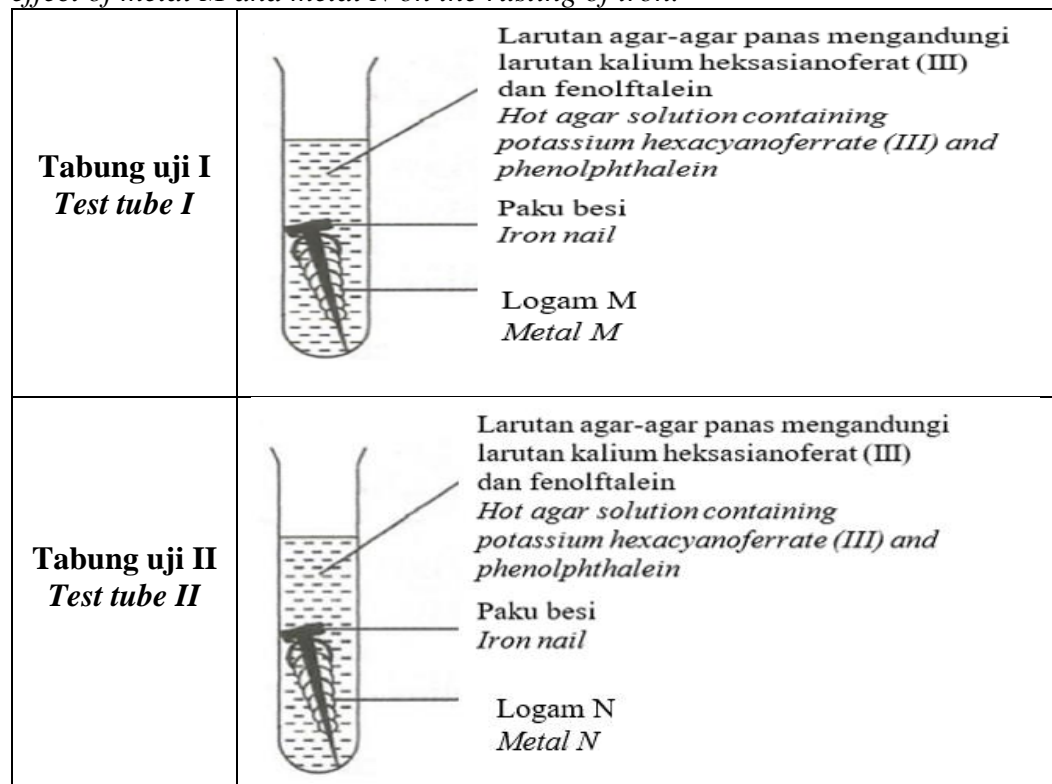
- (iii) Berdasarkan Situasi II, terangkan pembentukan pepejal perang dan cadangkan satu cara untuk menghalang pembentukan tersebut.

Based on Situation II, explain formation of brown solid and suggest one way to prevent the formation.

[6 markah /6 marks]

- (b) Rajah 9.2 menunjukkan susunan radas eksperimen untuk mengkaji kesan logam M dan logam N ke atas pengurangan besi.

Diagram 9.2 shows the apparatus set-up of an experiment to investigate the effect of metal M and metal N on the rusting of iron.



Rajah 9.2
Diagram 9.2

Jadual 3 menunjukkan nilai keupayaan elektrod piawai, E° bagi logam M, logam N dan besi.

Table 3 shows the standard electrode potential, E° for metal M, metal N and iron.

Tindak balas setengah <i>Half-cell equation</i>	Nilai E° (V) <i>E° Value (V)</i>
$M^{2+} + 2e^- \rightleftharpoons M$	-0.76
$Fe^{2+} + 2e^- \rightleftharpoons Fe$	-0.44
$N^{2+} + 2e^- \rightleftharpoons N$	+0.34

Jadual 3
Table 3


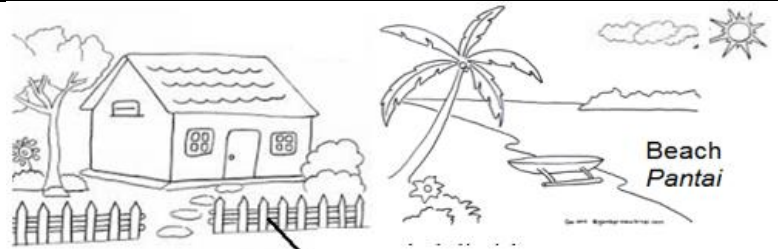
Bandingkan pemerhatian di tabung uji I dan tabung uji II dan jelaskan perbezaan pemerhatian antara kedua-dua tabung uji.

Compare the observations in test tube I and test tube II and explain the differences in the observations between both test tubes.

[6 markah /6 marks]

- (c) Rajah 9.3 menunjukkan dua rumah dengan pagar besi yang dibina di dua kawasan yang berlainan.

Diagram 9.3 shows two houses with iron fences built at two different areas.

Kawasan <i>Area</i>	Jenis pagar <i>Type of fences</i>
Luar bandar <i>Rural area</i>	 <p>Pagar besi <i>Iron fence</i></p>
Pantai <i>Coastal</i>	 <p>Pagar besi <i>Iron fence</i></p> <p>Beach <i>Pantai</i></p>

Rajah 9.3/Diagram 9.3

Pada pandangan anda, kawasan manakah pagar besi akan berkarat lebih cepat? Berikan sebab untuk jawapan anda itu.

In our opinion, iron fence at which area rusted faster? Give reasons for your answer.

[2 markah /2 marks]

BAHAGIAN C**Section C****[20 markah]****[20 marks]**

Jawab soalan dalam bahagian ini.

Answer the question in this section.

11. (a) Satu tindak balas kimia cepat ialah proses menukarkan bahan tindak balas kepada hasil tindak balas yang lengkap dalam masa singkat manakala tindak balas perlahan mengambil masa yang panjang untuk lengkap.

Nyatakan definisi kadar tindak balas. Lakarkan graf perubahan kuantiti bahan tindak balas melawan masa bagi satu tindak balas cepat kemudian labelkannya sebagai "I". Pada paksi yang sama lakarkan satu lagi graf bagi tindak balas perlahan dan labelkannya sebagai "II".

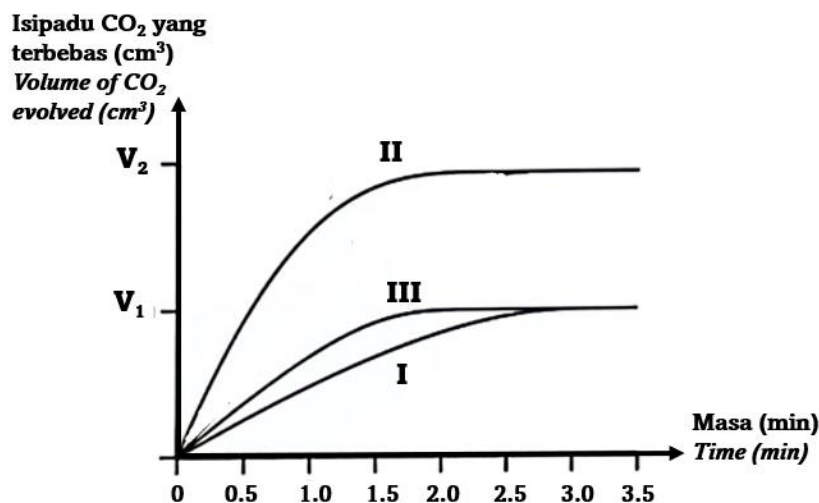
A fast chemical reaction is a process of converting reactants into products that completes in a short time while slow reaction takes long to complete.

State the definition of rate of reaction. Sketch a graph of quantity of reactants against time for a fast reaction then label it as "I". On the same axis, sketch another graph for slow reaction and then label it using "II".

[3 markah/3 marks]

- (b) Dalam tiga eksperimen yang berasingan, asid nitrik ditambahkan ke dalam ketulan batu marmar berlebihan. Rajah 10.1 menunjukkan isi padu gas karbon dioksida terbebas dan masa yang diambil untuk isi padu gas mencapai maksimum dalam tiga eksperimen yang berasingan. Dalam ketiga-tiga eksperimen itu, isi padu asid nitrik yang digunakan adalah sama, manakala kepekatan atau suhu, atau kedua-dua kepekatan dan suhu asid nitrik diubah.

In three separate experiments, nitric acid is added to excess marble chips. Diagram 10.1 shows the volume of carbon dioxide gas evolved and the time taken for maximum volume of gas evolved in three separate experiments. In all three experiments, the volume of nitric acid used is the same. However, the concentration, or temperature, or both concentration and temperature of nitric acid are changed.



Rajah 10.1/ Diagram 10.1

- (i) Dalam Eksperimen I dan III, 100 cm^3 asid nitrik 0.5 mol dm^{-3} ditambahkan ke dalam batu marmar.

Apakah faktor yang dimanipulasikan dalam kedua-dua eksperimen ini? Tuliskan persamaan kimia yang seimbang bagi Eksperimen I.

Hitung isipadu gas, V_1 .

[Isipadu molar gas pada keadaan bilik = $24.0 \text{ dm}^3 \text{ mol}^{-1}$]

In Experiment I and III, 100 cm^3 of nitric acid 0.5 mol dm^{-3} is added to marble chips.

What is the factor being manipulated in these two experiments?

Write a balanced chemical equation for the reaction in Experiment I.

Calculate the volume of gas, V_1 .

[Molar volume of gas at room condition = $24.0 \text{ dm}^3 \text{ mol}^{-1}$]

[5 markah /5 marks]

- (ii) Berdasarkan Rajah 10.1, huraikan bagaimana mendapatkan lenkungan II daripada eksperimen.

Terangkan mengapa terdapat perbezaan kadar tindak awal antara Eksperimen I dan Eksperimen II. Terangkan jawapan anda dengan merujuk teori perlanggaran.

Based on Diagram 10.1, describe how to obtain curve II from the experiment.

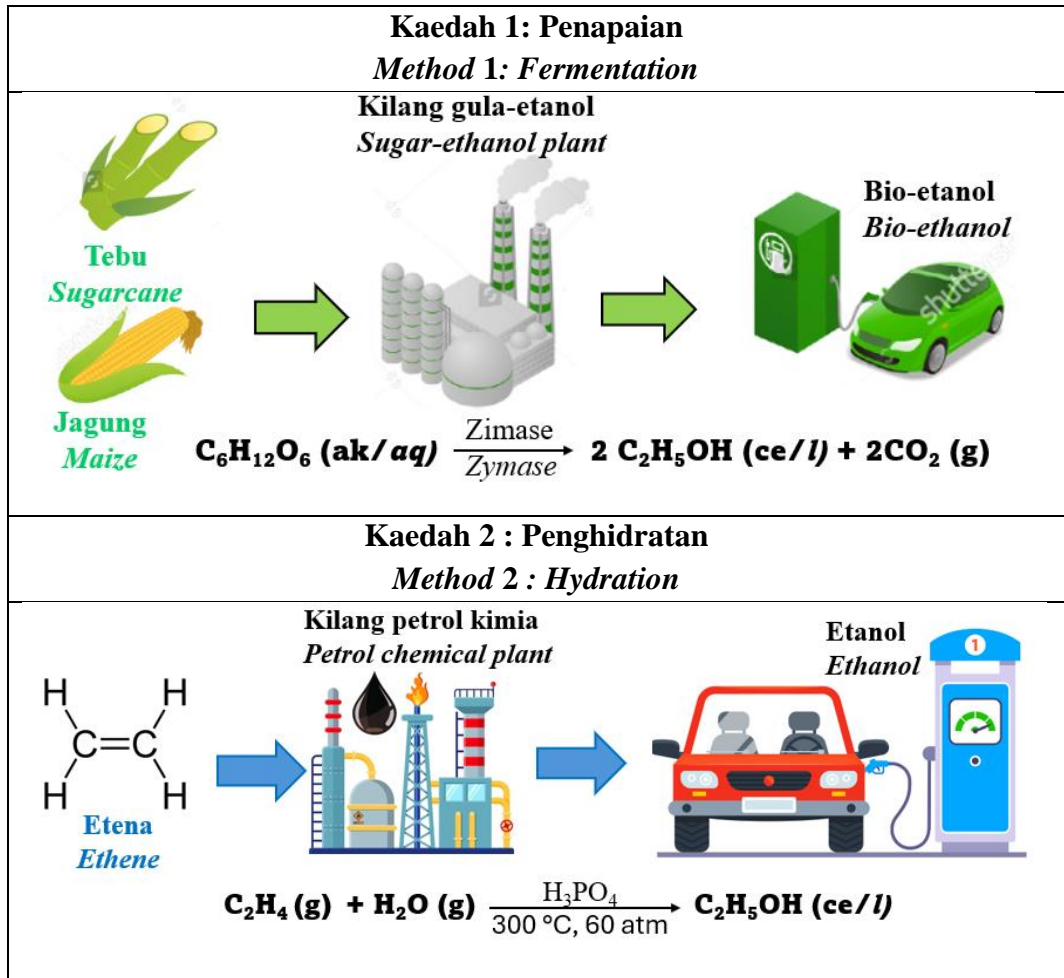
Explain why there are differences in the initial rate of reaction between

Experiment I and Experiment II. Explain your answer using collision theory.

[4 markah /4 marks]

- (c) Rajah 10.2 menunjukkan dua kaedah yang digunakan untuk menghasilkan bahan api etanol untuk kegunaan kenderaan secara besar-besaran.

Diagram 10.2 shows two methods that can be used in large scale production of ethanol fuel for vehicle use.



Rajah 10.2

Diagram 10.2

Anda ditugaskan untuk menilai kaedah yang lebih sesuai untuk menghasilkan etanol sebagai bahan api.

Nyatakan pilihan anda berdasarkan Rajah 10.2 dan wajarkan jawapan anda.

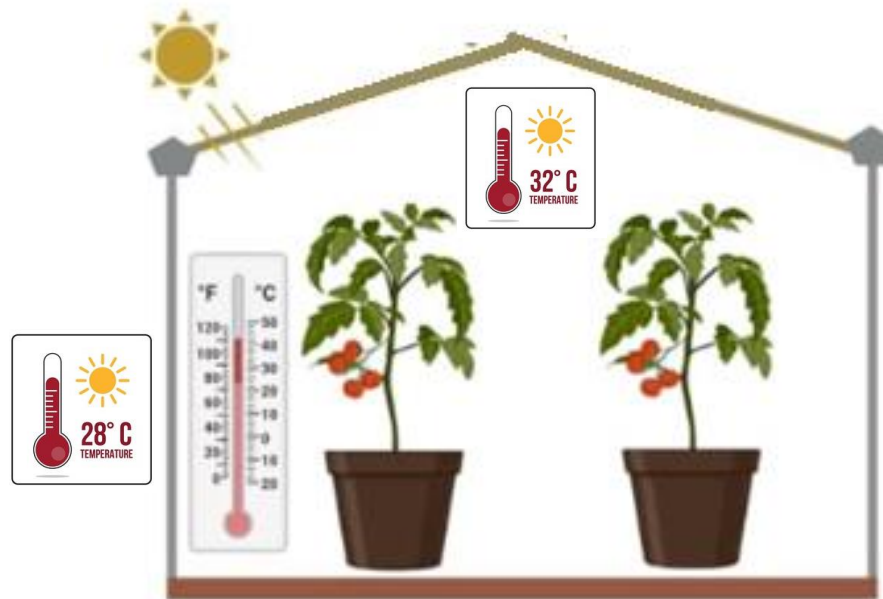
You are assigned to evaluate which method is more suitable to produce ethanol as fuel.

State your choice based on Diagram 10.2 and justify your answer.

[2 markah / 2 marks]

- (d) Rajah 10.3 menunjukkan pokok tomat ditanam dalam rumah hijau untuk melindungi tanamannya daripada serangga perosak. Petani mengalami masalah semua buah tomatnya masak secara serentak pada musim panas. Masalah ini timbul apabila buah tomat hijau yang belum matang dirangsang oleh gas etilena, C_2H_4 yang terbebas daripada buah yang sudah matang.

Diagram 10.3 shows the tomato planted in greenhouse to protect the plants from pests. The farmer is facing a problem where all the tomatoes ripen simultaneously during summer. This problem arises when premature green tomatoes are stimulated by the ethylene gas, C_2H_4 releases from mature fruits.



Rajah 10.3 /Diagram 10.3

Dengan menggunakan pengetahuan anda dalam kimia, cadangkan dua cara mengatasi masalah tersebut supaya petani dapat menuai buah tomat secara berkala. Terangkan jawapan anda.

By using your knowledge in chemistry, suggest two solutions to overcome the problem so that the farmer can harvest the tomato periodically. Explain your answer.

[6 markah /6 marks]

KERTAS PEPERIKSAAN TAMAT
END OF QUESTION PAPER

SKEMA JAWAPAN / PEMARKAHAN

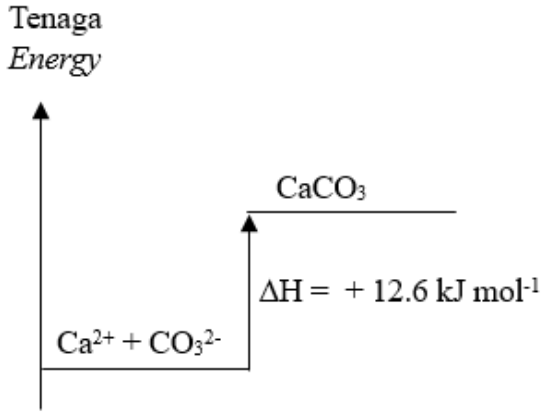
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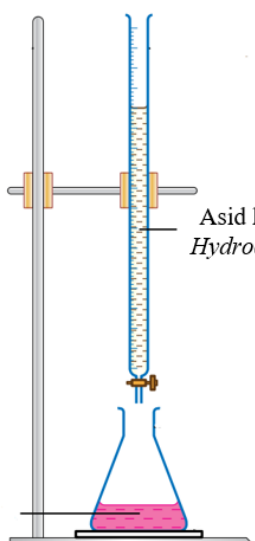
SET 2

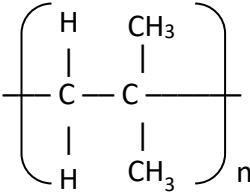
Soalan Question			Jawapan Answer	Markah Marks	
				Sub	Total
1	(a)	(i)	Campuran dua atau lebih unsur yang mana unsur yang utama ialah logam. <i>Mixture of two or more elements where the main element is a metal.</i>	1	1
	(b)	(i)	Logam tulen / <i>pure metal</i> : kuprum / <i>copper</i> Logam asing / <i>foreign metal</i> : Zink / <i>Zinc</i> stanum / <i>tin</i>	1 1	4
		(ii)	<ul style="list-style-type: none"> Atom-atom asing mempunyai saiz yang berlainan daripada atom logam tulen. <i>Foreign atoms are different in size compared to the atoms in pure metal.</i> Susunan teratur atom logam tulen terganggu // lapisan atom di dalam aloi sukar menggelongsor di atas satu sama lain apabila dikenakan daya. <i>The foreign atoms are different in size compared to the atoms in pure metal.</i> Susunan teratur atom logam tulen akan terganggu. // lapisan atom di dalam aloi sukar menggelongsor di atas satu sama lain apabila dikenakan daya. <i>The orderly arrangement of atoms in a pure metal is disrupted //// This makes it difficult for the layers of atoms in an alloy are difficult to slide over each other when force is applied.</i> 	1 1	
			Jumlah / Total		
2.	(a)	(i)	Takat lebur ialah suhu malar apabila sesuatu bahan bertukar daripada keadaan pepejal menjadi cecair pada tekanan tertentu. <i>Melting point is the constant temperature when a substance changes from solid state to become liquid at a specific pressure.</i>	1	1
		(ii)	Kovalen, <i>Covalent</i> Naftalena / <i>Naphthalene</i>	1 1	2
	(b)	(i)	Ikatan hydrogen <i>Hydrogen bond</i>	1	1

Soalan Question			Jawapan Answer	Markah Marks	
				Sub	Total
		(ii)	Ketumpatan ais lebih rendah daripada air <i>Density of ice is lower than water</i>	1	1
			Jumlah / Total		5
3	(a)		$4 \text{ Fe (p)} + 3 \text{ O}_2(\text{g}) \rightarrow 2 \text{ Fe}_2\text{O}_3(\text{p})$ $4 \text{ Fe (s)} + 3 \text{ O}_2(\text{g}) \rightarrow 2 \text{ Fe}_2\text{O}_3(\text{s})$	1	1
	(b)		1. Nama bahan tindak balas dan hasil tindak balas dan keadaan fizikalnya <i>Names of reactants and products and its state of matter</i> 2. Mol bahan tindak balas dan hasil tindak balas <i>Moles of reactants and product</i> 4 mol pepejal besi bertindak balas dengan 3 mol gas oksigen menghasilkan 2 mol pepejal besi(III) oksida <i>4 moles of solid iron reacts with 3 moles of oxygen gas produces 2 moles of solid iron(III) oxide</i>	1 1	2
	(c)		Ion	1	1
	(d)		Fe^{3+}	1	1
	(e)		$2(56)+3(16)=160$	1	1
			Jumlah / Total		6
4	(a)	(i)	Atom mempunyai 3 petala berisi elektron. <i>Atoms have 3 shells filled with electrons.</i>	1	1
		(ii)	Atom mencapai susunan elektron oktet yang stabil <i>Atom has achieved stable octet electron arrangement</i>	1	1
	(b)	(i)	$\text{Cl}_2 + \text{H}_2\text{O} \rightleftharpoons \text{HCl} + \text{HOCl}$	1+1	2
		(ii)	Bilangan mol $\text{HOCl} = \frac{(0.000\ 04)(2\ 500\ 000)}{1000}$ <i>Number of moles</i> $= 100 \text{ mol}$ $\text{HOCl} : \text{Cl}_2$ 100 mol HOCl : 100 mol Cl_2	1 1	3

Soalan Question			Jawapan Answer	Markah Marks	
				Sub	Total
			Jisim / <i>Mass</i> $\text{Cl}_2 = 100 \times [1+16+35.5]$ $= 52\,500 \text{ g} / 52.5 \text{ kg}$	1	
			Jumlah / Total		7
5	(a)	(i)	Monomer <i>Monomer</i>	1	1
		(ii)	1. Termoplastik <i>Thermoplastic</i> 2. tiada rangkai silang antara rantai polimernya <i>there is no cross-linking between the polymer chains</i>	1	1
		(iii)	1. Wajar 2. Plastik tidak mudah terurai secara semulajadi // <i>Plastic is not easily decomposed naturally //</i> <i>biodegradable</i> 2. Plastik mengurangkan kesuburan tanah <i>Plastic reduces the fertility of soil</i> 3. Plastik menyekat aliran air // longkang tersumbat <i>Plastic blocks the flow of water // clogged drains</i> 4. Pembakaran plastik membebaskan gas beracun <i>Burning of plastic produces poisonous gas</i> (Mana-mana dua / <i>any two</i>)	1 1+1	3
	(b)	(i)	$\begin{array}{ccccccccccc} \sim & \text{CH}_2 & - & \text{C} & - & \text{CH}_3 & - & \text{CH}_2 & - & \text{CH}_2 & - & \text{C} & - & \text{CH} & - & \text{CH}_2 & \sim \\ & & & & & & & & & & & & & & & \\ & & & \text{S} & & \text{S} & & & & & & \text{S} & & \text{S} & & \\ & & & & & & & & & & & & & & & \\ \sim & \text{CH}_2 & - & \text{C} & - & \text{CH}_3 & - & \text{CH}_2 & - & \text{CH}_2 & - & \text{C} & - & \text{CH} & - & \text{CH}_2 & \sim \end{array}$	1	1
		(ii)	1. Lebih tahan pengoksidaan <i>More resistant to oxidation</i> 2. Lebih kenyal dan keras <i>More elastic and harder</i> 3. Lebih tahan haba yang tinggi <i>More resistant to heat</i> (Mana-mana dua / <i>any two</i>)	1 1	2
			Jumlah / Total		8
6	(a)	(i)	Natrium karbonat // kalium karbonat // ammonium karbonat // $\text{Na}_2\text{CO}_3 // \text{K}_2\text{CO}_3 // (\text{NH}_4)_2\text{CO}_3$ <i>Sodium carbonate // potassium carbonate // ammonium carbonate</i>	1	1

Soalan Question		Jawapan Answer	Markah Marks	
			Sub	Total
(b)	(i)	1. Melukis bentuk aras tenaga bagi tindak balas endotermik Draw the energy level for endothermic reaction 2. Formula bahan, hasil tindak balas dengan nilai ΔH Chemical formula for reactants and products, ΔH value 	1	2
	(ii)	Jumlah kandungan tenaga bahan tindak balas lebih rendah berbanding jumlah kandungan hasil tindak balas // Suhu persekitaran menurun // Haba diserap semasa pemendakan kalsium karbonat <i>Total energy content of reactants is lower than total energy content of products // The temperature of the surrounding drops // Heat is absorbed during precipitation of calcium carbonate</i>	1	1
	(iii)	1. Bilangan mol kalsium karbonat <i>Number of mol of calcium carbonate</i> 2. Nilai perubahan haba dengan unit yang betul <i>Heat change value with correct unit</i> Bilangan mol $\text{CaCO}_3 = \frac{24}{100} // 0.24$ <i>Number of mol of CaCO_3</i> Perubahan haba = $12.6 \times 0.24 \text{ kJ} // 12600 \times 0.24 \text{ J}$ // <i>Heat change</i> $3.024 \text{ kJ} // 3024 \text{ J}$	1	2
(c)		P1. Endotermik <i>Endothermic</i> P2. Peluh menyerap haba daripada kulit	1	3

Soalan Question		Jawapan Answer	Markah Marks	
			Sub	Total
		Sweat absorb heat from the skin P3. semasa peluh tersejat as sweat evaporates	1	
		Jumlah / Total		9
7	(a)	Larutan piawai ialah larutan yang kepekatannya diketahui dengan tepat. <i>Standard solution is a solution in which its concentration is accurately known.</i>	1	1
	(b)	Bilangan mol sodium carbonate / <i>Number of moles sodium carbonate</i> Jisim sodium carbonate / <i>mass of sodium carbonate</i> Bilangan mol / $= \frac{0.05 \times 250}{1000} = 0.0125 \text{ mol}$ <i>number of moles</i> Mass = 0.0125 X 106 = 1.33 g	1 1	2
	(c)	<ul style="list-style-type: none"> Gambar rajah berfungsi / <i>Functioning diagram</i> Dilabel dengan betul / <i>labelled</i> <div style="text-align: center;">  </div>	1 1	2
	(d)	X = Kuprum (II) sulfat / CuSO_4 / <i>Copper (II) sulphate</i> Mendakan hijau = Kuprum (II) karbonat / CuCO_3 / <i>Copper (II) Carbonate</i>	1 1	2
	(e)	<ul style="list-style-type: none"> tidak sesuai natrium hidroksida, NaOH bersifat higroskopik // kebolehan menyerap air atau lembapan di dalam udara. // Natrium hidroksida, NaOH menyerap gas karbon dioksida di dalam udara untuk membentuk natrium karbonat, Na_2CO_3. Jisim NaOH tidak dapat ditimbang dengan tepat. 	1 1 1	3

Soalan Question		Jawapan Answer	Markah Marks	
			Sub	Total
		<ul style="list-style-type: none"> not suitable sodium hydroxide, NaOH is hygroscopic // absorbs water or moisture in the air // Sodium hydroxide, NaOH also absorbs carbon dioxide gas, CO₂ in the air to form sodium carbonate, Na₂CO₃. difficult to determine the exact mass of sodium hydroxide, NaOH 		
Jumlah / Total				10
8	(a)	Molekul yang mempunyai formula molekul yang sama tetapi formula struktur yang berbeza <i>Molecules that have the same molecular formula but different structural formulae</i>	1	1
	(b)		1	1
	(c)	(i) Nikel / Platinum sebagai mangkin dan suhu 180°C <i>Nickel / Platinum as catalyst and temperature of 180°C</i>	1	1
		(ii) Alirkan gas ke dalam air Br ₂ / larutan KMnO ₄ berasid / larutan K ₂ Cr ₂ O ₇ <i>Flow the gas into Br₂ water / acidified KMnO₄ solution / acidified K₂Cr₂O₇</i> Dalam sebatian P, tiada perubahan Dalam butena, larutan perang dinyahwarnakan / larutan ungu dinyahwarnakan / larutan jingga menjadi hijau <i>In compound P, no changes</i> <i>In butene, brown solution decolourises / purple solution decolourises / orange solution turns green</i>	1 1	2
	(d)	(i) Pengoksidaan / Penghidroksilan <i>Oxidation / Hydroxylation</i>	1	1
		(ii) C ₄ H ₈ + [O] + H ₂ O → C ₄ H ₈ (OH) ₂	1	1
	(e)	(i) 2-metilpropan-1-ol / 2-metilpropan-2-ol <i>2-methylpropan-1-ol / 2-methylpropan-2-ol</i>	1	1
		(ii) Panaskan sebatian R dengan asid metanoik dan beberapa titik asid sulfurik pekat dengan perlahan sehingga mendidih <i>Heat compound R with methanoic acid and a few drops of concentrated sulphuric acid gently until boil</i> Hasil tindak balas mempunyai bau raspberi <i>The product has a raspberry scent</i>	1 1	2

Soalan Question			Jawapan Answer	Markah Marks	
				Sub	Total
			Jumlah / Total		10
9.	(a)	(i)	Bahagian A: Hidrofobik <i>Part A : Hydrophobic</i> Bahagian B: Hidrofilik <i>Part B : Hydrophilic</i>	1 1	 2
		(ii)	Anion detergen mengurangkan tegangan permukaan air. <i>Detergent anion reduce the surface tension of water.</i> Bahagian hidrofilik anion detergen larut dalam air, bahagian hidrofobik anion detergen larut dalam gris. <i>Hydrophilic part of detergent anion dissolves in water, hydrophobic part of detergent anion dissolves in grease.</i> Pergerakan air semasa gosokan / pengocakan menanggalkan gris daripada permukaan kain. <i>Movement of water during scrubbing / agitation helps to remove the grease from the surface of cloth.</i> Gris dipecahkan kepada titisan kecil. <i>Grease are breaking down into droplets.</i> Titisan gris terampai di dalam air dan membentuk emulsi. <i>The grease droplets suspend in the water and form an emulsion.</i>	1 1 1 1	 5
		(iii)	Agen pencuci A: Sabun <i>Cleaning agent A: soap</i> Agen pencuci B: Detergen <i>Cleaning agent B: detergent</i> Detergen lebih berkesan berbanding sabun. <i>Detergent is more effective than soap</i> Anion sabun bertindak balas dengan ion Ca^{2+} dan Mg^{2+} dalam air laut membentuk kekat. <i>Soap anions react with Ca^{2+} or Mg^{2+} ion in sea water to form scum.</i> Anion detergen tidak membentuk kekat apabila bertindak balas dengan ion Ca^{2+} dan Mg^{2+} <i>Detergent anions does not form scum when react with Ca^{2+} or Mg^{2+} ion in sea water.</i>	1 1 1 1	 5
	(b)		Teknologi / Aplikasi yang dibangunkan untuk mengurangkan impak aktiviti manusia terhadap alam sekitar.	1	 3

Soalan Question		Jawapan Answer		Markah Marks	
				Sub	Total
			<p><i>Technology / Application developed to minimise the negative effect of harmful human activities.</i></p> <p>Membunuh hidupan akuatik / hidupan liar // <i>Kill aquatic life / wildlife</i></p> <p>Membunuh tumbuh-tumbuhan // <i>Kill plants</i></p> <p>Menyebabkan eutrofikasi <i>Cause eutrophication</i></p>	1+1	
	(c)	(i)	<p>Aspirin adalah bersifat asid. <i>Aspirin is acidic in nature.</i></p> <p>Aspirin akan menyebabkan ulser perut / pendarahan dalaman <i>Aspirin can cause stomach ulcer / internal bleeding</i></p> <p>Parasetamol <i>Paracetamol</i></p>	1 1 1	3
		(ii)	<p>Wajar digunakan <i>Can use</i></p> <p>Tidak guna bahan kimia tambahan // tiada kesan sampingan // boleh didapati daripada bahan semula jadi // senang diperolehi // lebih murah / senang disediakan <i>Does not used additional chemical // no side effects // obtained from natural substances // easily obtained // cheaper // easy to prepare</i></p> <p>Atau <i>Or</i></p> <p>Tidak wajar <i>Cannot use</i></p> <p>Lebih panjang masa untuk berkesan // tidak tahu dos yang betul // tidak diuji secara klinikal <i>Longer time to take effect // correct dosage is unknown // not clinically tested</i></p>	1 1 1 1	2
			Jumlah / Total		20
10.	(a)	(i)	<p>Nombor pengoksidaan : +3 <i>Oxidation number: +3</i></p> <p>Nama IUPAC: Ferum (III) oksida <i>IUPAC name: Iron(III) oxide</i></p>	1 1	2
		(ii)	<p>1. Jisim molar <i>Molar mass=2(56) + 3(16)= 160</i></p> <p>2. Bilangan mol Fe₂O₃</p>	1	4

Soalan Question		Jawapan Answer	Markah Marks	
			Sub	Total
		<p>$No\ of\ mole\ Fe_2O_3 = \frac{360000}{160} = 2250\ mol$</p> <p>3. Nisbah mol <i>Mole ratio</i> 2 mol of Fe_2O_3: 4 mol of Fe 2250 mol of Fe_2O_3 : 4500 mol Fe</p> <p>4. Jisim Fe <i>Mass of Fe = 4500 x 56 g // 252000 g // 252 k</i></p>	1 1 1	
	(iii)	<p>1. Kehadiran air dan oksigen <i>Water and oxygen is present</i></p> <p>2. Besi dioksidakan kepada Fe^{2+} <i>Iron oxidised to Fe^{2+} // $Fe \rightarrow Fe^{2+} + 2e$</i></p> <p>3. Oksigen diturunkan kepada OH^- <i>Oxygen is reduced to OH^- // $2H_2O + O_2 + 4e \rightarrow 4OH^-$</i></p> <p>4. Ion Ferum (II) bertindak balas dengan ion hidroksida untuk membentuk ferum (II) hidroksida. <i>Iron (II) ion, Fe^{2+} and hydroxide ion, OH^- react to form iron (II) hydroxide // $Fe(OH)_2 / Fe^{2+} + 2OH^- \rightarrow Fe(OH)_2$</i></p> <p>5. $Fe(OH)_2$ mengalami pengoksidaan yang berterusan. <i>$Fe(OH)_2$ undergoes further oxidation.// $Fe(OH)_2 \rightarrow Fe_2O_3 \cdot xH_2O$</i></p> <p>6. Menggunakan cat atau gris. <i>Apply spray paint//any grease</i></p>	1 1 1 1 1	6
	(b)	<p>1. Tabung uji I: Warna merah jambu terbentuk.</p> <p>2. Nilai E° logam M lebih negatif daripada nilai E° besi.</p> <p>3. Logam M di tabung uji I lebih cenderung membebaskan elektron untuk membentuk M^{2+} daripada besi.</p> <p>4. Tabung uji II: Tompok biru tua terbentuk.</p> <p>5. Nilai E° besi lebih negatif daripada nilai E° logam N.</p> <p>6. Besi di tabung uji II lebih cenderung membebaskan elektron untuk membentuk Fe^{2+} daripada Logam N.</p> <p><i>1. Test tube I: Pink colour is formed.</i></p> <p><i>2. E° value of metal M is more negative than E° value of iron.</i></p> <p><i>3. Metal M in test tube I has higher tendency to release electron to form M^{2+} than iron.</i></p> <p><i>4. Test tube II: Dark blue spots are formed.</i></p> <p><i>5. E° value of iron is more negative than E° of metal N.</i></p> <p><i>6. Iron in test tube II has a higher tendency to release electron to form Fe^{2+} than metal N.</i></p>	1 1 1 1 1 1	6
	(c)	<p>1. Pengaratan pagar besi berlaku lebih cepat di kawasan pantai.</p>	1 1	2

Soalan Question		Jawapan Answer		Markah Marks	
				Sub	Total
		<p><i>Ethanol can be produced in large scale because glucose is a renewable resource / ethanol produced is a renewable fuel/ easily obtained / a natural substance / an organic substance</i></p> <p>Atau Or</p> <p>1. Penghidratan <i>Hydration</i></p> <p>2. Etanol dapat dihasilkan dalam masa yang singkat kerana kehadiran mangkin / suhu bahan tindak balas yang tinggi / gas dimampatkan di bawah tekanan tinggi. <i>Ethanol can be produced in shorter time because the presence of catalyst / high reacting temperature/ gaseous reactants are compressed under high pressure.</i></p>			
	(d)	<p>Cadangan Suggestion</p> <p>P1 Pasang tingkap ventilasi <i>install ventilation window</i></p> <p>P4 Menyiram lebih kerap menggunakan air// tanam dalam batas <i>Watering the plant more frequently // plant the tomato in soil bed</i></p>	<p>Penerangan Explanation</p> <p>P2 Untuk memperbaiki pengudaraan <i>Improve the air ventilation</i></p> <p>P3 merendahkan kepekatan gas etelina, merendahkan kadar tindak balas. <i>Lower the concentration of ethylene gas and lower the rate of reaction.</i></p> <p>P5 Untuk merendahkan suhu dalam rumah hijau. <i>To lower the temperature in green house.</i></p> <p>P6 Kadar resapan gas etilina direndahkan</p>	1+1+1	6
				1+1+1	

Soalan Question		Jawapan Answer		Markah Marks	
				Sub	Total
			<p><i>Lower the rate of diffusion of ethylene gas.</i></p>	1+1+1	
		<p>P7 Mengantung botol yang mengandungi larutan kalium manganat (VII) berasid pada pokok tomat.</p> <p><i>Hang a bottle of acidified potassium manganate (VII) solution onto the tomato tree.</i></p>	<p>P8 Kalium manganat(VII) berasid mengoksidakan etena kepada Etan-1,2-diol.</p> <p><i>Acidified potassium manganate (VII) solution oxidised ethylene gas to ethan-1,2-diol.</i></p> <p>Menyerap/ menyingkirkan gas etilina yang terbebas dari buah matang.</p> <p><i>Absorbs / eliminates ethylene gas releases from mature tomato.</i></p> <p>P9 Buah matang sendiri tanpa dirangsang oleh gas etilina yang meresap daripada buah berhampiran.</p> <p><i>Tomatoes ripen naturally without stimulation of ethylene gas diffused from nearby fruits.</i></p>		
		<p>Mana-mana dua pasangan berikut: <i>Any two pairs of following:</i></p> <ul style="list-style-type: none"> • Cadangan berserta dengan two penerangan <i>Suggestion together with two explanation</i> 		Max 6	
Jumlah / Total					20

LAMPIRAN

(Untuk rujukan guru)

JADUAL SPESIFIKASI UJIAN (JSU) PRAKTIS KIMIA 4541/2: SET 2

Chapter	Sub-chapter	Remembering			Understanding			Applying			Analyzing			Evaluating			Creating			Total
		E	M	H	E	M	H	E	M	H	E	M	H	E	M	H	E	M	H	
1. Introduction to chemistry [F4]	1.1 Development in chemistry field and its importance in daily life																			
	1.2 Scientific investigation in chemistry																			
	1.3 Usage, management and handling of apparatus and materials																			
2. Matter and the Atomic Structure [F4]	2.1 Basic concepts of matter																			
	2.2 The development of the atomic model																			
	2.3 Atomic structure																			
	2.4 Isotopes and its uses																			
3. The Mole Concept, Chemical Formula and Equation [F4]	3.1 Relative atomic mass and relative molecular mass																			
	3.2 Mole concept																			
	3.3 Chemical formula																			
	3.4 Chemical equation	1			2			1	2											6
4. The Periodic Table of Elements [F4]	4.1 The development of The Periodic Table of Elements																			
	4.2 The arrangement in The Periodic Table of Elements																			
	4.3 Elements in Group 18																			
	4.4 Elements in Group 1																			
	4.5 Elements in Group 17																			
	4.6 Elements in Period 3	1			1			1	2	2										7
	4.7 Transition elements																			
5. Chemical Bond [F4]	5.1 Basics of compound formation																			
	5.2 Ionic bond																			
	5.3 Covalent bond																			
	5.4 Hydrogen bond	3			2															5
	5.5 Dative bond																			
	5.6 Metallic bond																			
	5.7 Properties of ionic and covalent compounds																			
11. Thermochemistry [F5]	11.1 Heat change in reactions																			
	11.2 Heat of reaction			1	1			2	2			3								9
	11.3 Application of endothermic and exothermic reactions in daily life																			

Chapter	Sub-chapter	Remembering			Understanding			Applying			Analyzing			Evaluating			Creating			Total
		E	M	H	E	M	H	E	M	H	E	M	H	E	M	H	E	M	H	
12. Polymer Chemistry [F5]	12.1 Polymer	1			1			1				3								6
	12.2 Natural rubber							2												2
	12.3 Synthetic rubber																			
13. Consumer and Industrial Chemistry [F5]	13.1 Oils and fats																			
	13.2 Cleaning agents	2				2	3	3			4	4		2						20
	13.3 Food additives																			
	13.4 Medicines and cosmetics																			
	13.5 Application of nanotechnology in industry																			
	13.6 Application of green technology in industrial waste management																			
Total		14	2	1	11	4	3	13	14	5	9	19	2	7	2	2	0	0	12	120
Ratio of E:M:H		5:03:02																		
Level of Difficulty E : Easy M : Medium H : Hard																				