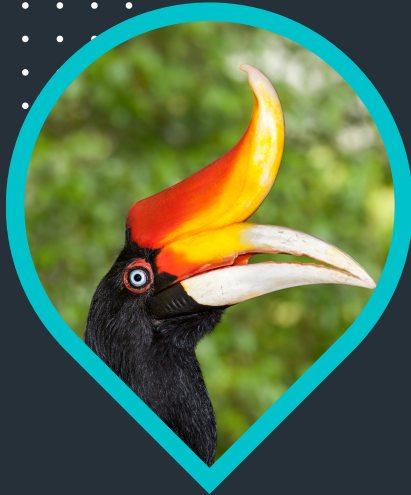




KEMENTERIAN PENDIDIKAN
JABATAN PENDIDIKAN NEGERI SARAWAK



MODUL KENYALANG CEMERLANG SPM 2023

KIMIA
SEKTOR
PEMBELAJARAN

Tinta Bicara
Timbalan Pengarah
Sektor Pembelajaran



KEMENTERIAN PENDIDIKAN
JABATAN PENDIDIKAN NEGERI SARAWAK

Salam Sejahtera,
Salam Menjulung Pendidikan Negeri Sarawak
Salam Malaysia Madani
Fly Kenyalang Fly, Fly High

Terlebih dahulu saya ingin mengucapkan syabas dan tahniah di atas terbitnya Modul Kenyalang Cemerlang SPM 2023 pada tahun ini. Sesungguhnya kerja buat yang dilaksanakan ini bukan hanya dari jabatan ini tetapi semua mereka yang terlibat khususnya guru-guru cemerlang, guru-guru pakar mata pelajaran dan guru-guru kanan mata pelajaran yang bertungkus lumus dalam memastikan Modul Kenyalang Cemerlang SPM 2023 ini disiapkan mengikut kualiti yang ditetapkan.

Jabatan Pendidikan Negeri Sarawak telah mendapat maklum balas yang positif dari kalangan guru dan murid berkenaan Modul Kenyalang Cemerlang SPM 2022. Penggunaan modul tersebut sebagai instrumen persediaan sebelum murid menduduki SPM merupakan matlamat utama jabatan untuk meningkatkan kemajuan murid dan seterusnya meningkatkan peratusan layak sijil SPM yang telah meningkat pada tahun 2021 daripada 88.29% kepada 91.22% pada tahun 2022.

Saya percaya dengan terbitnya modul ini guru-guru dan murid-murid terutamanya calon SPM tahun 2023 dapat memanfaatkan modul ini sebagai modul rujukan dalam menjawab SPM nanti. Jabatan ini juga berharap Modul Kenyalang Cemerlang SPM dapat dikongsi bersama-sama dalam kalangan panitia mata pelajaran di seluruh negara khususnya dalam memahami teknik menjawab soalan pelbagai aras yang dikemukakan. Sebaiknya modul ini dapat dikongsi bersama bagi memastikan modul ini sentiasa meniti dari bibir ke bibir guru-guru di seluruh Malaysia.

Tahniah kepada para pegawai di Sektor Pembelajaran yang sama-sama menyelaras bagi memastikan modul ini dapat disiapkan dalam masa yang ditetapkan. Saya berharap dengan usaha gigih ini akan membuahkan hasil yang lebih baik lagi dalam kita menghitung hari menjelang SPM 2023 nanti.

**Selamat Maju Jaya,
Tingkatkan Prestasi untuk Pendidikan yang
Berkualiti**

Fly Kenyalang Fly, Fly High

Dr. LES ANAK MET
Jabatan Pendidikan Negeri Sarawak



**MODUL KENYALANG CEMERLANG
SPM
TAHUN 2023**

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 2023. Sehubungan dengan itu, pada tahun 2023 ini, Sektor Pembelajaran, Jabatan Pendidikan Negeri Sarawak mengadakan **Program Modul Kenyalang Cemerlang SPM 4.0** untuk membantu guru dan calon SPM menghadapi peperiksaan SPM 2023.

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 2023 di semua sekolah menengah di negeri Sarawak.

Objektif Program

1. Memastikan calon SPM menguasai format baharu Peperiksaan SPM 2023.
2. Memastikan calon SPM mempunyai bahan pembelajaran yang berfokus ke arah peperiksaan SPM.
3. Meningkatkan pencapaian akademik calon SPM 2023.
4. Melonjakkan keputusan SPM 2023 Negeri Sarawak

Senarai Kandungan

Bil.	Perkara	Muka surat
1	Format Kertas Peperiksaan SPM Mulai Tahun 2021	2
2	Latihan - Praktis Kimia 4541/1: Set 1	3 – 20
3	Skema Jawapan/Pemarkahan	21
4	LAMPIRAN: Sampel Jadual Spesifikasi Ujian (JSU) untuk Praktis Kimia 4541/1: Set 1	22 - 23

Senarai Ahli Panel Pembina Modul Kenyalang Cemerlang SPM 4.0

Bil.	Nama Guru	Sekolah	PPD
1.	Francisca Lau Siew Hsia (Ketua)	SMK Methodist	SIBU
2.	Bella Mahony Sie	SMK Luar Bandar Sibul	SIBU
3.	Fun Ngik Ngon	SMK Bandar Sibul	SIBU
4.	Goh Leh Ling	SMK Sacred Heart	SIBU
5.	Catherine Law Fong Fong	SMK Deshon Sibul	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.	Tie Woon Yen	SMK Bandar Bintulu	BINTULU
11.	Law Hui Nong	SMK Tinggi Sarikei	SARIKEI
12.	Victoria Petrus	SMK Tun Abdul Razak	SERIAN
13.	Chien Hui Siong	SMK Tinggi Sarikei	SARIKEI
14.	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) <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 1**

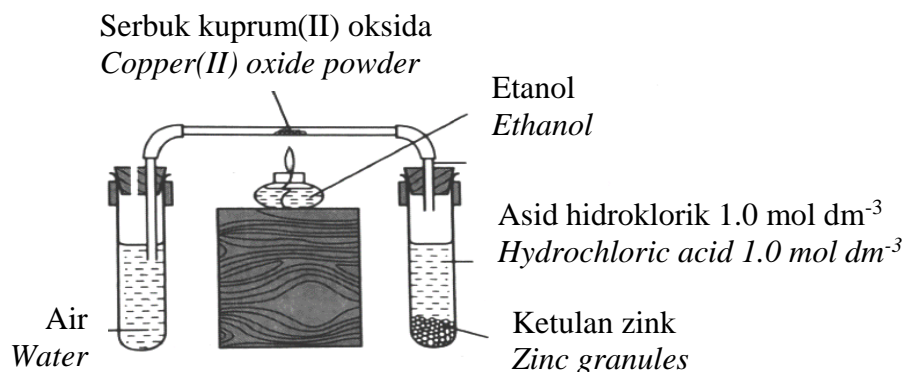
1. Antara bahan berikut, yang manakah terdiri daripada satu jenis atom sahaja?
Which of the following substances is made up of one type of atom only?
- A** Ferum
Iron
- B** Gas nitrogen
Nitrogen gas
- C** Naftalena
Naphthalene
- D** Plumbum(II) bromida
Lead(II) bromide
2. Rajah 1 menunjukkan seorang pesakit yang sedang menjalani rawatan radioterapi bagi membunuh sel kanser.
Diagram 1 shows a patient undergoing a radiotherapy treatment to kill cancer cells.

Rajah 1 / *Diagram 1*

Antara yang berikut, yang manakah digunakan dalam rawatan tersebut?
Which of the following is used in the treatment?

- A** Karbon-14
Carbon-14
- B** Kobalt-60
Cobalt-60
- C** Fosforus-32
Phosphorus-32
- D** Iodin-131
Iodine-131

3. Antara yang berikut, yang manakah menerangkan maksud jisim atom relatif?
 Which of the following explains the meaning of relative atomic mass?
- A** Purata jisim satu atom bagi suatu unsur berbanding dengan $\frac{1}{12}$ kali jisim satu atom karbon-12
 The average mass of one atom of an element compared with $\frac{1}{12}$ times of the mass of a carbon-12 atom
- B** Purata jisim satu molekul bagi suatu bahan berbanding dengan $\frac{1}{12}$ kali jisim satu atom karbon-12
 The average mass of one molecule of a substance compared with $\frac{1}{12}$ times of the mass of a carbon-12 atom
- C** Purata jisim satu atom bagi suatu unsur berbanding dengan 12 kali jisim satu atom karbon-12
 The average mass of one atom of an element compared with 12 times of the mass of a carbon-12 atom
- D** Purata jisim satu molekul bagi suatu unsur berbanding dengan 12 kali jisim satu atom karbon-12
 The average mass of one molecule of an element compared with 12 times of the mass of a carbon-12 atom
4. Rajah 2 menunjukkan susunan alat radas untuk menentukan formula empirik bagi kuprum(II) oksida.
 Diagram 2 shows the apparatus set-up to determine the empirical formula of copper(II) oxide.



Rajah 2 / Diagram 2

Gas hidrogen kering mesti dialirkan semasa proses penyejukan. Mengapakah langkah ini perlu dijalankan?

Dry hydrogen gas must be flowed during the cooling process. Why this step must be carried out?

- A** Untuk menyingkirkan udara daripada tiub pembakaran
 To remove air from the combustion tube
- B** Untuk mengelakkan pengoksidaan kuprum kepada kuprum(II) oksida
 To avoid the oxidation of copper to copper(II) oxide
- C** Untuk memastikan pertukaran lengkap kuprum kepada kuprum(II) oksida
 To ensure the complete conversion of copper to copper(II) oxide
- D** Untuk meningkatkan jisim kuprum yang terbentuk di dalam tiub kaca
 To increase the mass of copper formed in the glass tube

5. Unsur L terletak di atas bromin dalam Jadual Berkala Unsur. Antara berikut, pernyataan manakah yang menerangkan mengapa unsur L lebih reaktif berbanding bromin?

Element L is located above bromine in the Periodic Table of Elements.

Which of the following statement explains why element L is more reactive than bromine?

- A Takat lebur bagi unsur menurun apabila menuruni kumpulan
The melting point of the elements decrease when going down the group
- B Elektron valens semakin jauh dari nukleus
The valence electrons get further from the nucleus
- C Keadaan fizik bagi unsur berubah daripada gas kepada cecair kepada pepejal pada suhu bilik
The physical state of the elements changed from gas to liquid to solid at room temperature
- D Daya tarikan antara elektron valens dengan nukleus lebih kuat bagi unsur L berbanding bromin
Attraction force between valence electrons and nucleus is stronger for element L compared to bromine

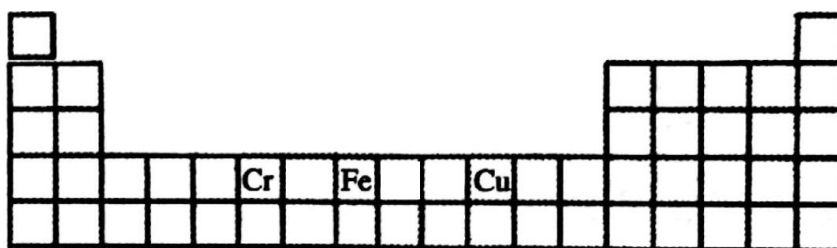
6. Antara berikut, unsur manakah yang akan membentuk oksida asid apabila bertindak balas dengan oksigen?

Which of the following element can form oxide of acid when react with oxygen?

- A Natrium
Sodium
- B Aluminium
Aluminium
- C Magnesium
Magnesium
- D Klorin
Chlorine

7. Rajah 3 menunjukkan tiga unsur dalam Kala 4 dalam Jadual Berkala Unsur.

Diagram 3 shows three elements in Period 4 of the Periodic Table of Elements.



Rajah 3 / Diagram 3

Antara yang berikut, yang manakah benar tentang unsur-unsur itu?

*Which of the following is **true** about the elements?*

- A Mempunyai takat lebur yang rendah
Have low melting point
- B Tidak mengkonduksi haba
Cannot conduct heat
- C Boleh membentuk sebatian yang berwarna
Can form coloured compounds
- D Mempunyai hanya satu nombor pengoksidaan
Have only one oxidation number

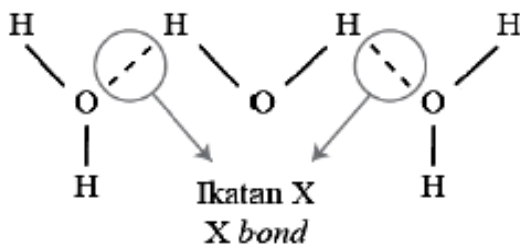
8. Antara berikut, sebatian manakah mempunyai ikatan ion?
Which of the following compounds has an ionic bond?

- | | |
|---|---|
| <p>A Kloroform, CH_3Cl
<i>Chloroform, CH_3Cl</i></p> <p>B Etanol, $\text{C}_2\text{H}_5\text{OH}$
<i>Ethanol, $\text{C}_2\text{H}_5\text{OH}$</i></p> | <p>C Magnesium etanoat, CH_3COOMg
<i>Magnesium ethanoate, CH_3COOMg</i></p> <p>D Etil butanoat, $\text{C}_3\text{H}_7\text{COOC}_2\text{H}_5$
<i>Ethyl butanoate, $\text{C}_3\text{H}_7\text{COOC}_2\text{H}_5$</i></p> |
|---|---|

9. Kuprum mengkonduksikan arus elektrik dalam keadaan leburan dan pepejal.
Copper conducts electricity in solid and molten state.

- Antara pernyataan berikut, yang manakah **betul**?
Which of the following explanation is **correct**?

- A** Mempunyai lautan elektron yang berpindah dari atom logam ke atom bukan logam.
Has sea of electrons that transferred from a metal atom to a non-metal atom.
- B** Mempunyai lautan elektron yang dikongsi bersama oleh atom-atom bukan logam.
Has sea of electrons that shared together by non-metal atoms.
- C** Mempunyai lautan elektron yang bergerak bebas.
Has sea of electron that move freely.
- D** Mempunyai ikatan ion yang kuat
Has strong ionic bond
10. Rajah 4 menunjukkan ikatan yang terbentuk di antara molekul air.
Diagram 4 shows the bond formed between water molecules.



Rajah 4 / Diagram 4

- Antara yang berikut, fenomena yang manakah melibatkan ikatan X?
Which of the following phenomenon are involving X bond?

- I** Apabila rambut basah, ia akan melekat sesama sendiri dan susah disikat.
When the hair is wet, it will stick to each other and be difficult to comb.
- II** Pembentukan wasap putih ammonium klorida, NH_4Cl .
Formation of white fumes of ammonium chloride, NH_4Cl .
- III** Danny mengira wang kertas itu dengan membasahkan hujung jarinya.
Danny counts the money notes by wetting his fingertips.
- IV** Wayar kuprum mengkonduksikan elektrik.
Copper wires conduct electricity

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

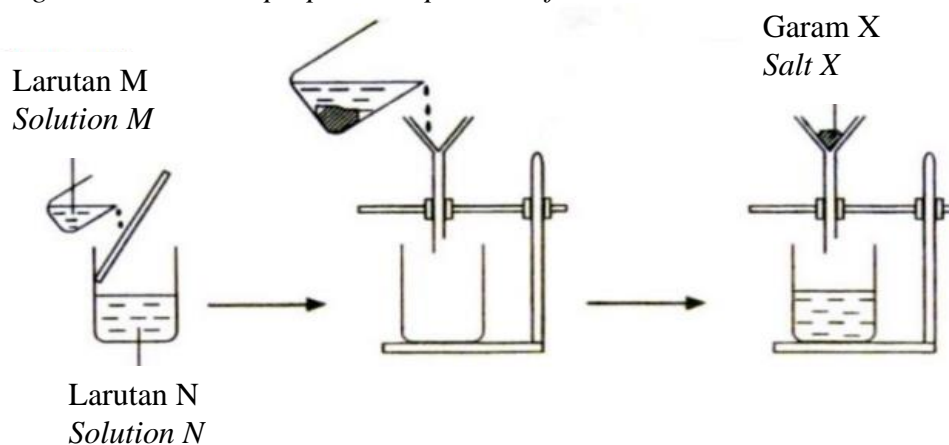
11. Jadual 1 menunjukkan nilai pH bagi dua asid yang mempunyai kepekatan yang sama.
Table 1 shows the pH value of two acids with the same concentration.

Asid <i>Acid</i>	Nilai pH <i>pH value</i>
Asid nitrik 0.1 mol dm ⁻³ <i>0.1 mol dm⁻³ of nitric acid</i>	3
Asid sulfurik 0.1 mol dm ⁻³ <i>0.1 mol dm⁻³ of sulphuric acid</i>	1

Jadual 1 / *Table 1*

Mengapa nilai pH bagi asid sulfurik lebih rendah daripada asid nitrik?
Why the pH value of sulphuric acid is lower than that in nitric acid?

- A Asid sulfurik lebih larut di dalam air
Sulphuric acid more soluble in water
- B Asid sulfurik adalah asid diprotik
Sulphuric acid is a diprotic acid
- C Asid sulfurik adalah asid yang lebih kuat
Sulphuric acid is a stronger acid
- D Asid sulfurik mengandungi kepekatan ion hidrogen yang lebih rendah
Sulphuric acid contains lower concentration of hydrogen ions
12. Rajah 5 menunjukkan proses penyediaan garam X.
Diagram 5 shows the preparation process of salt X.



Rajah 5 / *Diagram 5*

Persamaan manakah yang mewakili penyediaan garam di atas?
Which equation represent the preparation of the above salt?

- I $\text{KOH} + \text{HCl} \rightarrow \text{KCl} + \text{H}_2\text{O}$
- II $\text{Na}_2\text{CO}_3 + \text{ZnCl}_2 \rightarrow \text{ZnCO}_3 + 2\text{NaCl}$
- III $2\text{CH}_3\text{COOH} + \text{ZnO} \rightarrow (\text{CH}_3\text{COO})_2\text{Zn} + \text{H}_2\text{O}$
- IV $\text{Na}_2\text{SO}_4 + \text{CaCl}_2 \rightarrow \text{CaSO}_4 + 2\text{NaCl}$

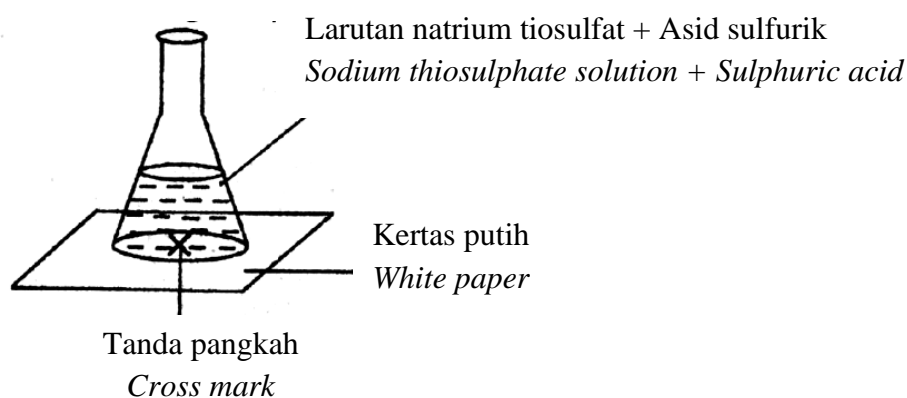
- A I dan III
I and III
- B II dan III
II and III

- C II dan IV
II and IV
- D III dan IV
III and IV

13. Apakah bahan yang boleh digunakan untuk mengenal pasti kehadiran kation dan anion dalam ammonium klorida?
 What are the substances that can be used to identify the cation and anion present in ammonium chloride?

	Kation <i>Cation</i>	Anion <i>Anion</i>
A	Reagen Nessler <i>Nessler reagent</i>	Asid nitrik cair dan larutan argentum nitrat <i>Dilute nitric acid and silver nitrate solution</i>
B	Reagen Nessler <i>Nessler reagent</i>	Asid hidroklorik cair dan larutan barium klorida <i>Dilute hydrochloric acid and barium chloride solution</i>
C	Kalium tiosianat <i>Potassium thiocyanate</i>	Asid nitrik cair dan larutan argentum nitrat <i>Dilute nitric acid and silver nitrate solution</i>
D	Kalium tiosianat <i>Potassium thiocyanate</i>	Asid hidroklorik cair dan larutan barium klorida <i>Dilute hydrochloric acid and barium chloride solution</i>

14. Rajah 6 menunjukkan susunan radas bagi eksperimen untuk menentukan kadar tindak balas.
 Diagram 6 shows the apparatus set-up for an experiment to study the rate of reaction.



Rajah 6 / Diagram 6

Antara berikut, kaedah manakah paling sesuai untuk menentukan kadar tindak balas itu?
 Which of the following method is the most suitable to determine the rate of reaction?

- A** Mencatat masa sebaik sahaja mendakan mula terbentuk
Record the time as soon as the formation of precipitate started
- B** Mencatat masa untuk mendapat suhu maksimum
Record the time to obtain the maximum temperature
- C** Mencatat masa sebaik sahaja tanda pangkah tidak kelihatan
Record the time as soon as the cross mark cannot be seen
- D** Mencatat masa bagi perubahan nilai pH sehingga nilai pH yang tetap diperolehi
Record the time for the change of the pH value until a constant pH value is obtained

15. Jadual 2 menunjukkan maklumat bagi tindak balas antara kalsium karbonat dan asid hidroklorik dalam Eksperimen I dan Eksperimen II.

Table 2 shows information for the reaction between calcium carbonate and hydrochloric acid in Experiment I and Experiment II.

Eksperimen I <i>Experiment I</i>	Ketulan kalsium karbonat + 25 cm ³ asid hidroklorik 1.0 mol dm ⁻³ <i>Calcium carbonate chips + 25 cm³ of 1.0 mol dm⁻³ hydrochloric acid</i>
Eksperimen II <i>Experiment II</i>	Ketulan kalsium karbonat + 50 cm ³ asid hidroklorik 0.5 mol dm ⁻³ <i>Calcium carbonate chips + 50 cm³ of 0.5 mol dm⁻³ hydrochloric acid</i>

Jadual 2 / *Table 2*

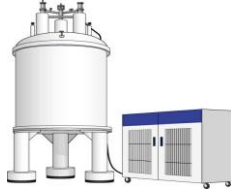
Antara pernyataan berikut, yang manakah benar bagi tindak balas Eksperimen I dan II?
Which of the following statements is true for the reactions of Experiments I and II?

- A** Kadar tindak balas Eksperimen I lebih rendah berbanding Eksperimen II
Rate of reaction for Experiment I is lower than Experiment II
- B** Eksperimen I membebaskan isi padu gas karbon dioksida yang lebih tinggi
Experiment I produces higher volume of carbon dioxide gas
- C** Bilangan ion hidrogen per unit isi padu dalam Eksperimen I lebih tinggi berbanding Eksperimen II
The number of hydrogen ions per unit volume in Experiment I is higher than in Experiment II
- D** Masa yang diambil bagi tindak balas lengkap Eksperimen I lebih panjang berbanding Eksperimen II
Time taken for complete a reaction Experiment I is longer than Experiment II
16. Antara kombinasi bahan yang berikut, yang manakah membentuk aloi yang sesuai untuk membuat sudu dan garfu?
Which of the following combination of substances, produce an alloy that is suitable to make cutlery?

- A** Kuprum dan zink
Copper and zinc
- B** Kuprum dan timah
Copper and tin
- C** Besi dan karbon
Iron and carbon
- D** Besi dan kromium
Iron and chromium

17. Superkonduktor seperti seramik itrium barium kuprum oksida, YBCO merupakan bahan komposit yang ringan dan mempunyai daya magnet yang sangat kuat. Antara berikut, yang manakah bukan merupakan contoh kegunaan magnet superkonduktor?
Superconductors such as yttrium barium copper oxide, YBCO ceramic is a composite material that are light weight and have a very strong magnetic force. Which of the following is not an example of the use of superconductor magnets?

A



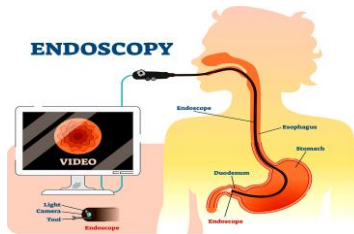
Mesin resonans magnet nukleus
 (NMR)
Nuclear magnetic resonance machine

C



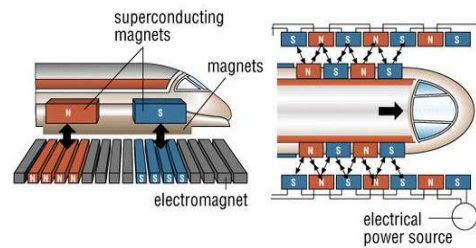
Mesin pengimejan resonans magnet(MRI)
Magnetic Resonance Imaging

B



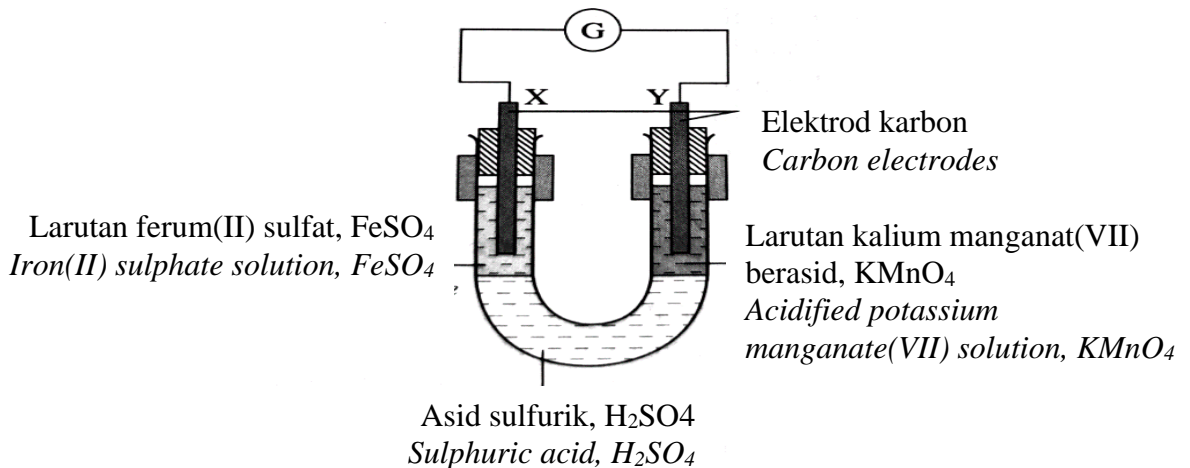
Endoskop
Endoscope

D



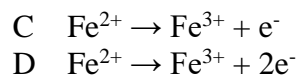
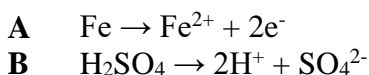
Kereta api Maglev
Maglev train

18. Rajah 7 menunjukkan suatu eksperimen yang dijalankan untuk mengkaji tindak balas pengoksidaan dan penurunan dari segi pemindahan electron pada suatu jarak.
Diagram 7 shows an experiment carried out to study the oxidation and reduction reactions in terms of electron transfer at a distance.

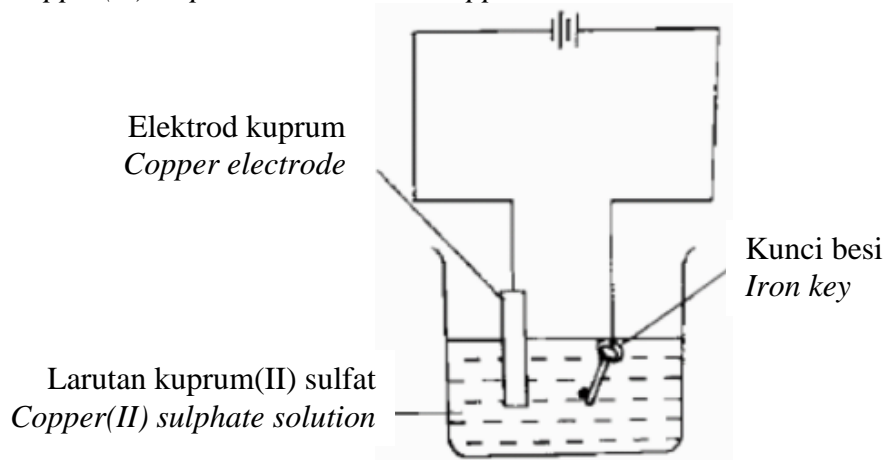


Rajah 7 / Diagram 7

Apakah setengah persamaan pada elektrod X?
What is the half-equation at the electrode X?



19. Rajah 8 menunjukkan susunan radas untuk penyaduran kunci besi dengan menggunakan larutan kuprum(II) sulfat 1.0 mol dm^{-3} dan logam kuprum sebagai elektrod.
Diagram 8 shows the apparatus set-up for the electroplating of iron key using 1.0 mol dm^{-3} copper(II) sulphate solution and copper metal as electrode.



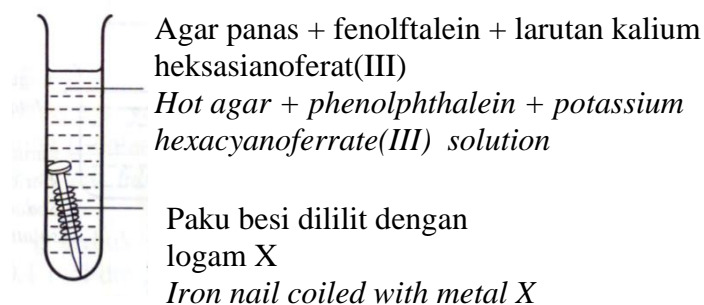
Rajah 8 / Diagram 8

Selepas 30 minit, jelaskan pemerhatian dalam eksperimen ini.
After 30 minutes, explain the observation in this experiment.

- A** Penyaduran kunci besi oleh logam kuprum tidak berlaku kerana elektrod kuprum kurang elektropositif berbanding paku besi.
The electroplating of iron key by copper metals does not occur because copper electrodes are less electropositive than iron key
- B** Penyaduran kunci besi tidak berlaku kerana bilangan sel kering tidak mencukupi
The electroplating of iron key does not occur due to insufficient number of dry cells
- C** Penyaduran kunci besi tidak berlaku kerana kepekatan larutan kuprum(II) sulfat terlalu rendah
The electroplating of iron key does not occur because the concentration of copper(II) sulphate is too low
- D** Penyaduran kunci besi tidak berlaku kerana elektrod kuprum perlu disambung pada terminal positif sel kering
The electroplating of iron key by copper metals does not occur because copper electrodes need to be connected to the positive terminals of dry cells

20. Rajah 9 menunjukkan paku besi dililit dengan logam X. Selepas beberapa hari, terdapat banyak tompok biru kelihatan di sekeliling paku besi.

Diagram 9 shows an iron nail coiled with metal X. After a few days, there are plenty of blue spots visible around the iron nails.



Rajah 9 / Diagram 9

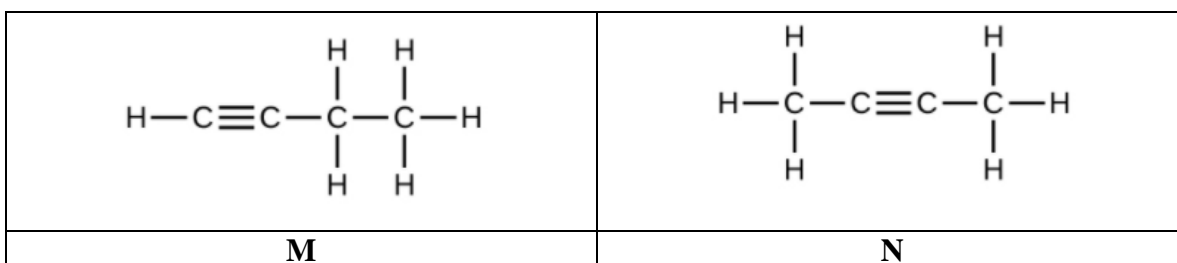
Antara berikut yang manakah logam X?

Which of the following is metal X?

- | | |
|-----------------------------|---------------------------------|
| A Zink
<i>Zinc</i> | C Aluminium
<i>Aluminium</i> |
| B Argentum
<i>Silver</i> | D Magnesium
<i>Magnesium</i> |

21. Rajah 10 menunjukkan formula struktur bagi dua isomer, M dan N.

Diagram 10 shows the structural formulae of two isomers, M and N.



Rajah 10 / Diagram 10

Antara pasangan berikut, yang manakah mempunyai nama isomer yang betul?

Which of the following pairs has the correct name of the isomers?

	M	N
A	But-1-ena <i>But-1-ene</i>	But-2-ena <i>But-2-ene</i>
B	But-3-ena <i>But-3-ene</i>	Butana <i>Butane</i>
C	But-1-una <i>But-1-yne</i>	But-2-una <i>But-2-yne</i>
D	But-3-una <i>But-3-yne</i>	Butana <i>Butane</i>

22. Maklumat berikut adalah tentang sebatian organik P.
The following information is about organic compound P.

- Mempunyai 3 atom karbon
Has 3 carbon atoms
- Larut dalam air
Soluble in water
- Bertindak balas dengan zink untuk menghasilkan gas hidrogen
Reacts with zinc to produce hydrogen gas

Apakah sebatian organik P?
What is organic compound P?

- | | |
|---|---|
| <p>A Propena
 <i>Propene</i></p> <p>B Propanol
 <i>Propanol</i></p> | <p>C Propana
 <i>Propane</i></p> <p>D Asid propanoik
 <i>Propanoic acid</i></p> |
|---|---|

23. Rajah 11 menunjukkan bunga yang berbau harum.
Diagram 11 shows flowers that have a pleasant smell.



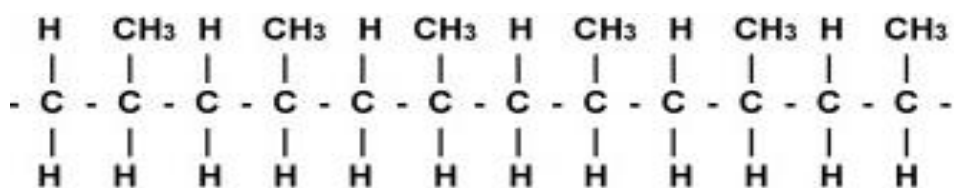
Rajah 11 / *Diagram 11*

Apakah nama bahan yang menghasilkan haruman tersebut?
What is the name of the substance that produces the fragrance?

- | | |
|--|--|
| <p>A Asid askorbik
 <i>Ascorbic acid</i></p> <p>B Asid etanoik
 <i>Ethanoic acid</i></p> | <p>C Heksil etanoat
 <i>Hexyl ethanoate</i></p> <p>D Natrium benzoat
 <i>Sodium benzoate</i></p> |
|--|--|

24. Rajah 12 menunjukkan struktur bagi suatu polimer.

Diagram 12 shows the structure of a polymer.

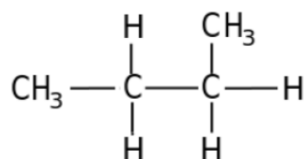


Rajah 12 / Diagram 12

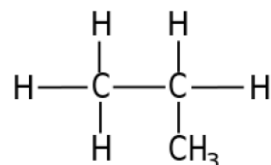
Antara yang berikut, yang manakah monomer bagi polimer tersebut?

Which of the following is the monomer of the polymer?

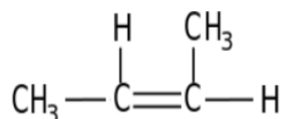
A



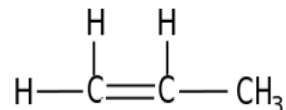
C



B



D



25. Rajah 13 menunjukkan pengumpulan lateks daripada pokok getah. Bagaimanapun, lateks tersebut telah menggumpal selepas beberapa jam.

Diagram 13 shows the collection of latex from rubber tree. However, latex has coagulated after a few hours.



Rajah 13 / Diagram 13

Antara pernyataan berikut, yang manakah **benar** tentang penggumpalan getah?

*Which of the following statements is **true** regarding to the coagulation of latex?*

- A Zarah-zarah getah yang bergabung menyebabkan penggumpalan getah
Rubber particles combine which causes the coagulation of latex
- B Ion hidrogen daripada asid meneutralkan cas negatif pada membran protein
Hydrogen ions from the acid neutralise the negative charges on the protein membrane
- C Ion hidroksida daripada larutan ammonia meneutralkan ion hidrogen daripada asid laktik
Hydroxide ions from the ammonia solution neutralise the hydrogen ions from the lactic acid
- D Tolakan antara zarah bercas negatif menghalang zarah-zarah getah daripada mendekati antara satu sama lain
Repulsion between the negatively-charged particles prevents the rubber particles from coming closer to one another

26. Maklumat berikut menunjukkan ciri-ciri bagi getah X.
The following information shows the characteristics of rubber X.

- Tahan haba yang tinggi
High heat resistance
- Tahan pengoksidaan
Oxidation resistance
- Tidak mudah terbakar
Flame resistance
- Tidak bertindak balas dengan bahan api
Does not react with fuel

Apakah getah X?
What is rubber X?

- | | |
|---|---|
| <p>A Neoprena
<i>Neoprene</i></p> <p>B Isoprena
<i>Isoprene</i></p> | <p>C Getah nitril
<i>Nitril rubber</i></p> <p>D Getah stirena-butadiena
<i>Styrene-butadiene rubber</i></p> |
|---|---|

27. Pernyataan manakah yang betul tentang tindakan pencucian bagi sabun?
Which statement is correct about the cleansing action of soap?

- A Bahagian hidrofilik molekul sabun larut dalam air
The hydrophilic part of soap molecules dissolves in water
- B Menambah ketegangan permukaan air
Increases the surface tension of water
- C Molekul sabun mengemulsikan air
Soap molecules emulsify water
- D Bertindak balas dengan asid untuk membentuk garam
Reacts with acid to form salt.

28. Rajah 14 menunjukkan sejenis ubat yang digunakan dalam kehidupan harian.
Diagram 14 shows a medicine used in daily life.



Rajah 14 / *Diagram 14*

Apakah jenis ubat bagi antihistamin?
What is the type of medicine for antihistamine?

- | | |
|---|--|
| <p>A Analgesik
<i>Analgesics</i></p> <p>B Anti alergi
<i>Anti-allergies</i></p> | <p>C Kortikosteroid
<i>Corticosteroids</i></p> <p>D Ubat psikotik
<i>Psychotic drugs</i></p> |
|---|--|

29. Salah satu nanoteknologi yang banyak memberi manfaat pada masa kini adalah grafen. Pelbagai aplikasi sedia ada dapat ditambah baik atau diganti dengan grafen yang mempunyai ciri-ciri unggul dan istimewa.

Antara yang berikut, yang manakah menunjukkan sifat grafen yang **betul**?

One of the many beneficial nanotechnologies today is graphene. Various existing applications can be improved or replaced with graphene that has superior and distinctive characteristics.

*Which of the following shows the **correct** physical property of graphene?*

- | | | | |
|----------|---|----------|---|
| A | Bersifat tidak telap
<i>Impermeable</i> | C | Penebat elektrik
<i>Electrical insulator</i> |
| B | Keras tetapi rapuh
<i>Hard but brittle</i> | D | Penebat haba
<i>Heat insulator</i> |

30. Antara yang berikut, yang manakah merupakan kepentingan Teknologi Hijau dalam kehidupan?

Which of the following are the importance of Green Technology in life?

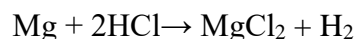
- I** Teknologi Hijau membantu menghasilkan inovasi baharu pada kadar yang rendah.
Green Techology helps to produce innovation at a lower rate.
- II** Teknologi Hijau membantu meningkatkan penghasilan gas rumah hijau.
Green Technology helps to increase the production of green houses gases.
- III** Teknologi Hijau membantu meningkatkan kualiti hidup manusia.
Green Technology helps to improve human's standard of living.
- IV** Teknologi Hijau membantu memperlahankan pemanasan global.
Green Technology helps to mitigating global warning.

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

31. 0.30 g pita magnesium diletakkan ke dalam 20 cm³ asid hidroklorik 1.0 mol dm⁻³.
0.30 g of magnesium ribbon was placed in 20 cm³ of 1.0 mol dm⁻³ hydrochloric acid.

Persamaan untuk tindak balas ditunjukkan di bawah:

The equation for the reaction is shown below:



Hitungkan isipadu gas hidrogen yang dibebaskan pada keadaan bilik.

Calculate the volume of hydrogen gas which was given off at room condition.

[Jisim atom relatif: Mg = 24 ; Isipadu molar gas pada keadaan bilik = 24 dm³ mol⁻¹]

[Relative atomic mass of Mg = 24; Molar volume of gas at room condition = 24 dm³ mol⁻¹]

- | | | | |
|----------|---------------------|----------|---------------------|
| A | 240 cm ³ | C | 480 cm ³ |
| B | 300 cm ³ | D | 600 cm ³ |

32. Rajah 15 menunjukkan tangki skuba berisi campuran helium, nitrogen dan X yang digunakan oleh penyelam.
Diagram 15 shows a scuba tank filled with a mixture of helium, nitrogen and X that is used by a diver.



Rajah 15 / Diagram 15

1.60 g X menempati 1120 cm³ pada suhu dan tekanan piawai (STP). Hitungkan bilangan molekul dalam 2.56 g X.

1.60 g of X occupies 1120 cm³ at standard temperature and pressure (STP.). Calculate the number of molecules in 2.56 g of X.

[Isipadu molar = 22.4 dm³ mol⁻¹ pada STP]

[Molar volume = 22.4 dm³ mol⁻¹ at STP]

- | | | | |
|----------|------------------------|----------|------------------------|
| A | 9.632×10^{21} | C | 4.812×10^{21} |
| B | 9.632×10^{22} | D | 4.812×10^{22} |

33. Hidrokarbon Z mengandungi 93.75% karbon dan 6.25% hidrogen berdasarkan jisimnya. Jisim molekul relatif Z ialah 128. Apakah formula molekul bagi hidrokarbon tersebut?
Hydrocarbon X contains 93.75% of carbon and 6.25% of hydrogen according to its mass. The relative molecular mass of X is 128. What is the molecular formula of the hydrocarbon?

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

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

- | | | | |
|----------|-------------------------------|----------|--------------------------------|
| A | CH ₂ | C | C ₅ H ₄ |
| B | C ₃ H ₂ | D | C ₁₀ H ₈ |

34. Apakah nilai pH bagi larutan kalium hidroksida yang mengandungi 0.02 mol dm⁻³ ion hidroksida?
What is the pH value of potassium hydroxide solution that contains 0.02 mol dm⁻³ hydroxide ions?

- | | | | |
|----------|-------|----------|--------|
| A | 1.047 | C | 12.301 |
| B | 1.699 | D | 12.953 |

38. Haba pembakaran propanol, C_3H_7OH ialah $-2016 \text{ kJ mol}^{-1}$. Apabila 0.30 g propanol terbakar lengkap dalam oksigen, haba yang dibebaskan digunakan untuk memanaskan 250 cm^3 air. Berapakah kenaikan suhu untuk air?

The heat of combustion for propanol, C_3H_7OH is $-2016 \text{ kJ mol}^{-1}$. When 0.3 g of propanol is completely burnt, the heat given out is used to heat 250 cm^3 of water. What is the rise in temperature for the water?

[Muatan haba tentu air = $4.2 \text{ J g}^{-1} \text{ }^\circ\text{C}^{-1}$, Jisim molar propanol = 60 g mol^{-1}]

[Specific heat capacity of water = $4.2 \text{ J g}^{-1} \text{ }^\circ\text{C}^{-1}$. Molar mass of propanol = 60 g mol^{-1}]

- | | | | |
|----------|----------------------|----------|-----------------------|
| A | 2.4 $^\circ\text{C}$ | C | 9.6 $^\circ\text{C}$ |
| B | 4.8 $^\circ\text{C}$ | D | 19.2 $^\circ\text{C}$ |

39. Jadual 4 menunjukkan pemerhatian bagi mengkaji tindak balas redoks dalam penyesaran halogen.

Table 4 shows the observations to study a redox reaction in displacement of halogen.

Eksperimen <i>Experiment</i>	Bahan tindak balas <i>Reactants</i>	Pemerhatian di lapisan 1,1,1-trikloroetana <i>Observation at 1,1,1-trichloroethane</i>
I	X_2 + Larutan kalium bromida X_2 + Potassium bromide solution	Lapisan perang terbentuk <i>Brown layer is formed</i>
II	Y_2 + Larutan kalium bromida Y_2 + Potassium bromide solution	Lapisan ungu terbentuk <i>Purple layer is formed</i>
III	Z_2 + Larutan kalium iodida Z_2 + Potassium iodide solution	Lapisan ungu terbentuk <i>Purple layer is formed</i>

Jadual 4 / Table 4

Apakah halogen X_2 , Y_2 dan Z_2 ?

What is halogen X_2 , Y_2 and Z_2 ?

	X_2	Y_2	Z_2
A	Cl_2	Br_2	I_2
B	Cl_2	I_2	Br_2
C	I_2	Br_2	Cl_2
D	Br_2	I_2	Cl_2

40. Satu siri ujian telah dijalankan untuk mengenal pasti garam X.
A series of tests are conducted to identify salt X.

Ujian Test	Pemerhatian Observation
Larutan kalium iodida ditambahkan ke dalam larutan garam X <i>Potassium iodide solution is added into salt X solution</i>	Tiada perubahan <i>No changes</i>
Larutan natrium hidroksida dan larutan ammonia ditambahkan sedikit demi sedikit sehingga berlebihan ke dalam larutan garam X secara berasingan. <i>Sodium hydroxide solution and ammonia solution are added little by little until excess into salt solution X separately.</i>	Mendakan putih terbentuk dan larut dalam larutan natrium hidroksida dan larutan ammonia berlebihan. <i>White precipitate is formed and dissolve in excess sodium hydroxide solution and ammonia solution.</i>
2 cm ³ asid nitrik ditambahkan ke dalam larutan garam X diikuti dengan 2 cm ³ larutan barium nitrat. <i>2 cm³ nitric acid is added into salt solution X followed by 2 cm³ barium nitrate solution</i>	Mendakan putih terbentuk <i>White precipitate is formed</i>

Seterusnya, larutan garam X dicampurkan dengan larutan kalsium nitrat untuk membentuk mendakan Y. Apakah Y?

Then, salt X solution is added with calcium nitrate solution to form precipitate Y. What is Y?

- | | |
|---|---|
| A Kalsium sulfat
<i>Calcium sulphate</i> | C Kalsium oksida
<i>Calcium oxide</i> |
| B Kalsium hidroksida
<i>Calcium hydroxide</i> | D Kalsium karbonat
<i>Calcium carbonate</i> |

SKEMA JAWAPAN
PRAKTIS KIMIA 4541/1
SET 1

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

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													
	2.4 Isotopes and its uses		2											1
3. The Mole Concept, Chemical Formula and Equation [F4]	3.1 Relative atomic mass and relative molecular mass				3					31				2
	3.2 Mole concept									32				1
	3.3 Chemical formula					4								1
	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	5												1
	4.6 Elements in Period 3	6												1
	4.7 Transition elements		7											1
5. Chemical Bond [F4]	5.1 Basics of compound formation													
	5.2 Ionic bond				8									1
	5.3 Covalent bond													
	5.4 Hydrogen bond	10												1
	5.5 Dative bond													
	5.6 Metallic bond				9									1
	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								34					1
	6.3 Strength of acids and alkalis					11								1
	6.4 Chemical properties of acids and alkalis													
	6.5 Concentration of aqueous solution													
	6.6 Standard solution													
	6.7 Neutralisation									35				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													
	6.11 Qualitative analysis					13				33		40		3
7. Rate of Reaction [F4]	7.1 Determining rate of reaction													
	7.2 Factors affecting rate of reaction					14								1
	7.3 Application of factors that affect the rate of reaction in daily life													
	7.4 Collision theory					15								1
8. Manufactured Substances in Industry [F4]	8.1 Alloy and its importance					16								1
	8.2 Composition of glass and its uses													
	8.3 Composition of ceramics and its uses													
	8.4 Composite materials and its importance						17							1

9. Redox equilibrium [F5]	9.1 Oxidation and reduction				18			30				39	3	
	9.2 Standard electrode potential													
	9.3 Voltaic cell													
	9.4 Electrolytic cell				19								1	
	9.5 Extraction of metal from its ore													
	9.6 Rusting		20										1	
10. Carbon compound [F5]	10.1 Types of carbon compound													
	10.2 Homologous series				22								1	
	10.3 Chemical properties and interconversion of compounds between homologous series				23								1	
	10.4 Isomers and naming based on IUPAC nomenclature				21								1	
11. Thermochemistry [F5]	11.1 Heat change in reactions													
	11.2 Heat of reaction						36						1	
	11.3 Application of endothermic and exothermic reactions in daily life							38					1	
12. Polymer Chemistry [F5]	12.1 Polymer				24								1	
	12.2 Natural rubber				25								1	
	12.3 Synthetic rubber	26											1	
13. Consumer and Industrial Chemistry [F5]	13.1 Oils and fats													
	13.2 Cleaning agents				27								1	
	13.3 Food additives													
	13.4 Medicines and cosmetics	28											1	
	13.5 Application of nanotechnology in industry				29								1	
	13.6 Application of green technology in industrial waste management				30								1	
Total		6	3	0	9	12	0	0	3	5	0	1	1	40

**MODUL KENYALANG CEMERLANG
SPM
TAHUN 2023**

JABATAN PENDIDIKAN NEGERI SARAWAK

**KIMIA 4541
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 2023. Sehubungan dengan itu, pada tahun 2023 ini, Sektor Pembelajaran, Jabatan Pendidikan Negeri Sarawak mengadakan **Program Modul Kenyalang Cemerlang SPM 4.0** untuk membantu guru dan calon SPM menghadapi peperiksaan SPM 2023.

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 2023 di semua sekolah menengah di negeri Sarawak.

Objektif Program

1. Memastikan calon SPM menguasai format baharu Peperiksaan SPM 2023.
2. Memastikan calon SPM mempunyai bahan pembelajaran yang berfokus ke arah peperiksaan SPM.
3. Meningkatkan pencapaian akademik calon SPM 2023.
4. Melonjakkan keputusan SPM 2023 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 – 24
3	Skema Jawapan/Pemarkahan	25 – 37
4	LAMPIRAN: Sampel Jadual Spesifikasi Ujian (JSU) untuk Praktis Kimia 4541/2: Set 1	38 - 39

Senarai Ahli Panel Pembina Modul Kenyalang Cemerlang SPM 4.0

Bil.	Nama Guru	Sekolah	PPD
1.	Francisca Lau Siew Hsia (Ketua)	SMK Methodist	SIBU
2.	Bella Mahony Sie	SMK Luar Bandar Sibu	SIBU
3.	Fun Ngik Ngon	SMK Bandar Sibu	SIBU
4.	Goh Leh Ling	SMK Sacred Heart	SIBU
5.	Catherine Law Fong Fong	SMK Deshon Sibu	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 Yiang	SMK Tiong Hin	SIBU
10.	Tie Woon Yen	SMK Bandar Bintulu	BINTULU
11.	Law Hui Nong	SMK Tinggi Sarikei	SARIKEI
12.	Victoria Petrus	SMK Tun Abdul Razak	SERIAN
13.	Chien Hui Siong	SMK Tinggi Sarikei	SARIKEI
14.	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 4541/2

SET 1

BAHAGIAN A

[60 markah]

Jawab **semua** soalan dalam bahagian ini.

1. Seramik boleh dikelaskan kepada dua kumpulan. Jadual 1 menunjukkan seramik P dan Q serta kegunaan masing- masing.
Ceramics can be classified into two groups. Table 1 shows ceramics P and Q and their respective uses.

Seramik <i>Ceramic</i>	Kegunaan <i>Uses</i>
P	Untuk menghasilkan batu-bata dan tembikar <i>To make bricks and potteries</i>
Q	Untuk menghasilkan cakera brek dan cakera pemotong. <i>To make brake disc and cutting disc.</i>

Jadual / Table 1

- (a) Kelaskan seramik P dan Q.
Classify ceramic P and Q.

Seramik / Ceramic P:

Seramik / Ceramic Q:

[2 markah /2 marks]

- (b) Namakan komponen utama dalam seramik P.
Name the main component in ceramic P.

.....

[1 markah /1 mark]

- (c) Nyatakan satu sifat asas P dan Q.
State one basic property of P and Q.

.....

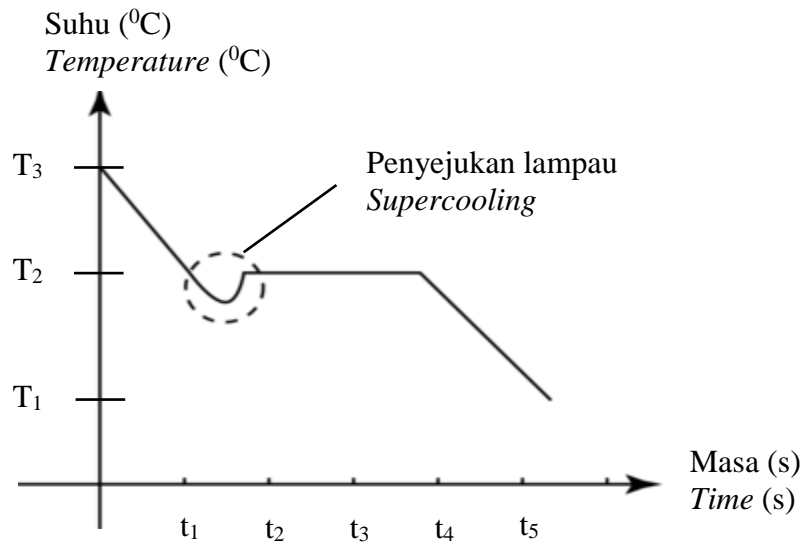
[1 markah /1 mark]

- (d) Nyatakan kegunaan bagi seramik Q dalam bidang perubatan.
State the usage of ceramic Q in the field of medicine.

.....

[1 markah /1 mark]

2. Rajah 1 menunjukkan graf suhu melawan masa apabila cecair asetamida tidak dikacau secara berterusan semasa penyejukan.
 Diagram 1 shows the graph of temperature against time when liquid acetamide is not stirred continuously during the cooling.



Rajah 1 / Diagram 1

Berdasarkan Rajah 1:
 Based on Diagram 1:

- (a) Apakah yang dimaksudkan dengan takat beku?
 What is meant by freezing point?

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

- (b) Nyatakan takat beku bagi asetamida.
 State the freezing point of acetamide.

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

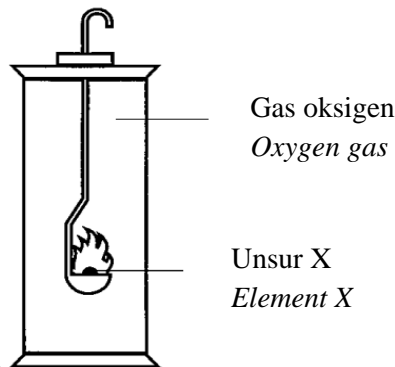
- (c) Mengapakah tidak terdapat perubahan suhu dari t_2 ke t_4 ?
 Why there is no change in temperature from t_2 to t_4 ?

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

- (d) Lakar graf suhu melawan masa apabila pepejal asetamida dipanaskan daripada T_1 °C hingga T_3 °C.
Sketch a graph of temperature against time when solid acetamide is heated from T_1 °C to T_3 °C.

[2 markah / 2 marks]

3. Rajah 2 menunjukkan susunan radas bagi tindak balas unsur X dengan gas oksigen. Didapati bahawa X membakar dengan nyala ungu yang cepat dan suatu pepejal putih terhasil.
Diagram 2 shows the apparatus set-up for the reaction of element X with oxygen gas. It was found that X burns very vigorously with a lilac flame and a white solid was produced.



Rajah 2 / Diagram 2

Berdasarkan Rajah 3,
Based on Diagram 3,

- (a) Nyatakan nama bagi kumpulan dalam Jadual Berkala Unsur bagi unsur X.
State the name of group in Periodic Table of Elements for element X.

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

- (b) Litium berada di atas X dalam Kumpulan. Bandingkan kereaktifan Lithium dengan unsur X dengan gas oksigen.
Lithium is located above X in the group. Compare the reactivity among Lithium and element X with oxygen gas.

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

- (c) (i) Tulis persamaan kimia bagi tindak balas yang terlibat dalam Rajah 2.
Write the chemical equation for the reaction involved in Diagram 2.

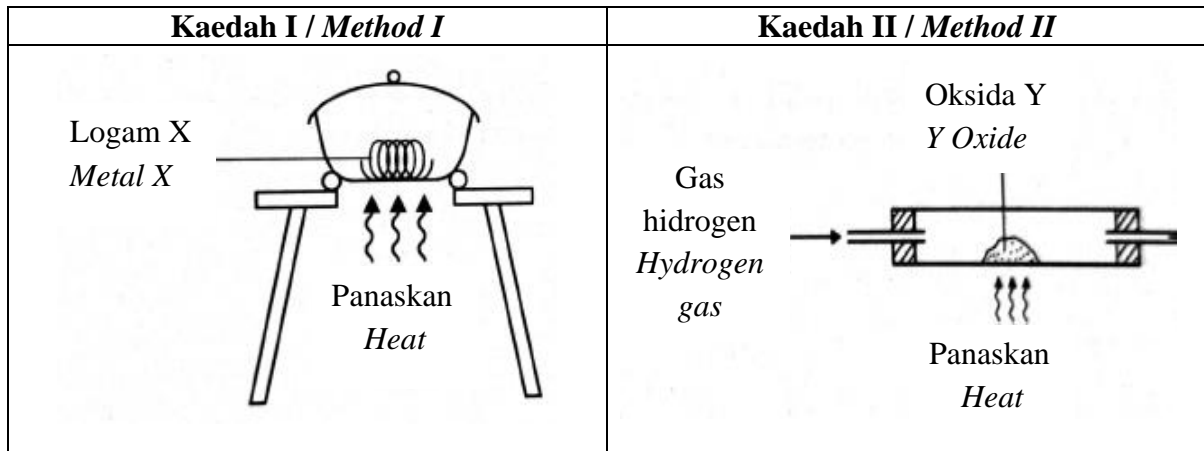
.....
 [2 markah / 2 marks]

- (ii) Hitung jisim hasil tindak balas yang terbentuk apabila 0.5 mol unsur X terbakar dalam oksigen berlebihan.
 [Jisim atom relatif: X=39; O=16]
Calculate the mass of the product formed when 0.5 mol of element X is burned in excess oxygen.
 [Relative atomic mass: X=39; O=16]

[2 markah / 2 marks]

4. Rajah 3 menunjukkan susunan radas bagi dua kaedah untuk menentukan formula empirik sesuatu sebatian.

Diagram 3 shows the apparatus set-up of two methods to determine the empirical formula of a compound.



Rajah 3/ Diagram 3

- (a) Apakah yang dimaksudkan dengan formula empirik?
What is meant by empirical formula?

.....
.....

[1 markah /1 mark]

- (b) Cadangkan logam X dan logam Y.
Suggest metal X and metal Y.

Logam X/*Metal X*:

Logam Y/*Metal Y*:

[2 markah /2 marks]

- (c) Tuliskan persamaan kimia untuk menunjukkan tindak balas yang berlaku berdasarkan logam Y yang diberikan dalam 4(b).
Write a chemical equation to show the reaction that occurred based on metal Y given in 4(b).

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

- (d) 2.4 g logam X bertindak balas dengan oksigen berlebihan untuk menghasilkan 4.0 g oksida logam X. Tentukan formula empirik oksida X.

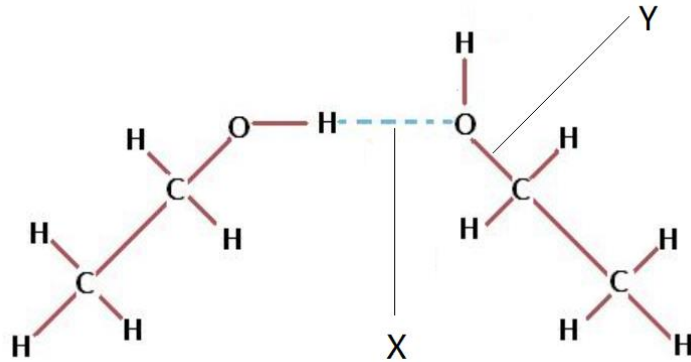
[Jisim atom relative: X = 24, O = 16]

2.4 g of metal X reacts with excess oxygen to produce 4.0 g of metal X oxide. Determine the empirical formula of X oxide.

[Relative atomic mass: X = 24, O = 16]

[3 markah /3 marks]

5. Rajah 4.1 menunjukkan ikatan yang terbentuk antara molekul etanol.
 Diagram 4.1 shows the formation of bond between ethanol molecules.



Rajah 4.1 / Diagram 4.1

- (a) Nyatakan ikatan X dan ikatan Y.
 State the X bond and Y bond.

X:

Y:

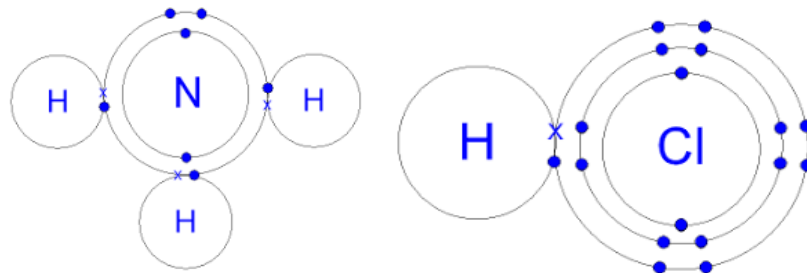
[2 markah /2 marks]

- (b) Apakah yang dimaksudkan dengan ikatan X yang dinyatakan di 6(a)?
 What is meant by the X bond stated in 6(a)?

.....

[1 markah /1 mark]

- (c) Apabila gas ammonia, NH_3 dan gas hidrogen klorida, HCl bercampur, wasap putih terhasil. Rajah 4.2 menunjukkan susunan elektron bagi ammonia dan hidrogen klorida. *When ammonia gas, NH_3 and hydrogen chloride gas, HCl are mixed, white fume is formed. Diagram 4.2 shows the electron arrangement of ammonia and hydrogen chloride.*



Rajah 4.2 / Diagram 4.2

Dengan menggunakan Struktur Lewis, lukiskan pembentukan produk tindak balas dan labelkan ikatan datif yang terbentuk.

Using Lewis structure, draw the formation for the products of the reaction and label the dative bond formed.

[2 markah /2 marks]

- (d) Terangkan pembentukan ikatan datif di dalam ion ammonium, NH_4^+ .
Explain the formation of dative bond in ammonium ion, NH_4^+ .

.....

.....

.....

.....

[3 markah /3 marks]

6. Jadual 1 menunjukkan maklumat bagi tiga bahan tambah makanan yang berbeza, X, Y dan Z.

Table 1 shows the information of three different food additives, X, Y and Z.

Bahan tambah makanan <i>Food additives</i>	Maklumat <i>Information</i>
X	Ditambah kepada jem nanas untuk menghalang pertumbuhan mikroorganisma supaya jem dapat disimpan lebih lama. <i>Added to pineapple jam to inhibit the growth of microorganism to make the jam lasts longer.</i>
Y	Ditambah kepada kek harijadi untuk memberikannya warna kuning dan merah supaya kelihatan menarik. <i>Added to a birthday cake to give yellow and red colours and make the cake look attractive.</i>
Z	Ditambah kepada daging segar supaya ia tahan lama dan kelihatan segar. <i>Added to fresh meat to preserve it and to make it looks fresh.</i>

Jadual 1 / *Table 1*

Berdasarkan Jadual 1:

Based on Table 1:

- (a) Apakah maksud bagi bahan tambah makanan?

What is the meaning of food additives?

.....
.....

[1 markah / 1 mark]

- (b) (i) Nyatakan jenis bahan tambah makanan Y dan Z.

State the types of food additives Y and Z.

Y :

Z :

[2 markah / 2 marks]

- (ii) Cadangkan nama bagi bahan tambah makanan X.

Suggest the name for food additive X.

.....

[1 markah / 1 mark]

- (iii) Aminah ingin membakar sebiji kek mentega yang manis tetapi berkalori rendah. Apakah bahan yang perlu ditambah ke dalam kek itu?

Aminah wants to bake a butter cake which is sweet but low in calorie. What is the substance that should be added into the cake?

.....

[1 markah / 1 mark]

(c)

Tidak dapat dinafikan bahawa sesetengah bahan tambah makanan dapat menjejaskan kesihatan kita. Walaupun demikian, bahan tambah makanan boleh digunakan dalam makanan kita.

There is no denying that some food additives can affect our health. However, food additives can be used in our food.

Berdasarkan pernyataan di atas, wajarkan penggunaan bahan tambah makanan dan berikan **satu** sebab

*Based on the above statement, justify the usage of food additives and give **one** reason.*

.....

.....

.....

.....

[2 markah / 2 marks]

(d) 0.29 g bahan perisa nanas iaitu etil butanoat, $C_3H_7COOC_2H_5$ digunakan untuk memperbaiki rasa sebiji kek nanas. Berapakah bilangan molekul bahan perisa yang telah digunakan?

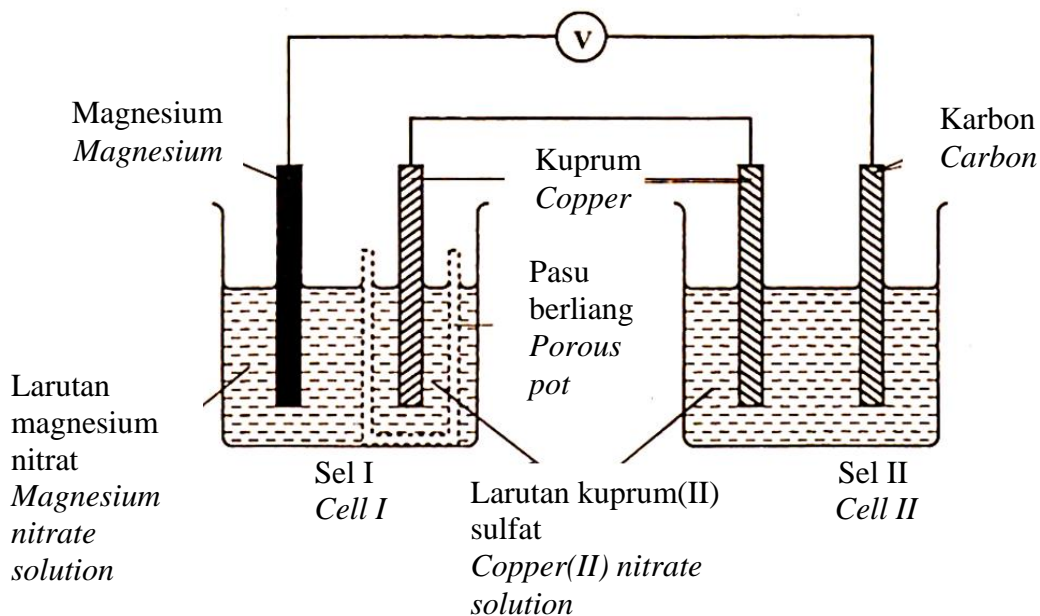
[Pemalar Avogadro = $6.02 \times 10^{23} \text{ mol}^{-1}$]

0.29 g pineapple flavouring substance which is ethyl butanoate, $C_3H_7COOC_2H_5$ is used to improve the taste of a pineapple cake. What is the number of molecules of the flavouring substance used?

[Avogadro constant = $6.02 \times 10^{23} \text{ mol}^{-1}$]

[2 markah / 2 marks]

7. (a) Rajah 5.1 menunjukkan susunan radas bagi kombinasi sel I dan sel II.
 Diagram 5.1 shows the set-up apparatus for a combination of cell I and cell II.



Rajah 5.1 / Diagram 5.1

Berdasarkan gambar rajah 5.1,
 Based on Diagram 5.1,

- (i) Nyatakan semua ion yang hadir di dalam larutan kuprum(II) sulfat.
 State all the ions present in the copper(II) sulphate solution.

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

- (ii) Apakah jenis tindak balas yang berlaku pada elektrod karbon dalam sel II?
 What is the type of reaction occurs at the carbon electrode in cell II?

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

- (iii) Tuliskan setengah persamaan yang berlaku di elektrod kuprum dalam sel II.
 Write the half-equation that occurs at the copper electrode in cell II.

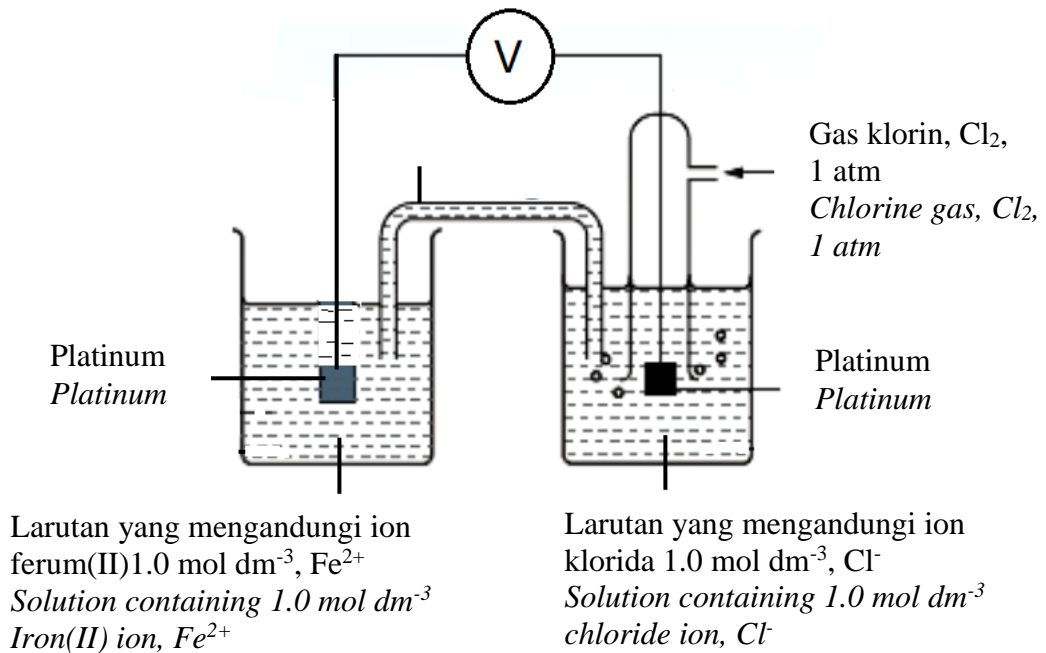
.....
 [1 markah /1 mark]

- (iv) Nyatakan perubahan warna bagi larutan kuprum(II) sulfat dalam sel I. Berikan **satu** sebab untuk jawapan anda.
 State the change in colour of copper(II) sulphate solution in cell I. Give **one** reason for your answer.

.....

 [2 markah /2 marks]

- (b) Rajah 5.2 menunjukkan satu sel kimia.
 Diagram 5.2 shows a chemical cell.



Rajah 5.2 / Diagram 5.2

Diberikan sebahagian daripada Siri Keupayaan Elektrod Piawai:
 Given that a part of Standard Electrode Potential Series:

Persamaan sel setengah <i>Half-cell equation</i>	$E^\circ / \text{V (298K)}$
$\text{Fe}^{3+} + e^- \rightarrow \text{Fe}^{2+}$	+ 0.77
$\text{Cl}_2 + 2e^- \rightarrow 2\text{Cl}^-$	+ 1.36

Berdasarkan rajah 5.2, dan dengan merujuk kepada nilai keupayaan elektrod piawai sel setengah:

Based on the Diagram 5.2, and referring to the standard electrode potential of the half cells:

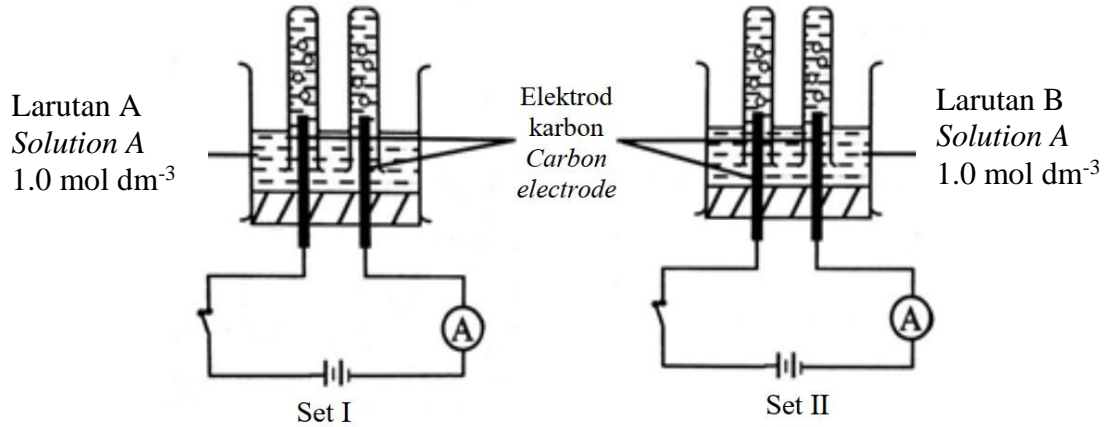
- (i) Tuliskan notasi sel bagi sel kimia ini.
 Write the cell notation of the chemical cell.

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

- (ii) Hitung voltan sel.
 Calculate the voltage of the cell.

[1 markah / 1 mark]

- (c) Adam menjalankan eksperimen bagi elektrolisis dengan menggunakan dua larutan berbeza. Rajah 5.3 menunjukkan susunan radas bagi dua set eksperimen itu. Adam carried out an electrolysis by using two different solutions. Diagram 5.3 shows the apparatus set-up for two sets of experiment.



Rajah 5.3 / Diagram 5.3

Set	Pemerhatian Observation	
	Anod Anode	Katod Cathode
I	Gas kuning kehijauan dibebaskan <i>Greenish yellow gas is released</i>	Gas tidak berwarna dibebaskan <i>Colourless gas is released</i>
II	Gas tidak berwarna dibebaskan <i>Colourless gas is released</i>	Gas tidak berwarna dibebaskan <i>Colourless gas is released</i>

Jadual 2 / Table 2

- (i) Cadangkan nama asid yang digunakan dalam Rajah 5.3.
Suggest the names of the acids used in Diagram 5.3.

Larutan A:
Solution A

Larutan B:
Solution B

[2 markah / 2 marks]

- (ii) Nyatakan pemerhatian apabila gas tidak berwarna dibebaskan di katod diuji dengan menggunakan kayu uji bernayala.
State the observation when gas released at cathode is tested by using lighted wooden splinter.

.....

[1 markah / 1 mark]

8. Jadual 3 menunjukkan dua kaedah dan persamaan berlainan untuk menghasilkan etanol.
Table 3 shows two different methods and equations to prepare ethanol.

Kaedah I <i>Method I</i>	$\text{Alkene X} + \text{H}_2\text{O} \rightarrow \text{C}_2\text{H}_5\text{OH}$
Kaedah II <i>Method II</i>	$\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2$

Jadual 3 / *Table 3*

- (a) (i) Kenalpasti alkena X
Identify alkene X.

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

- (ii) Hitungkan jisim etanol yang terhasil jika 900 g glukosa digunakan dalam Kaedah II.
 [Jisim atom relatif: H = 1; C = 12; O = 16]
Calculate the mass of ethanol produced if 50 moles of glucose is used in Method II.
 [Relative atomic mass: H = 1; C = 12; O = 16]

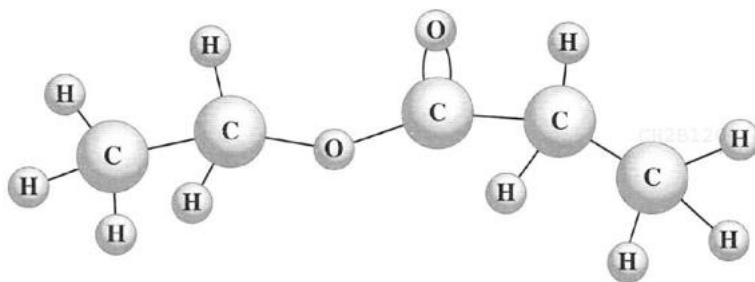
[3 markah / 3 marks]

- (iii) Pada pandangan anda, kaedah manakah yang lebih sesuai digunakan untuk menyediakan etanol? Berikan satu sebab.
In your opinion, which method is more suitable to prepare ethanol? Give one reason.

.....

 [2 markah / 2 marks]

- (b) Rajah 6 menunjukkan lukisan model molekul bagi sebatian organik W yang dihasilkan daripada tindak balas antara ethanol dan bahan Z.
Diagram 6 shows the drawing models for organic compound W that is produced from the reaction between ethanol and substance Z.



Rajah 6 / Diagram 6

- (i) Lukis formula struktur bagi bahan Z.
Draw the structural formula of substance Z.

[1 markah / 1 mark]

- (ii) Huraikan secara ringkas langkah penyediaan sebatian organik W di dalam makmal.
Describe briefly the steps of preparation of the organic compound W in a laboratory.

.....

.....

.....

.....

.....

[3 markah / 3 marks]

BAHAGIAN B

[20 markah]

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

9. Rajah 7.1 menunjukkan ubat antacid yang digunakan untuk merawat gastrik.
Diagram 7.1 shows antacid tablet used to treat gastric.



Rajah 7.1 / Diagram 7.1

- (a) (i) Pada pendapat anda, adakah tablet antacid perlu ditelan atau dikunyah?
 Wajarkan jawapan anda.
In your opinion, should antacid tablets be swallowed or chewed?
Justify your answer.

[3 markah /3 marks]

- (ii) Ubat antacid mengandungi magnesium karbonat. Jadual 9 menunjukkan isipadu gas yang terkumpul melawan masa untuk tindak balas di antara ubat antacid dengan asid hidroklorik. Set I dan Set II menggunakan ubat antacid dengan saiz yang berbeza.

The antacid tablets contain magnesium carbonate. Table 9 shows the volume of gas collected against time for the reaction between antacid tablets with hydrochloric acid. Set I and Set II use different size of antacid tablets.

Set	Masa (s) <i>Time (s)</i>	0	60	120	180	240	300
I	Jumlah isipadu gas (cm ³) <i>Total volume of gas (cm³)</i>	0.00	17.20	30.90	40.10	45.30	45.30
II	Jumlah isipadu gas (cm ³) <i>Total volume of gas (cm³)</i>	0.00	25.50	60.00	60.00	60.00	60.00

Jadual 4 / Table 4

Hitungkan kadar tindak balas purata bagi Set I dan Set II.
Calculate the average rate of reaction for Set I and Set II.

[2 markah /2 marks]

- (ii) Tuliskan satu persamaan kimia seimbang yang mewakili tindak balas antara ubat antacid dan asid hidroklorik dan hitungkan jisim magnesium karbonat dalam ubat antacid dalam Set II.

Write a balanced chemical equation to represent the reaction between antacid tablet and hydrochloric acid and calculate the mass of magnesium carbonate in the antacid tablets in Set II.

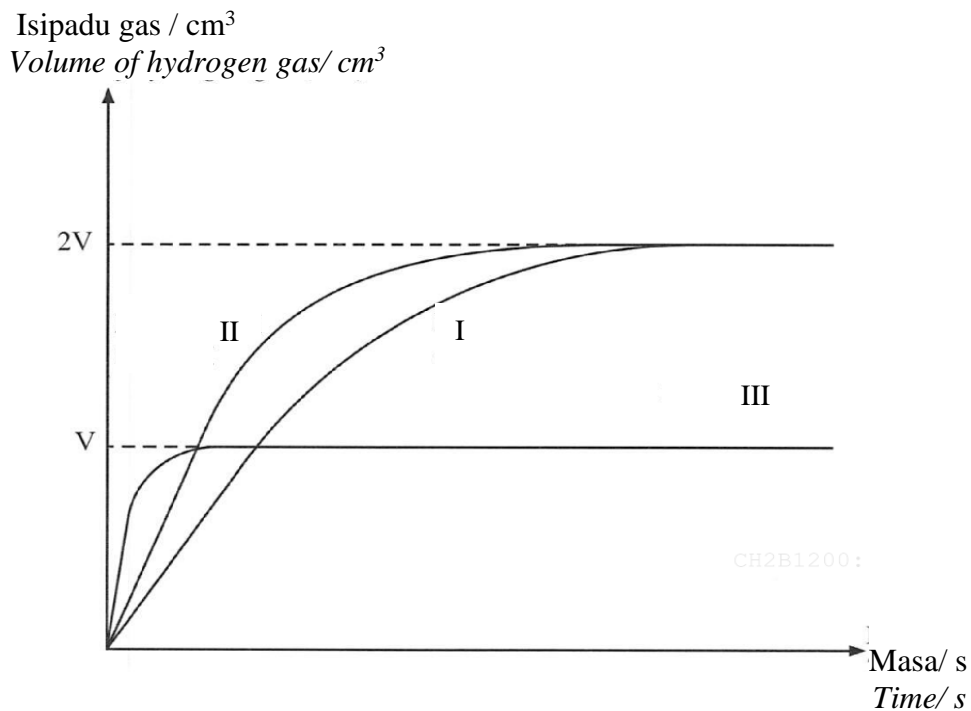
[Jisim atom relatif: H = 1, C = 12, O = 16, Mg = 24, Cl = 35.5. 1 mol gas menempati 24 dm³ pada keadaan bilik]

[Relative atomic mass: H = 1, C = 12, O = 16, Mg = 24, Cl = 35.5. 1 mol of gas occupies 24 dm³ at room conditions]

[5 markah /5 marks]

- (b) Rajah 7.2 menunjukkan graf isipadu gas yang terhasil melawan masa bagi tiga set eksperimen untuk menyiasat faktor-faktor yang mempengaruhi kadar tindak balas antara zink dan asid nitrik.

Diagram 7.2 shows the graph of volume of gas released against time for three sets of experiments to investigate the factors affecting rate of reaction between zinc and nitric acid.



Rajah 7.2 / Diagram 7.2

Serbuk zink berlebihan ditambah ke dalam 50 cm³ asid nitrik 0.1 mol dm⁻³ pada 30 °C dalam Set I. Cadangkan perubahan yang boleh dilakukan selain daripada suhu untuk mendapatkan lengkung bagi Set II dan Set III.

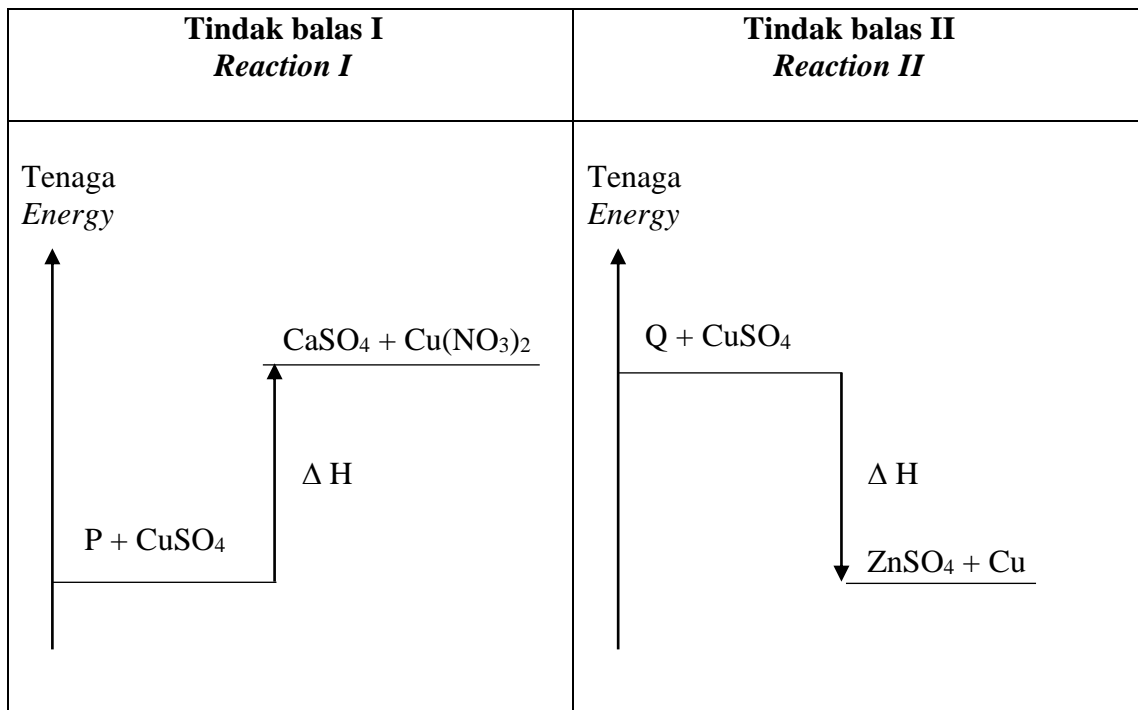
Terangkan kedua-dua cadangan anda berdasarkan teori perlanggaran.

Excess zinc powder is added to 50 cm³ of 0.1 mol dm⁻³ nitric acid at 30 °C in Set I. Suggest changes that can be done other than temperature to obtain the curve in Set II and Set III.

Explain both of your suggestions based on the collision theory.

[10 markah /10 marks]

10. (a) Rajah 8.1 menunjukkan gambar rajah aras tenaga bagi dua tindak balas kimia berbeza menggunakan larutan kuprum(II) sulfat, CuSO_4 .
 Diagram 8.1 shows the energy level diagram for two different chemical reactions using copper(II) sulphate solution, CuSO_4



Rajah 8.1 / Diagram 8.1

- (a) Berdasarkan Rajah 10.1,

- (i) Cadangkan P dan Q.
 Suggest P and Q.

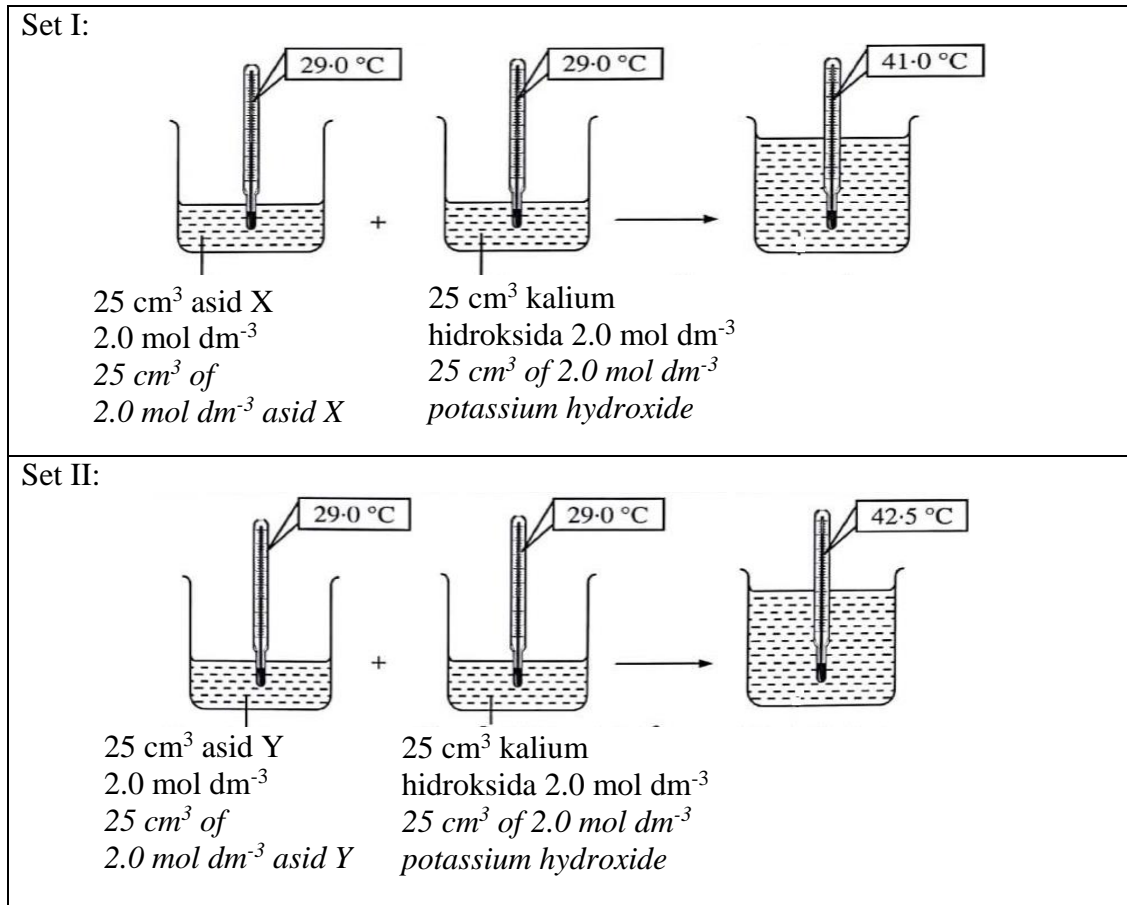
[2 markah / 2 marks]

- (ii) Determine the sign for ΔH . Tentukan tanda bagi ΔH . Banding dan deduksikan maklumat yang diperolehi daripada gambar rajah aras tenaga bagi Tindak balas I dan Tindak balas II. Compare and deduce the information that can be obtained from the energy level diagrams for Reaction I and Reaction II.

[5 markah / 5 marks]

- (b) Rajah 8.2 menunjukkan susunan alat radas dan suhu yang direkodkan untuk menentukan haba peneutralan menggunakan dua jenis asid, asid X dan asid Y dengan larutan kalium hidroksida.

Diagram 8.2 shows the apparatus set-up and the temperature recorded to determine the heat of neutralisation using two types of acid, acid, X and acid Y with potassium hydroxide solution.



Rajah 8.2 / Diagram 8.2

Berdasarkan Rajah 8.2,
Based on Diagram 8.2,

- (i) Nyatakan definisi bagi haba peneutralan. Hitungkan haba peneutralan bagi Set I dan Set II.
[Diberi muatan haba tentu bagi larutan ialah $C = 4.2 \text{ J g}^{-1} \text{ } ^\circ\text{C}^{-1}$; ketumpatan larutan = 1 g cm^{-3}]

State the definition for heat of neutralisation. Calculate the heat of neutralisation of the reaction in Set I and Set II.

[Given the heat specific heat capacity of solution is $C = 4.2 \text{ J g}^{-1} \text{ } ^\circ\text{C}^{-1}$; density of solution = 1 g cm^{-3}]

[7 markah / 7 marks]

- (ii) Namakan asid X dan asid Y. Terangkan mengapa terdapat perbezaan haba peneutralan antara Set I dan Set II.
Name acid X and acid Y. Explain why there is a difference in heat of neutralisation between Set I and Set II.

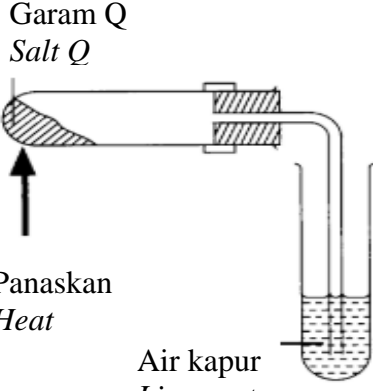
[6 markah / 6 marks]

BAHAGIAN C

[20 markah]

Jawab soalan dalam bahagian ini.

- 11 (a) Rajah 9 menunjukkan maklumat bagi tindakan haba ke atas garam Q.
Diagram 9 shows the information on action of heat for salt Q.

Susunan alat radas <i>Apparatus set-up</i>	Hasil <i>Products</i>	Pemerhatian <i>Observation</i>
	Baki R <i>Residue R</i>	Pepejal perang apabila panas, kuning apabila sejuk <i>Brown solid when hot, yellow when cold</i>
	Gas S <i>Gas S</i>	Air kapur menjadi keruh <i>Lime water become chalky</i>

Rajah 9 / *Diagram 9*

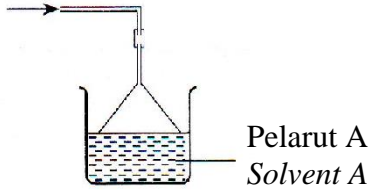
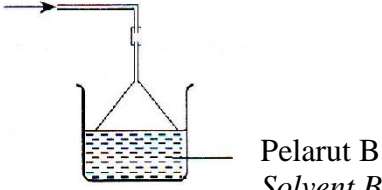
Berdasarkan Rajah 11, kenal pasti garam !, baki R dan gas S
 Tuliskan persamaan kimia bagi tindak balas yang berlaku.

*Based on Diagram 11, identify salt Q, residue R and gas S.
 Write the chemical equation the reaction that occur*

[4 markah / 4 marks]

- (b) (i) Jadual 5 menunjukkan susunan radas bagi penyediaan larutan X dan larutan Y dan keputusan yang diperolehi apabila logam zink ditambahkan kepada kedua-dua larutan.

Table 5 shows the apparatus set-up for the preparation of solution X and solution Y and the results obtained when zinc metal is added to both solutions.

Susunan radas <i>Apparatus set-up</i>	Bahan tindak balas <i>Reactants</i>	Pemerhatian <i>Observation</i>
Gas hydrogen klorida kering <i>Dry hydrogen chloride gas</i>  Pelarut A <i>Solvent A</i> Larutan X <i>Solution X</i>	Zink + Larutan X <i>Zinc + Solution X</i>	Gelembung gas <i>Bubbles of gas</i>
Gas hydrogen klorida kering <i>Dry hydrogen chloride gas</i>  Pelarut B <i>Solvent B</i> Larutan Y <i>Solution Y</i>	Zink + Larutan Y <i>Zinc + Solution Y</i>	Tiada gelembung gas <i>No bubble of gas</i>

Jadual 5 / *Table 5*

Berdasarkan Jadual 5, cadangkan nama pelarut A dan pelarut B.

Jelaskan pemerhatian

Tulis persamaan bagi tindak balas yang berlaku dalam Larutan X apabila zink ditambahkan

Based on Table 5, suggest the name of solvent A and solvent B.

Explain the observations.

Write the equation for the reaction that occurs in solution X when zinc is added

[6 markah / 6 marks]

- (ii) Cadangkan larutan yang dapat bertindak balas dengan natrium hidroksida untuk menghasilkan garam dan air.
Namakan tindak balas tersebut. Tulis persamaan ion bagi tindak balas.

Suggest the solution that can reacts with sodium hydroxide to produce salt and water.

Name the reaction. Write an ionic equation for the reaction.

[3 markah / 3 marks]

- (iii) Huraikan secara ringkas bagaimana tindak balas antara larutan yang dicadangkan dan natrium hidroksida dapat dilakukan melalui pentitratan. Kemudian, tentukan isipadu larutan tersebut yang diperlukan.

Describe briefly how the reaction between solution that being suggested and sodium hydroxide can be carried out by titration. Hence, determine the volume of that solution needed.

[7 markah / 7 marks]

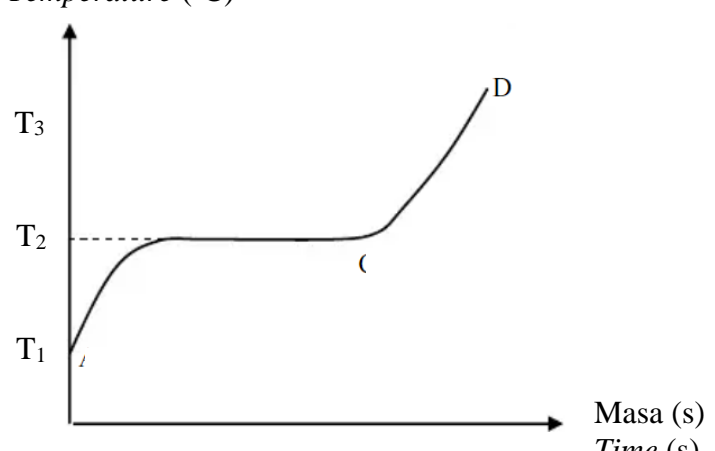
KERTAS PEPERIKSAAN TAMAT
END OF QUESTION PAPER

SKEMA JAWAPAN / PEMARKAHAN

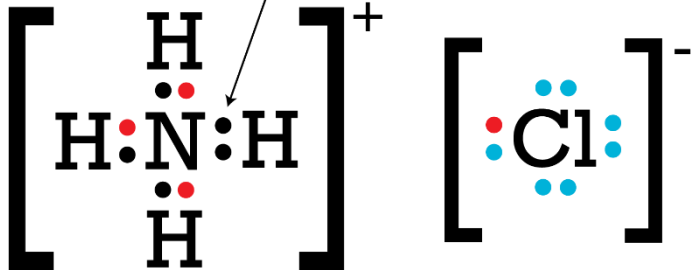
PRAKTIS KIMIA 4541/2

SET 1

Soalan Question		Jawapan Answer	Markah Marks	
			Sub	Total
1	(a)	P: Seramik tradisional // <i>Traditional ceramic</i> Q: Seramik termaju // <i>Advanced ceramic</i>	1 1	1 1
	(b)	Tanah liat <i>Clay // kaolin</i>	1	1
	(c)	Rintangan haba tinggi//mudah pecah//lengai secara kimia//penebat elektrik//keras dan kuat//penebat haba//rapuh <i>High thermal resistant // Breaks easily // Chemically inert // Electrical insulator // Hard and strong // Heat insulator// Brittle</i> (mana-mana satu jawapan yang betul) <i>(any one correct answer)</i>	1	1
	(d)	Implan pergigian// membuat tulang pinggul/ tulang lutut// diguna dalam mesin MRI <i>Dental implants// to make knee/hip bone // used in MRI machine</i> (mana-mana jawapan yang betul) <i>(any correct answer)</i>	1	1
Jumlah / Total				5
2	(a)	Suhu malar apabila sesuatu bahan bertukar daripada keadaan cecair menjadi pepejal pada tekanan tertentu. <i>The constant temperature when a substance changes from liquid state to become solid at a specific pressure.</i>	1	1
	(b)	T ₂ °C	1	1
	(c)	Tenaga haba yang dibebaskan ke persekitaran diimbangi oleh tenaga haba yang terbebas apabila zarah menarik antara satu sama lain membentuk pepejal. <i>Heat energy that is lost to the surroundings is balanced by the heat energy released when the particles attract each other to form solid.</i>	1	1

Soalan Question		Jawapan Answer	Markah Marks	
			Sub	Total
	(d)	Suhu ($^{\circ}\text{C}$) Temperature ($^{\circ}\text{C}$)  1M – labelled correctly (axes) 1M – correct and smooth curve	1 1	2
Jumlah / Total				5
3.	(a)	Logam Alkali <i>Alkali metal</i>	1	1
	(b)	Litium kurang reaktif daripada X // X lebih reaktif daripada Litium. <i>Lithium is less reactive than // X is more reactive than Lithium.</i>	1	1
	(c)	(i) P1. Formula kimia bahan dan produk betul <i>Correct chemical formula for reactant and product</i> P2. Persamaan seimbang <i>Balance equation</i> $4\text{X} + \text{O}_2 \rightarrow 2\text{X}_2\text{O}$ // $4\text{K} + \text{O}_2 \rightarrow 2\text{K}_2\text{O}$ //	1 1	2
	(ii)	P1. Nisbah mol betul / <i>Correct mole ratio</i> P2. Jisim / <i>Mass</i> 4 mol X menghasilkan 2 mol X_2O 0.5 mol X menghasilkan $0.5 \times \frac{2}{4} = 0.25$ mol X_2O // <i>4 mol of X produced 2 mol of X_2O //</i> <i>0.5 mol of X produced $0.5 \times \frac{2}{4} = 0.25$ mol of X_2O //</i> Jisim of X_2O / <i>Mass of X_2O</i> $= 0.25 \times [39 \times 2 + 16]$ $= 0.25 \times 94$ $= 23.5$ g	1 1	2
Jumlah / Total				6

Question Soalan		Answers Jawapan	Marks Markah																
			Sub	Total															
4	(a)	Formula kimia yang menunjukkan nisbah paling ringkas bagi bilangan atom setiap jenis unsur dalam sesuatu sebatian. <i>Chemical formula that shows the simplest ratio of the number of atoms of each element in a compound.</i>	1	1															
	(b)	X: Magnesium //Zink // Aluminium <i>Magnesium//Zinc// Aluminium</i> Y: Kuprum//Plumbum // Stanum <i>Copper//Lead // Tin</i>	1 1	2															
	(c)	$\text{CuO} + \text{H}_2 \rightarrow \text{Cu} + \text{H}_2\text{O}$	1	1															
	(d)	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Unsur <i>Element</i></th> <th style="text-align: center;">X</th> <th style="text-align: center;">O</th> </tr> </thead> <tbody> <tr> <td>Jisim (g) <i>Mass (g)</i></td> <td style="text-align: center;">2.4</td> <td style="text-align: center;">$4.0 - 1.2 = 1.6$</td> </tr> <tr> <td>Bilangan mol <i>Number of moles</i></td> <td style="text-align: center;">$\frac{2.4}{24} = 0.1$</td> <td style="text-align: center;">$\frac{1.6}{16} = 0.1$</td> </tr> <tr> <td>Nisbah paling ringkas <i>Simplest ratio</i></td> <td style="text-align: center;">$\frac{0.1}{0.1} = 1$</td> <td style="text-align: center;">$\frac{0.1}{0.1} = 1$</td> </tr> <tr> <td>Formula empirik <i>Empirical formula</i></td> <td colspan="2" style="text-align: center;">XO</td> </tr> </tbody> </table>	Unsur <i>Element</i>	X	O	Jisim (g) <i>Mass (g)</i>	2.4	$4.0 - 1.2 = 1.6$	Bilangan mol <i>Number of moles</i>	$\frac{2.4}{24} = 0.1$	$\frac{1.6}{16} = 0.1$	Nisbah paling ringkas <i>Simplest ratio</i>	$\frac{0.1}{0.1} = 1$	$\frac{0.1}{0.1} = 1$	Formula empirik <i>Empirical formula</i>	XO		1 1 1	3
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Formula empirik <i>Empirical formula</i>	XO																		
Jumlah / Total				7															
5.	(a)	X: Ikatan hidrogen <i>Hydrogen bond</i> Y: Ikatan kovalen <i>Covalent bond</i>	1 1	2															
	(b)	Ikatan hidrogen adalah daya tarikan antara atom hidrogen yang terikat kepada atom yang lebih tinggi keelektronegatifan iaitu N, O atau F dengan atom N, O atau F dalam molekul lain. <i>Hydrogen bond is an attraction force between hydrogen atom that is bonded with an atom of high electronegativity such as N, O or F, with N, O or F atom in another molecule.</i>	1	1															

Question Soalan		Answers Jawapan	Marks Markah		
			Sub	Total	
5	(c)	1. Bilangan elektron yang betul and cas yang betul, nisbah ion yang betul <i>Correct number of electrons and charge of each ion, correct ratio for ions</i> 2. Label ikatan datif di tempat yang betul <i>Correct label of dative bond</i> Ikatan datif <i>Dative bond</i> 	1 1	2	
	(d)	1. H ⁺ dari hydrogen klorida tidak mempunyai electron dalam petala. <i>H⁺ ion from the hydrogen chloride does not have any electron in the shell</i> 2. Pasangan elektron bebas pada atom nitrogen yang tidak terlibat dalam ikatan kovalen <i>Lone pair of electrons at nitrogen atom that are not involved in covalent bond in the ammonia molecules.</i> 3. Akan dikongsikan kepada ion hidrogen. <i>Will be shared to hydrogen ion.</i>	1 1 1	3	
Jumlah/Total				9	
6.	(a)	Bahan semula jadi atau sintetik yang ditambahkan pada makanan untuk menghalang kerosakan atau memperbaiki rupa bentuk, rasa atau tekstur. <i>Natural or synthetic ingredients added to food to prevent damage or to improve the appearance, taste or texture.</i>	1	1	
	(b)	(i)	Y : Pewarna / <i>Dyes</i> Z : Pengawet / <i>Preservatives</i>	1 1	2
		(ii)	Gula / <i>Sugar</i>	1	1
		(iii)	Aspartam // Sorbitol // Stevia Aspartame // Sorbitol // Stevia	1	1

Question Soalan			Answers Jawapan	Marks Markah	
				Sub	Total
6.	(c)		1. Sesuai digunakan <i>Suitable to be used</i> 2. Tanaman dan buahan bermusim dapat dinikmati sepanjang tahun // Makanan kekal segar lebih lama // Kelihatan lebih menarik // Rasa lebih sedap <i>Seasonal crops and fruits can be enjoyed all year round // Food stays fresh and lasts longer // Enhance appearance // Taste better</i> Atau / Or 1. Tidak sesuai digunakan <i>Not suitable to be used</i> 2. Alahan // Gangguan saraf // Asma, ruam dan hiperaktif pada kanak-kanak // Kanser <i>Allergies // Nerve disorder // Astma, rashes and hyperactivity in children</i>	1	2
			1		
			Bilangan mol Na = $\frac{0.29}{116}$ <i>Number of mol</i> = 0.0025 mol Bil molekul etil butanoat <i>No of molecules of ethyl butanoate</i> = $0.0025 \times 6.02 \times 10^{23}$ = 1.505×10^{21}	1	2
			Jumlah / Total		9
7.	(a)	(i)	$\text{Cu}^{2+}, \text{SO}_4^{2-}, \text{H}^+, \text{OH}^-$ [a: nama bagi ion // <i>name of ions</i>]	1	1
		(ii)	Penurunan // <i>Reduction</i>	1	1
		(iii)	$\text{Cu} \rightarrow \text{Cu}^{2+} + 2\text{e}^-$	1	1
		(iv)	1. Warna biru dinyahwarna // <i>Blue solution decolourises</i> 2. Kepekatan ion Cu^{2+} berkurang // <i>Concentration of Cu^{2+} ions decreases</i>	1 1	2
(b)	(i)	$\text{Pt(s)} \text{Fe}^{2+}(\text{aq}), \text{Fe}^{3+}(\text{aq}) \text{Cl}_2(\text{g}) \text{Cl}^-(\text{aq}) \text{Pt(s)}$	1	1	
	(ii)	Voltan sel = $+1.36 - (+0.77) \text{ V}$ <i>Voltage</i> = $+0.59 \text{ V}$	1 1	2	

Question Soalan			Answers Jawapan	Marks Markah	
				Sub	Total
7.	(c)	(i)	1. Natrium klorida // Magnesium klorida // Kalium klorida <i>Sodium chloride // Magnesium chloride // Potassium chloride</i> [Mana-mana garam terlarutkan klorida yang tidak mengandungi ion kuprum(II) / <i>Any soluble chloride salt that does not contain copper(II) ion</i>] 2. Natrium nitrat// Magnesium sulfat // Kalium nitrat <i>Sodium nitrate // Magnesium sulphate // Potassium nitrate</i> [Mana-mana garam terlarutkan sulfat dan nitrat yang tidak mengandungi ion kuprum(II) / <i>Any soluble sulphate and nitrate salt that does not contain copper(II) ion</i>]	1	2
		(ii)	Bunyi 'pop' dihasilkan <i>A 'pop' sound is produced</i>	1	
			Jumlah / Total		10
8.	(a)	(i)	Etena / <i>Ethene</i> / C_2H_4	1	1
		(ii)	1. Bilangan mol glukosa / <i>Number of moles of glucose</i> 2. Nisbah mol betul / <i>Correct mole ratio</i> 3. Jisim / <i>Mass</i> $\text{Bilangan mol } C_6H_{12}O_6 = \frac{900}{180}$ $\text{Number of mol} = 5 \text{ mol}$ 1 mol $C_6H_{12}O_6$: 2 mol C_2H_5OH 5 mol $C_6H_{12}O_6$: 10 mol C_2H_5OH Jisim of C_2H_5OH // <i>Mass of</i> C_2H_5OH = 5×46 = 230 g	1 1 1	3
		(iii)	1. Kaedah I / <i>Method I</i> 2. Glukosa ialah bahan semula jadi // Glukosa mudah didapati <i>Glucose is a natural substance // Glucose is easy to get</i> Atau / <i>Or</i> 1. Kaedah II / <i>Method II</i> 2. Method II Boleh menghasilkan etanol dalam kuantiti yang banyak // dalam masa yang singkat <i>Can produce ethanol in large quantity // in shorter time</i>	1 1	2

Question Soalan		Answers Jawapan	Marks Markah					
			Sub	Total				
	(b)	(i)	$ \begin{array}{ccccccc} & \text{H} & & \text{H} & & \text{O} & \\ & & & & & & \\ \text{H} & - \text{C} & - & \text{C} & - & \text{C} & - \text{OH} \\ & & & & & & \\ & \text{H} & & \text{H} & & & \end{array} $		1	1		
		(ii)	<ol style="list-style-type: none"> 1. Tambah etanol ke dalam bahan Z / asid propanoik dalam sebuah tabung didih <i>Add ethanol to substance Z / propanoic acid in a boiling tube</i> 2. Tambah beberapa titik asid sulphurik pekat dan dipanaskan <i>Add a few drops of concentrated sulphuric acid and heated</i> 3. Tuang kandungan tabung didih ke dalam bikar yang berisi air <i>Pour the content of boiling tube into a beaker filled with water</i> 		1	1	1	3
			Jumlah / Total					10

Question Soalan			Answers Jawapan	Marks Markah	
				Sub	Total
9.	(a)	(i)	1. Ubat antasid perlu dikunyah <i>The antacid tablets need to be chewed</i> 2. Ubat antasid yang dikunyah mempunyai saiz yang lebih kecil <i>The chewed antacid tablets are smaller in size.</i> 3. Jumlah luas permukaan yang lebih besar terdedah / bertindak balas dengan asid <i>Larger total surface area exposed / react with acid</i>	1 1 1	3
		(ii)	1. Kadar tindak balas purata Set I = $\frac{45.30}{240}$ <i>Average rate of reaction Set I</i> $= 0.189 \text{ cm}^3 \text{ s}^{-1}$ 2. Kadar tindak balas purata Set II = $\frac{60.00}{120}$ <i>Average rate of reaction Set II</i> $= 0.50 \text{ cm}^3 \text{ s}^{-1}$	1 1	2
		(iii)	1. Formula bahan dan hasil tindak balas yang betul <i>Correct chemical formula of reactants and products</i> 2. Persamaan kimia seimbang yang betul <i>Correct balance chemical equation</i> $2\text{HCl} + \text{MgCO}_3 \rightarrow \text{MgCl}_2 + \text{CO}_2 + \text{H}_2\text{O}$ 3. Bilangan mol karbon dioksida = $\frac{60}{24000}$ 4. <i>Number of mol carbon dioxide</i> = 0.0025 mol 5. MgCO_3 : CO_2 1 mol : 1 mol 0.0025 mol : 0.0025 mol 6. Jisim MgCO_3 = 0.0025×84 <i>Mass of MgCO_3</i> = 0.21g	1 1 1 1	5

Question Soalan		Answers Jawapan	Marks Markah	
			Sub	Total
(b)		Untuk mendapat Lengkung Set II / To obtain curve Set II		
		1. Tambah mangkin / kuprum(II) sulfat <i>Add catalyst / copper(II) sulphate</i>	1	10
		2. Mangkin merendahkan tenaga pengaktifan <i>Catalyst lowers the activation energy</i>	1	
		3. Lebih banyak Zn dan H ⁺ mencapai tenaga pengaktifan yang lebih rendah <i>More Zn and H⁺ can achieve the lower activation energy</i>	1	
		4. Frekuensi perlanggaran berkesan antara zarah meningkat <i>Frequency of effective collision between particles increases</i>	1	
		5. Kadar tindak balas lebih tinggi <i>Higher rate of reaction</i>	1	
		Untuk mendapat Lengkung Set III / To obtain curve Set III	1	
		6. Guna 25 cm ³ asid nitrik 0.1 mol dm ⁻³ <i>Use 25 cm³, 0.1 mol dm⁻³ nitric acid.</i>		
		7. Tambah mangkin / kuprum(II) sulfat <i>Add catalyst / copper(II) sulphate</i>	1	
		8. Mangkin merendahkan tenaga pengaktifan <i>Catalyst lowers the activation energy</i>	1	
9. Lebih banyak Zn dan H ⁺ mencapai tenaga pengaktifan yang lebih rendah <i>More Zn and H⁺ can achieve the lower activation energy</i>	1			
10. Frekuensi perlanggaran berkesan antara zarah meningkat <i>Frequency of effective collision between particles increases</i>	1			
		Atau / or		
		6. Guna 12.5 cm ³ asid hidroklorik <i>Use 12.5 cm³ hydrochloric acid.</i>		
		7. dengan kepekatan 0.2 mol dm ⁻³ <i>With concentration of 0.2 mol dm⁻³.</i>		
		8. Bilangan H ⁺ per unit isipadu meningkat <i>Number of H⁺ per unit volume increases</i>		
		9. Frekuensi perlanggaran antara Zn dan H ⁺ meningkat <i>Frequency of collision between Zn and H⁺ increases</i>		
		10. Frekuensi perlanggaran berkesan antara zarah meningkat <i>Frequency of effective collision between particles increases</i>		
		Jumlah / Total		20

Soalan Question			Jawapan Answer		Markah Marks													
					Sub	Total												
10.	(a)	(i)	1. P: Kalsium nitrat / <i>Calcium nitrate</i> / $\text{Ca}(\text{NO}_3)_2$ 2. Q: Zink / <i>Zinc</i> / Zn		1 1	2												
		(ii)	<table border="1"> <thead> <tr> <th>Tindak balas I Reaction I</th> <th>Tindak balas II Reaction II</th> </tr> </thead> <tbody> <tr> <td>ΔH positif / <i>positive</i></td> <td>ΔH negatif / <i>negative</i></td> </tr> <tr> <td>Endotermik // <i>Endothermic</i></td> <td>Eksotermik // <i>Exothermic</i></td> </tr> <tr> <td>Suhu menurun // <i>Temperature decreases</i></td> <td>Suhu meningkat // <i>Temperature increases</i></td> </tr> <tr> <td>Jumlah kandungan tenaga hasil tindak balas lebih tinggi daripada bahan tindak balas <i>Total energy content of product is higher than reactants</i></td> <td>Jumlah kandungan tenaga bahan tindak balas lebih tinggi daripada hasil tindak balas <i>Total energy content of reactants is higher than products</i></td> </tr> <tr> <td>Tenaga haba yang diserap semasa pemecahan ikatan adalah lebih tinggi daripada tenaga haba yang dikeluarkan semasa pembentukan ikatan // <i>Heat energy absorbed during the bond breaking is higher than heat energy released during bonds formation</i></td> <td>Tenaga haba yang dibebaskan semasa pembentukan ikatan adalah lebih tinggi daripada tenaga haba yang diserap semasa pemecahan ikatan // <i>Heat energy released during formation of bond is greater than heat energy absorbed during the bond breaking</i></td> </tr> </tbody> </table>		Tindak balas I Reaction I	Tindak balas II Reaction II	ΔH positif / <i>positive</i>	ΔH negatif / <i>negative</i>	Endotermik // <i>Endothermic</i>	Eksotermik // <i>Exothermic</i>	Suhu menurun // <i>Temperature decreases</i>	Suhu meningkat // <i>Temperature increases</i>	Jumlah kandungan tenaga hasil tindak balas lebih tinggi daripada bahan tindak balas <i>Total energy content of product is higher than reactants</i>	Jumlah kandungan tenaga bahan tindak balas lebih tinggi daripada hasil tindak balas <i>Total energy content of reactants is higher than products</i>	Tenaga haba yang diserap semasa pemecahan ikatan adalah lebih tinggi daripada tenaga haba yang dikeluarkan semasa pembentukan ikatan // <i>Heat energy absorbed during the bond breaking is higher than heat energy released during bonds formation</i>	Tenaga haba yang dibebaskan semasa pembentukan ikatan adalah lebih tinggi daripada tenaga haba yang diserap semasa pemecahan ikatan // <i>Heat energy released during formation of bond is greater than heat energy absorbed during the bond breaking</i>	1 1 1 1 1	5
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Soalan Question			Jawapan Answer	Markah Marks									
				Sub	Total								
10.	(b)	(i)	1. Perubahan haba // Haba dibebaskan apabila 1 mol air terbentuk daripada tindak balas peneutralan antara asid dan alkali Heat change // released when 1 mole of water is formed from the reaction between acid and alkali 2. Bilangan mol asid / alkali di Set I and Set II <i>Number of mole of acid / alkali in Set I and Set II</i> 3. Perubahan haba Set I dan Set II <i>Heat change of Set I and Set II</i> 4. Haba peneutralan Set I dan Set II 5. <i>Heat of neutralisation for Set I and Set II</i>	1 1	2								
			<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Set I</th> <th style="width: 50%;">Set II</th> </tr> </thead> <tbody> <tr> <td> Bilangan mol <i>Number of moles</i> $= \frac{2 \times 25}{1000}$ $= 0.05 \text{ mol}$ </td> <td> Bilangan mol <i>Number of moles</i> $= \frac{2 \times 25}{1000}$ $= 0.05 \text{ mol}$ </td> </tr> <tr> <td> Perubahan haba <i>Heat change</i> $= 50 \times 4.2 \times (41.0 - 29.0)$ $= 2520 \text{ J}$ $= 2.52 \text{ kJ}$ </td> <td> Perubahan haba <i>Heat change</i> $= 50 \times 4.2 \times (42.5 - 29.0)$ $= 2835 \text{ J}$ $= 2.835 \text{ kJ}$ </td> </tr> <tr> <td> Heat of neutralisation $= - \frac{2.52}{0.05}$ $= - 50.4 \text{ kJ mol}^{-1}$ </td> <td> Heat of neutralisation $= - \frac{2.835}{0.05}$ $= - 56.7 \text{ kJ mol}^{-1}$ </td> </tr> </tbody> </table>	Set I	Set II	Bilangan mol <i>Number of moles</i> $= \frac{2 \times 25}{1000}$ $= 0.05 \text{ mol}$	Bilangan mol <i>Number of moles</i> $= \frac{2 \times 25}{1000}$ $= 0.05 \text{ mol}$	Perubahan haba <i>Heat change</i> $= 50 \times 4.2 \times (41.0 - 29.0)$ $= 2520 \text{ J}$ $= 2.52 \text{ kJ}$	Perubahan haba <i>Heat change</i> $= 50 \times 4.2 \times (42.5 - 29.0)$ $= 2835 \text{ J}$ $= 2.835 \text{ kJ}$	Heat of neutralisation $= - \frac{2.52}{0.05}$ $= - 50.4 \text{ kJ mol}^{-1}$	Heat of neutralisation $= - \frac{2.835}{0.05}$ $= - 56.7 \text{ kJ mol}^{-1}$	1+1 1+1 1+1	
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Soalan Question			Jawapan Answer	Markah Marks	
				Sub	Total
10.	(b)	(ii)	1. Asid X: Asid etanoik (Mana-mana asid lemah) <i>Acid X: Ethanoic acid (Any weak acid)</i>	1	6
			2. Asid Y: Asid nitrik / Asid hidroklorik <i>Acid Y: Nitric acid / Hydrochloric acid</i>	1	
			3. Haba peneutralan Set II lebih tinggi daripada Set I <i>Heat of neutralisation in Set II is higher than Set I</i>	1	
			4. Asid X ialah asid lemah manakala asid Y ialah asid kuat. // Asid X mengion separa dalam air manakala asid Y mengion lengkap dalam air <i>Acid X is a weak acid while acid Y is a strong acid // Acid X ionises partially in water while acid Y ionises completely in water</i>	1	
			5. Asid X menghasilkan kepekatan ion hidrogen yang rendah manakala asid Y menghasilkan kepekatan ion hidrogen yang tinggi // Kepekatan ion hidrogen di Set I lebih rendah daripada Set II <i>Acid X produces low concentration of hydrogen ions while acid Y produces high concentration of hydrogen ions // The concentration of hydrogen ions in Set I is lower than Set II</i>	1	
			6. Sebahagian haba yang dibebaskan semasa peneutralan diserap dan digunakan untuk mengionkan molekul asid X dengan lengkap <i>Some of the heat released during neutralisation is absorbed and used to completely ionise the molecule of acid X.</i>	1	
Jumlah / Total				20	

Soalan Question			Jawapan Answer	Markah Marks	
				Sub	Total
11.	(a)		1. Garam Q / <i>Salt Q</i> : PbCO_3	1	4
			2. Baki R / <i>Residue R</i> : Plumbum(II) oksida // Lead(II) oxide // PbO	1	
			3. Gas S : Karbon dioksida / Carbon dioxide / CO_2	1	
			4. $\text{PbCO}_3 \rightarrow \text{PbO} + \text{CO}_2$	1	

Soalan Question		Jawapan Answer	Markah Marks	
			Sub	Total
	(b) (i)	1. Pelarut A: Air <i>Solvent A :/ water</i> 2. Pelarut B: Metilbenzene <i>Solvent B: methylbenzene</i> 3. Dalam larutan X, ion hidrogen hadir <i>In solution X, hydrogen ions present</i> 4. Dalam larutan Y, tiada ion hydrogen hadir <i>In solution Y, no hydrogen ions present</i> 5. Formula bahan dan hasil tindak balas yang betul <i>Correct chemical formula of reactants and products</i> 6. Persamaan kimia seimbang yang betul <i>Correct balance chemical equation</i> $\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$	1 1 1 1 1	6
	(ii)	1. Larutan X / <i>Solution X</i> 2. Peneutralan / <i>Neutralisation</i> 3. Persamaan ion / <i>Ionic equation</i> : $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$	1 1 1	3
	(iii)	1. 0.1 – 2.0] mol dm ⁻³ larutan X dituangkan ke dalam buret dan rekod bacaan awal <i>[0.1 – 2.0] mol dm⁻³ solution X is poured into a burette and the initial burette reading is recorded</i> 2. Dengan menggunakan pipet, 25 cm ³ larutan natrium hidroksida [0.1 – 2.0] mol dm ⁻³ dituangkan ke dalam kelalang kon. <i>Using a pipette, 25cm³ of [0.1 – 2.0] mol dm⁻³ sodium hydroxide solution is transferred into a conical flask.</i> 3. Beberapa titis fenolftalein ditambah ke dalam kelalang kon itu. <i>A few drops of phenolphthalein are added to the conical flask.</i> 4. Larutan X ditambah dengan perlahan dari buret dan kelalang kon digoncangkan secara berterusan. <i>Solution X is added slowly from the burette and the conical flask is swirled continuously</i> 5. Apabila campuran menghampiri takat akhir, larutan X ditambah secara titis demi titis sehingga warna merah jambu bertukar ke tanpa warna <i>As the mixture nears the end-point solution X is added drop by drop until the pink colour changes to colourless</i> 6. Rekod bacaan akhir buret <i>Record final burette reading.</i> 7. Hitung isi padu asid yang digunakan, V cm ³ <i>Calculate the volume of acid used V cm³</i>	1 1 1 1 1 1	7
		Jumlah / Total		20

LAMPIRAN

(Untuk rujukan guru)

JADUAL SPESIFIKASI UJIAN (JSU) PRAKTIS KIMIA 4541/1: 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		1	2													5
	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	1				2					3									6
	3.4 Chemical equation										1									1
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	1				1			4											6
	4.5 Elements in Group 17																			
	4.6 Elements in Period 3																			
	4.7 Transition elements																			
5. Chemical Bond [F4]	5.1 Basics of compound formation																			
	5.2 Ionic bond																			
	5.3 Covalent bond										1									1
	5.4 Hydrogen bond	1									1									2
	5.5 Dative bond					3			2											5
	5.6 Metallic bond																			
	5.7 Properties of ionic and covalent compounds																			
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			
6. Acid, Base and Salt [F4]	6.1 The role of water in showing acidic and alkaline properties					5		1												6
	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					2			1									7		10
	6.8 Salts, crystals and their uses in daily life																			
	6.9 Preparation of salts																			
	6.10 Effect of heat on salts								1		3									4
	6.11 Qualitative analysis																			
7. Rate of Reaction [F4]	7.1 Determining rate of reaction							2	5											7
	7.2 Factors affecting rate of reaction										3									3
	7.3 Application of factors that affect the rate of reaction in daily life																			
	7.4 Collision theory			2					8											10
8. Manufactured Substances in Industry [F4]	8.1 Alloy and its importance																			
	8.2 Composition of glass and its uses																			
	8.3 Composition of ceramics and its uses	3				2														5
	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		1	2	2										7
	9.4 Electrolytic cell					1					2									3
	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			1																1
	10.3 Chemical properties and interconversion of compounds between homologous series								3		2	1			3					9

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 (ES)	12.1 Polymer																			
	12.2 Natural rubber																			
	12.3 Synthetic rubber																			
13. Consumer and	13.1 Oils and fats																			
	13.2 Cleaning agents																			
	13.3 Food additives	1				2		1	1		2	2								9
	13.4 Medicines and cosmetics industry																			
	13.6 Application of green technology in industrial waste management																			
	Total	10	3	1	12	17	2	7	29	4	13	12	0	0	3	0	0	7	0	120
Ratio of E:M:H																				
Level of Difficulty	E : Easy			M : Medium			H : Hard													

**PROGRAM
KENYALANG CEMERLANG SPM
TAHUN 2023
JABATAN PENDIDIKAN NEGERI SARAWAK**

KIMIA 4541

KERTAS 1

SET 2

Pengenalan

Program Semarak Kasih yang dilaksanakan pada tahun 2020 telah mendapat sambutan yang menggalakkan daripada warga pendidik dan murid, khususnya calon SPM 2023. Sehubungan dengan itu, pada tahun 2023 ini, Sektor Pembelajaran, Jabatan Pendidikan Negeri Sarawak mengadakan **Program Modul Kenyalang Cemerlang SPM 4.0** untuk membantu guru dan calon SPM menghadapi peperiksaan SPM 2023.

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 2023 di semua sekolah menengah di negeri Sarawak.

OBJEKTIF PROGRAM

1. Memastikan calon SPM menguasai format baharu Peperiksaan SPM 2023.
2. Memastikan calon SPM mempunyai bahan pembelajaran yang berfokus ke arah peperiksaan SPM.
3. Meningkatkan pencapaian akademik calon SPM 2023.
4. Melonjakkan keputusan SPM 2023 Negeri Sarawak

Senarai Kandungan

Bil.	Perkara	Muka surat
1	Format Kertas Peperiksaan SPM Mulai Tahun 2021	2
2	Latihan - Praktis Kimia 4541/1: Set 2	3 – 17
3	Skema Jawapan/Pemarkahan	18
4	LAMPIRAN: Sampel Jadual Spesifikasi Ujian (JSU) untuk Praktis Kimia 4541/1: Set 2	19 – 20

Senarai Ahli Panel Pembina Modul Kenyalang Cemerlang SPM 4.0

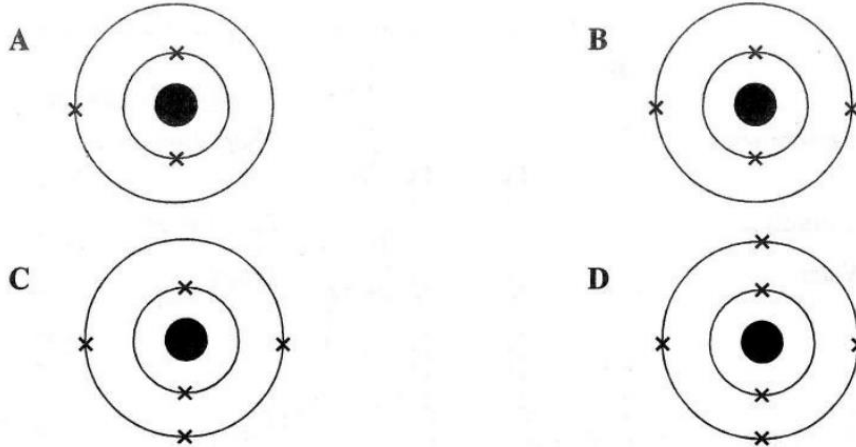
Bil.	Nama Guru	Sekolah	PPD
1.	Francisca Lau Siew Hsia (Ketua)	SMK Methodist	Sibu
2.	Chien Hui Siong	SMK Tinggi Sarikei	Sarikei
3.	Bella Mahony Sie	SMK Luar Bandar Sibu	Sibu
4.	Fun Ngiik Ngon	SMK Bandar Sibu	Sibu
5.	Goh Leh Ling	SMK Sacred Heart	Sibu
6.	Ling Mee Ling	SMK St Elizabeth	Sibu
7.	Ling Teck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

PENYELARAS

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

PRAKTIS KIMIA 4541/1**SET 2**

1. Antara susunan elektron berikut, yang manakah mempunyai tiga elektron valens?
Which of the following electron arrangement consists of three valence electrons?



2. Jadual 1 menunjukkan bilangan elektron dan nombor nukleon bagi zarah-zarah P, Q, R²⁻ dan S⁺.
Table 1 shows the number of electrons and nucleon number for particles P, Q, R²⁻ and S⁺.

Zarah Particle	Bilangan elektron Number of electrons	Nombor nukleon Nucleon number
P	8	16
Q	9	18
R ²⁻	10	18
S ⁺	10	22

Jadual 1 / Table 1

Pasangan zarah yang manakah merupakan isotop?
Which pair of particles are isotopes?

- A P dan R
P and R
- B Q dan R
Q and R
- C P dan S
P and S
- D Q dan S
Q and S
3. Purata jisim satu atom Magnesium adalah 24 kali lebih besar daripada $\frac{1}{12}$ jisim satu atom karbon-12. Apakah jisim atom relatif bagi Magnesium?
The average mass of a magnesium atom is 24 times greater than $\frac{1}{12}$ of the mass of a carbon-12 atom. What is the relative atomic mass of magnesium?

- A 2
- B 12
- C 24
- D 48

4. Yang manakah pernyataan berikut adalah berkaitan dengan definisi bagi ‘satu mol’?
Which of the following statements is related to the definition of ‘one mole’?

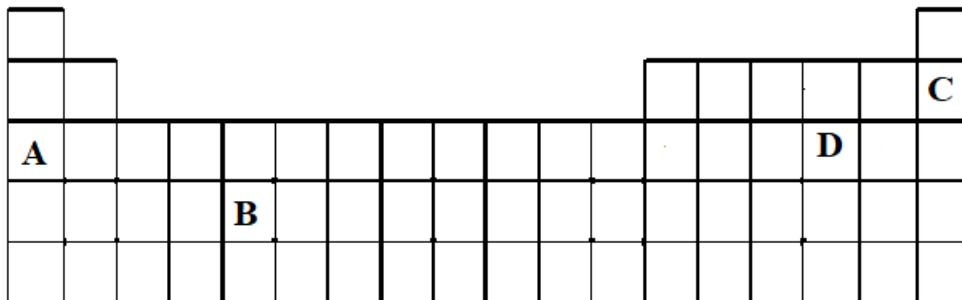
- A Jisim bagi suatu jirim atom yang mengandungi 6.02×10^{23} atom.
The mass of an atomic matter that contains 6.02×10^{23} atoms.
- B Jisim bagi suatu jirim molekul yang mengandungi 6.02×10^{23} molekul.
The mass of a molecular matter that contains 6.02×10^{23} molecules.
- C Isipadu bagi suatu jirim cecair yang mengandungi bilangan zarah yang sama dengan bilangan atom dalam 12.0 g karbon-12.
The volume of a liquid matter that contains the same number of particles as the number of atoms in 12.0 g of carbon-12.
- D Kuantiti bagi suatu jirim yang mengandungi bilangan zarah yang sama dengan bilangan atom dalam 12.0 g karbon-12.
The quantity of a matter that contains the same number of particles as the number of atoms in 12.0 g of carbon-12.

5. Logam X mempunyai ketumpatan rendah dan terapung di permukaan air. Larutan yang terhasil menukarkan kertas litmus merah kepada biru apabila logam X bertindak balas dengan air. Apakah susunan elektron bagi logam X?

Metal X has low density and float on the surface of water. The solution produced turns red litmus paper to blue when metal X reacts with water. What is the electron arrangement of metal X?

- A 2.8.1
- B 2.8.2
- C 2.8.3
- D 2.8.4

6. Rajah 1 menunjukkan kedudukan empat unsur dalam Jadual Berkala. Unsur manakah akan membentuk oksida asid?
Diagram 1 shows the position of four elements in the Periodic Table. Which element is most likely to form an acidic oxide?



Rajah 1 / Diagram 1

7. Pernyataan berikut memerihalkan ciri-ciri unsur X.
The following statements describe the characteristics of element X.

- Digunakan dalam proses Haber untuk menghasilkan ammonia, NH_3 .
Used in Haber process to produce ammonia, NH_3 .
- Oksida unsur X digunakan sebagai pigmen merah dalam cat.
Used as red pigment in paint.

Manakah antara unsur berikut adalah X?
Which of the following element is X?

- | | |
|-------------------------------------|--------------------------------------|
| A Mangan
<i>Manganese</i> | C Titanium
<i>Titanium</i> |
| B Besi
<i>Iron</i> | D Vanadium
<i>Vanadium</i> |

8. Jadual 2 menunjukkan nombor proton bagi unsur P, Q, R dan S. P, Q, R dan S bukan simbol sebenar unsur-unsur itu.

Table 2 shows the proton number of elements P, Q, R and S. P, Q, R and S are not the actual symbols of the elements.

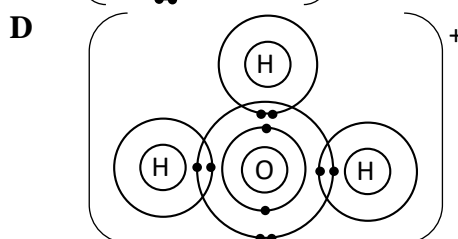
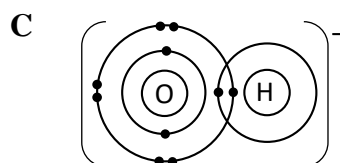
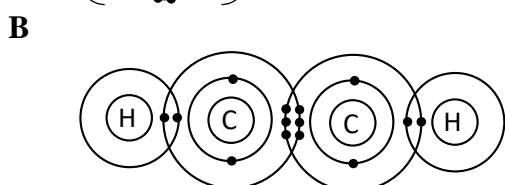
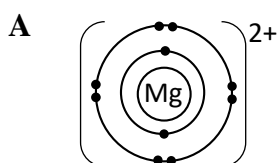
Unsur <i>Element</i>	P	Q	R	S
Nombor proton <i>Proton number</i>	2	11	14	16

Jadual 2 / *Table 2*

Unsur yang manakah akan membentuk ikatan kovalen?
Which elements will form covalent bond?

- | | |
|------------------------------------|------------------------------------|
| A Q dan S
<i>Q and S</i> | C Q dan R
<i>Q and R</i> |
| B P dan R
<i>P and R</i> | D R dan S
<i>R and S</i> |

9. Sebatian manakah yang terbentuk melalui perkongsian elektron di mana kedua-dua elektronnya disumbangkan daripada satu atom sahaja?
Which compound is formed through the sharing of electrons where both electrons are contributed from one atom only?



10. Yang manakah rajah berikut menunjukkan fenomena yang disebabkan oleh kewujudan ikatan hidrogen?
Which of the following diagrams shows the phenomena that is caused by existence of hydrogen bond?

I



III



II



IV



A I dan II
I and II

C II dan III
II and III

B I dan III
I and III

D II dan IV
II and IV

11. Jadual 3 menunjukkan nilai pH bagi larutan P, Q, R dan S.
Table 3 shows the pH values of P, Q, R and S solutions.

Larutan Solution	P	Q	R	S
pH	2	6	7	11

Jadual 3 / Table 3

Larutan manakah yang merupakan alkali?
Which solution is alkaline?

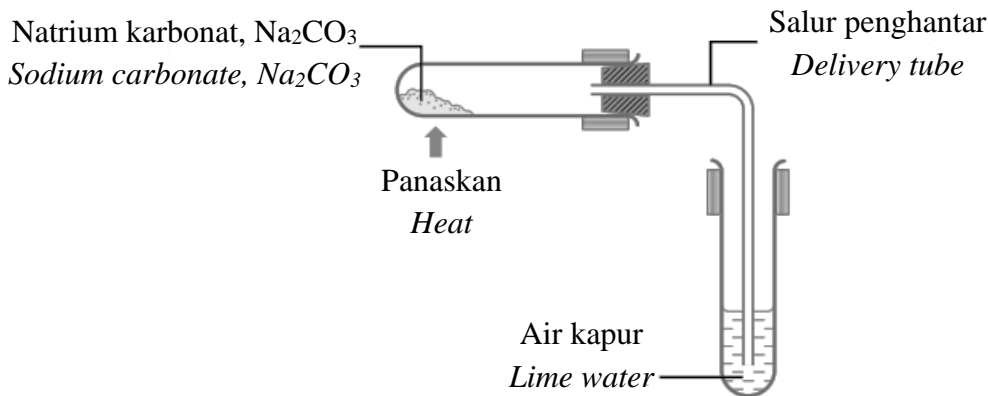
A P
B Q

C R
D S

12. Larutan X mempunyai nilai pH 1.0. Antara pernyataan berikut, yang manakah betul tentang larutan X?
Solution X has a pH value of 1.0. Which of the following statements is correct about solution X?

- A X ialah suatu alkali kuat
X is a strong alkali
- B X ialah suatu asid lemah
X is a weak acid
- C X mengion lengkap dalam air
X ionises completely in water
- D X mempunyai kepekatan ion hidroksida yang tinggi
X has a high concentration of hydroxide ions

13. Antara berikut, yang manakah boleh dikatakan sebagai larutan piawai?
Which of the following can be said to be a standard solution?
- A Larutan garam yang disediakan di dalam makmal
Salt solution prepared in the laboratory
- B Bahan kimia makmal yang berlabel tanda mengakis
Laboratory chemicals labeled as corrosive
- C Sebotol asid yang berlabel H_2SO_4 dan 1.0 mol dm^{-3}
A bottle of acid labeled H_2SO_4 and 1.0 mol dm^{-3}
14. Rajah 2 menunjukkan susunan radas untuk menguji kesan haba ke atas garam natrium karbonat, Na_2CO_3 .
Diagram 2 shows the apparatus set-up to test the effect of heat on sodium carbonate salt, Na_2CO_3 .



Rajah 2 / Diagram 2

- Yang manakah menunjukkan pemerhatian yang betul?
Which of the followings show the correct observation?
- A Air kapur menjadi keruh
Lime water turns cloudy
- B Air kapur tidak bertukar keruh.
Lime water does not turn cloudy.
- C Gas tak berwarna terbebas
Colourless gas released
- D Wasap putih terhasil
White fume produced
15. Antara berikut, yang manakah benar tentang teori perlanggaran suatu tindak balas apabila suhu zarah bahan tindak balas meningkat?
Which of the following is true about the collision theory of a reaction when temperature of the reactant particles increases?
- A Jumlah luas permukaan zarah-zarah bahan tindak bertambah.
Total surface area of reactant particles increases.
- B Tenaga kinetik bahan tindak balas bertambah.
The kinetic energy of reactant particles increases.
- C Jumlah bilangan zarah-zarah per unit isipadu bertambah.
The total number of reactant particles per unit volume increases.
- D Zarah-zarah bahan tindak balas yang berlanggar lebih kerap boleh mengatasi tenaga pengaktifan yang rendah.
The reactant particles which collide more often are able to overcome the lower activation energy.

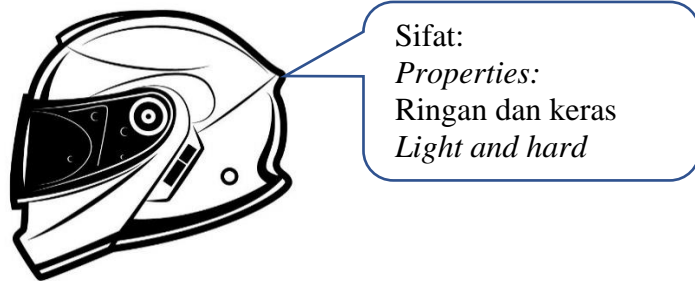
16. Komposisi utama bagi kaca ialah silikon dioksida. Apakah jenis kaca yang terbentuk daripada silikon dioksida tanpa campuran bahan kimia yang lain?
The main composition of glass is silicon dioxide. What type of glass is formed from silicon dioxide without the mixture of other chemicals?

- A Kaca soda kapur
Soda lime glass
- B Kaca plumbum
Lead crystal glass
- C Kaca borosilikat
Borosilicate glass
- D Kaca silika terlakur
Fused silica glass

17. Antara pernyataan berikut yang manakah benar tentang pengoksidaan dan penurunan?
Which of the following is true about oxidation and reduction?

	Pengoksidaan <i>Oxidation</i>	Penurunan <i>Reduction</i>
A	Menerima oksigen <i>Gain of oxygen</i>	Kehilangan hidrogen <i>Loss of hydrogen</i>
B	Kehilangan oksigen <i>Loss of oxygen</i>	Menerima hidrogen <i>Gain of hydrogen</i>
C	Kehilangan elektron <i>Loss of electrons</i>	Menerima elektron <i>Gain of electrons</i>
D	Menerima hidrogen <i>Gain of hydrogen</i>	Kehilangan oksigen <i>Loss of oxygen</i>

18. Rajah 3 menunjukkan satu topi keledar.
Diagram 3 shows a helmet.



Rajah 3 / Diagram 3

- Apakah bahan yang sesuai digunakan untuk menghasilkan topi keledar ini?
Which material is suitable materials to be used to produce this helmet?

- A Kaca digabungkan dengan argentum klorida
Glass combined with silver chloride
- B Plastik diperkukuh dengan gentian kaca
Plastic is strengthened with glass fibers
- C Konkrit diperkukuh dengan tetulang keluli
Concrete is strengthened with steel bars
- D Seramik itrium barium kuprum oksida
Ceramic of yttrium barium copper oxide

19. Antara berikut, ion manakah yang akan dinyahcas di anod semasa elektrolisis larutan argentum nitrat 0.5 mol dm^{-3} ?
Which of the following ions will be discharged at anode during electrolysis of 0.5 mol dm^{-3} silver nitrate solution?

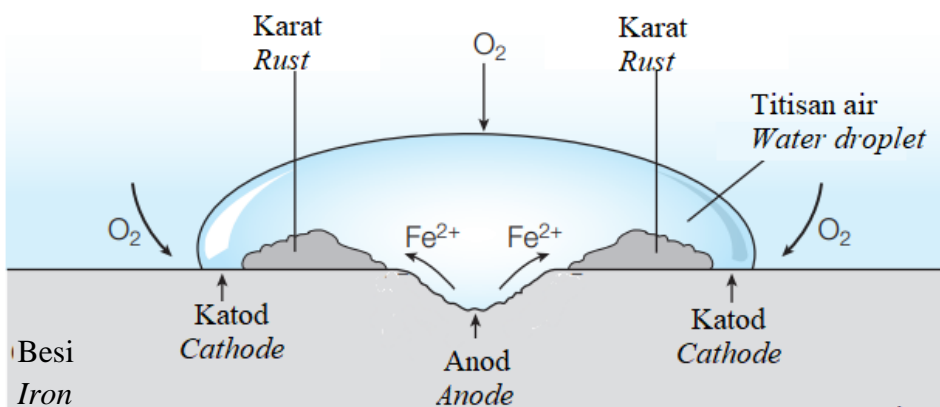
- | | |
|--|---|
| A Ion nitrat
<i>Nitrate ion</i> | C Ion argentum
<i>Silver ion</i> |
| B Ion hidrogen
<i>Hydrogen ion</i> | D Ion hidroksida
<i>Hydroxide ion</i> |

20. Kriolit, Na_3AlF_6 digunakan dalam proses pengekstrakan aluminium dalam industri. Apakah kegunaan bahan ini?

Cryolite, Na_3AlF_6 is used in the extraction process of aluminium in industry. What is the use of this substance?

- A** Merendahkan takat lebur aluminium oksida
Lowers the melting point of aluminium oxide
- B** Menyingkirkan bendasing
Removes impurities
- C** Menghalang elektrod daripada dioksidakan
Prevents the electrode from being oxidized
- D** Meningkatkan kadar tindak balas
Increases the rate of reaction

21. Rajah 4 menunjukkan mekanisme pengaratan besi dengan kehadiran titisan air dan oksigen.
Diagram 4 shows the mechanism of rusting with the presence of water and oxygen.



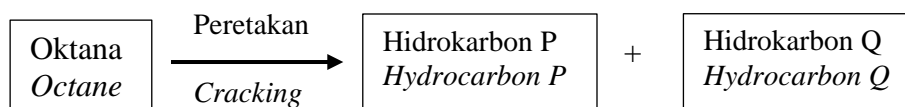
Rajah 4 / Diagram 4

Manakah pasangan persamaan setengah 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	$\text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^- \rightarrow 4\text{OH}^-$	$\text{Fe} \rightarrow \text{Fe}^{2+} + 2\text{e}^-$
B	$\text{Fe} \rightarrow \text{Fe}^{2+} + 2\text{e}^-$	$\text{O}_2 + \text{H}_2\text{O} + 4\text{e}^- \rightarrow 4\text{OH}^-$
C	$\text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^- \rightarrow 4\text{OH}^-$	$\text{Fe}^{2+} + 2\text{OH}^- \rightarrow \text{Fe}(\text{OH})_2$
D	$\text{Fe} \rightarrow \text{Fe}^{2+} + 2\text{e}^-$	$\text{Fe}(\text{OH})_2 \rightarrow \text{Fe}_2\text{O}_3 \cdot \text{H}_2\text{O}$

- 22 Rajah 5 menunjukkan pertukaran oktana kepada hidrokarbon P dan hidrokarbon Q melalui proses peretakan.
Diagram 5 shows the conversion of octane to hydrocarbon P and Q by cracking process.



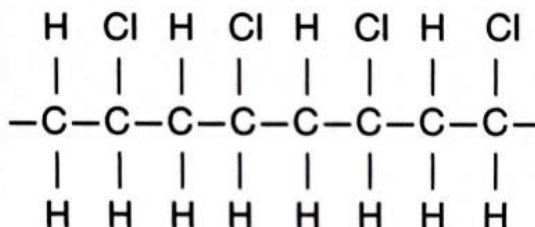
Rajah 5 / Diagram 5

- Hidrokarbon P melunturkan warna perang larutan bromin.
Hydrocarbon P decolourises brown colour of bromine water.
- Pembakaran lengkap 1 mol hidrokarbon Q menghasilkan 4 mol karbon dioksida.
Complete combustion of 1 mole of hydrocarbon Q produces 4 moles of carbon dioxide.

Kenalpasti hidrokarbon P?
Identify hydrocarbon P?

- | | |
|----------------------------------|------------------------------------|
| A Butana
<i>Butane</i> | C Propana
<i>Propane</i> |
| B Butena
<i>Butene</i> | D Propena
<i>Propene</i> |

23. Rajah 6 menunjukkan formula struktur bagi sebatian Y.
Diagram 6 shows the structural formula of compound Y.

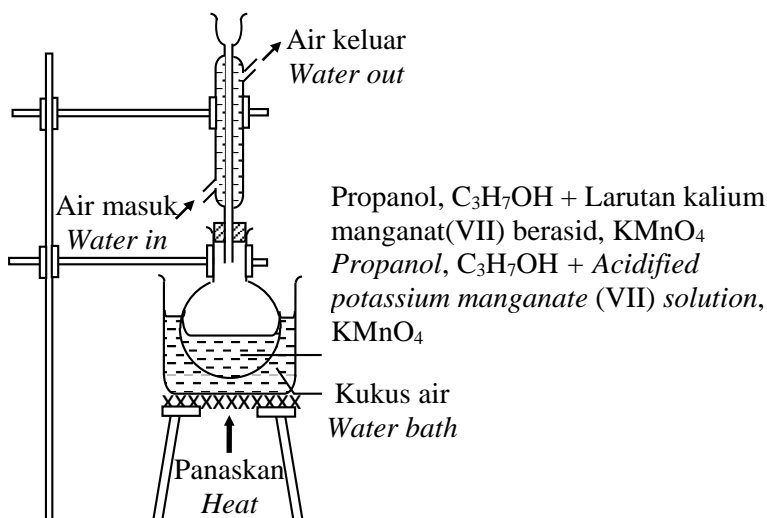


Rajah 6 / Diagram 6

Yang manakah berikut merupakan formula struktur yang betul bagi monomernya?
Which of the following is the correct structural formula of its monomer?

- | | |
|---|--|
| A $ \begin{array}{c} \text{H} \quad \text{Cl} \quad \text{H} \\ \quad \quad \\ \text{C} = \text{C} - \text{C} - \text{H} \\ \quad \quad \\ \text{H} \quad \quad \text{H} \end{array} $ | C $ \begin{array}{c} \text{Cl} \quad \text{Cl} \\ \quad \\ \text{C} = \text{C} \\ \quad \\ \text{H} \quad \text{H} \end{array} $ |
| B $ \begin{array}{c} \text{H} \quad \text{Cl} \\ \quad \\ \text{C} = \text{C} \\ \quad \\ \text{H} \quad \text{H} \end{array} $ | D $ \begin{array}{c} \text{Cl} \quad \text{Cl} \\ \quad \\ \text{C} = \text{C} \\ \quad \\ \text{Cl} \quad \text{H} \end{array} $ |

24. Rajah 7 menunjukkan satu eksperimen refluks bagi propanol dengan larutan kalium manganat(VII) berasid untuk menghasilkan sebatian X.
 Diagram 7 shows a reflux experiment for propanol with acidified potassium manganate(VII) solution to produce compound X.



Rajah 7 / Diagram 7

Antara yang berikut, yang manakah sifat sebatian X?
 Which of the following is a property of compound X?

- A** Larut dalam air
Soluble in water
- B** Berbau wangi buah-buahan
Smells fruity fragrance
- C** Menyahwarnakan warna ungu larutan kalium manganat(VII) berasid
Decolourises the purple colour of acidified potassium manganate(VII) solution
- D** Bertindak balas dengan serpihan porselin untuk membebaskan gas tidak berwarna
Reacts with porcelain chips to release colourless gas.
25. Manakah antara pasangan hidrokarbon, R dan S yang berikut merupakan isomer?
 Which of the following pairs of hydrocarbon, R and S, are isomers?

	R	S
I	2-methylpropane <i>2-methylpropane</i>	Pentane <i>Pentane</i>
II	2, 2- dimethylpropane <i>2,2-dimethylpropane</i>	Pentane <i>Pentane</i>
III	2-methylbutane <i>2-methylbutane</i>	Pent-1-ene <i>Pent-1-ene</i>
IV	2-methylbut- 1-ene <i>2-methylbut-1-ene</i>	Pent-2-ene <i>Pent-2-ene</i>

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

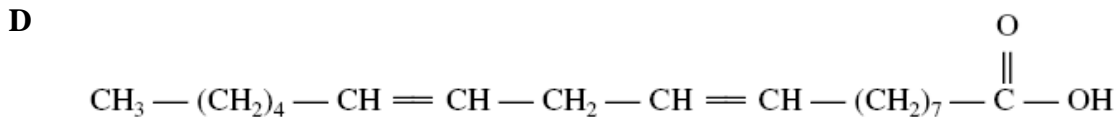
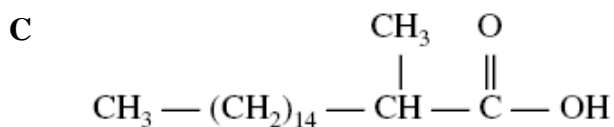
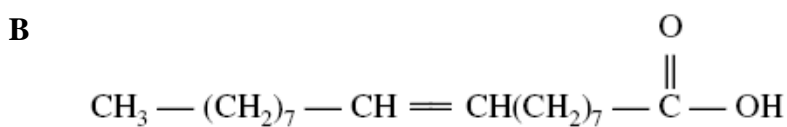
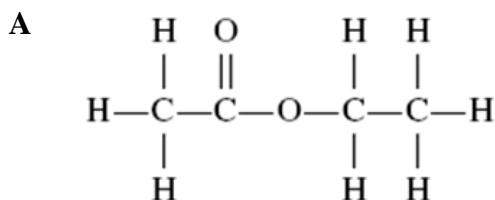
26. Rajah 8 menunjukkan sepasang tapak kasut yang diperbuat daripada getah stirena-butadiena.
Diagram 8 shows a pair of shoe sole which is made from styrene-butadiene rubber.



Rajah 8
Diagram 8

Antara berikut, yang manakah sifat bagi getah tersebut?
Which of the following is the characteristic of the rubber?

- A Tahan terhadap suhu rendah
Resistant to low temperature
- B Tahan terhadap pelepasan
Resistant to abrasion
- C Tahan terhadap bahan kimia
Resistant to chemicals
- D Tahan terhadap pelarut organik
Resistant to organic solvents
27. Apakah formula struktur bagi asid lemak monotaktepu?
What is the structural formula of a monounsaturated fatty acid?



28. Aini telah menghasilkan sebotol losyen badan dalam makmal. Aini mendapati kulitnya terasa berminyak apabila losyen tersebut disapu pada kulitnya. Antara berikut, pasangan bahan tambah kosmetik dan contoh manakah yang perlu ditambah oleh Aini ke dalam losyen badan untuk menyelesaikan masalah tersebut?

Aini produced a bottle of body lotion in the laboratory. Ani found that her skin feels oily after the body lotion was applied onto her skin. Which of the following pair of cosmetic additive and example should be added by Aini into the body lotion to solve the problem?

	Bahan tambah kosmetik <i>Cosmetic additive</i>	Contoh <i>Example</i>
A	Pemekat <i>Thickener</i>	Gliserin <i>Glycerin</i>
B	Pengawet <i>Preservative</i>	Paraben <i>Paraben</i>
C	Pelembap <i>Moisturiser</i>	Natrium laktat <i>Sodium lactate</i>
D	Pengemulsi <i>Emulsifier</i>	Asid stearik <i>Stearic acid</i>

29. Pernyataan di bawah adalah sifat bagi bahan X.
The following are the properties of substance X.

- Karbon tulen dalam bentuk kepingan yang sangat nipis, hampir lutsinar dan setebal satu atom.
Pure carbon in the form of a very thin, nearly transparent sheet and one atom thick.
- Mengalirkan haba dan elektrik dengan kecekapan yang tinggi
Conduct heat and electricity with great efficiency

Apakah bahan X?
What is Substance X?

- | | | | |
|----------|---------------------------|----------|---|
| A | Grafen
<i>Graphene</i> | C | Fullerena
<i>Fullerene</i> |
| B | Grafit
<i>Graphite</i> | D | Nanotiub karbon
<i>Carbon nanotube</i> |

30. Salah satu punca pencemaran air ialah resapan pembuangan air sisa yang tidak dirawat. Antara berikut, yang manakah menerangkan langkah untuk mengatasi isu ini menggunakan teknologi hijau?

One of the factors of water pollution is leachate of untreated wastewater disposal. Which of the following the step is used to overcome this issue using green technology?

- A** Taburkan sampah dalam lapisan nipis, kemudian mampat dan tutupkan dengan tanah.
Spread out garbage in thin layers, then compress and cover with soil.
- B** Kurangkan penggunaan plastik, guna semula dan kitar semula untuk mengurangkan pembuangan sampah.
Reduce plastic consumption, reuse and recycle to reduce waste disposal.
- C** Lupuskan sampah menggunakan sistem olahan larutlesapan untuk mengawal larutlesapan daripada mencemar sumber air bawah tanah.
Dispose garbage using solvent treatment system to control the leachate from contaminating underground water.
- D** Buang minyak, pembersih kimia dan bahan tak terbiodegradasi dengan kaedah yang bersesuaian untuk mengelakkan longkang daripada tersumbat.
Dispose oils, chemical cleaners and non-biodegradable items with appropriate method to prevent the drain from clogging.

31. 1.7 g campuran kalium hidroksida dan natrium hidroksida dijadikan 250 cm³ larutan dengan air. 25 cm³ larutan ini meneutralkan 37.5 cm³ asid hidroklorik 0.10 mol dm⁻³. Campuran itu mengandungi

1.7 g of mixture of potassium hydroxide and sodium hydroxide were made up to 250 cm³ solution with water. 25 cm³ of this solution neutralised 37.5 cm³ of 0.10 mol dm⁻³ hydrochloric acid. The mixture contained

- | | |
|--|--|
| A 0.697 g kalium hidroksida
<i>0.697 g potassium hydroxide</i> | C 0.822 g kalium hidroksida
<i>0.822 g potassium hydroxide</i> |
| B 0.794 g kalium hidroksida
<i>0.794 g potassium hydroxide</i> | D 0.948 g kalium hidroksida
<i>0.948 g potassium hydroxide</i> |

32. 1 g serbuk zink bertindak balas dengan 100 cm³ asid hidroklorik 0.1 mol dm⁻³. Berapakah isipadu gas yang terhasil pada keadaan bilik? [Jisim atom relatif Zn=65; 1 mol gas menepati 24 dm³ pada keadaan bilik]

1 g of zinc powder is reacted with 100 cm³ of 0.1 mol dm⁻³ hydrochloric acid. What is the volume of gas produced at room condition?

[Relative atomic mass of Zn=65; 1 mol of gas occupies 24 dm³ at room condition]

- | | |
|-------------------------------|-------------------------------|
| A 0.01 dm ³ | C 0.24 dm ³ |
| B 0.12 dm ³ | D 0.42 dm ³ |

33. 1.4 g logam Y bertindak balas dengan sulfur untuk menghasilkan 2.6 g Y sulfida. Apakah formula empirik bagi Y sulfida tersebut? [Jisim atom relatif: S =32, Y=56]

1.4 g of Y metal reacts with sulphur to produce 2.6 g of Y sulphide.

What is the empirical formula of the Y sulphide?

[Relative atomic mass: S=32, Y=56]

- | | |
|--------------------------|--|
| A YS | C Y ₂ S ₃ |
| B YS ₂ | D Y ₂ S |

34. Jadual 4 menunjukkan maklumat tentang empat sel kimia.

Table 4 shows information about four chemical cells.

Chemical cell <i>Sel kimia</i>	Pair of metal electrodes <i>Pasangan elektrod logam</i>	Voltage/V <i>Voltan/V</i>	Positive terminal <i>Terminal positif</i>
I	P, S	2.12	S
II	P, R	1.68	R
III	Q, S	1.17	S
IV	Q, R	x	R

Jadual 4 / Table 4

Apakah nilai voltan, x bagi sel IV?

What is the value of x , voltage of cell IV?

A 0.37 V

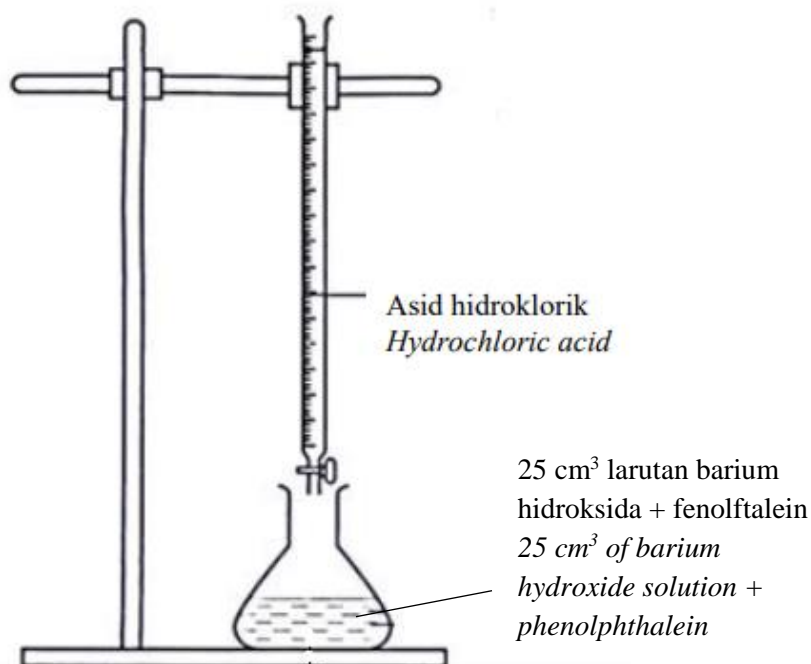
C 0.73V

B 0.44 V

D 0.91 V

35. Rajah 9 menunjukkan susunan radas yang digunakan oleh seorang murid untuk menentukan kepekatan larutan barium hidroksida, $\text{Ba}(\text{OH})_2$. Nilai pH asid hidroklorik yang digunakan dalam aktiviti ini ialah 1.

Diagram 9 shows the set-up of apparatus used by a student to determine the concentration of barium hydroxide solution, $\text{Ba}(\text{OH})_2$. The pH value of hydrochloric acid used in this activity is 1.



Rajah 9 / Diagram 9

Jadual 5 merekodkan bacaan awal dan akhir buret bagi tiga kali pentitratan.

Table 5 recorded the initial and final burette reading for three titrations.

Bilangan pentitratan <i>Number of titration</i>	1	2	3
Bacaan awal buret (cm ³) <i>Initial burette reading (cm³)</i>	0.00	19.90	25.00
Bacaan akhir buret (cm ³) <i>Final burette reading (cm³)</i>	19.90	39.90	45.10

Jadual 5 / Table 5

Berapakah kepekatan larutan barium hidroksida, Ba(OH)₂?

What is the concentration of barium hydroxide solution, Ba(OH)₂?

A 0.20 mol dm⁻³

C 0.40 mol dm⁻³

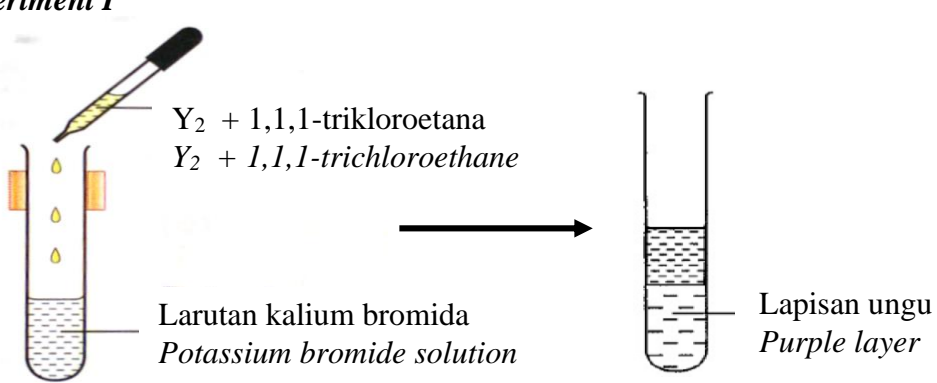
B 0.02 mol dm⁻³

D 0.04 mol dm⁻³

- 36 Rajah 10 menunjukkan susunan radas untuk mengkaji tindak balas redoks dalam penyesaran halogen.

Diagram 10 shows the apparatus set-up to study a redox reaction in displacement of halogen.

Eksperimen I
Experiment I

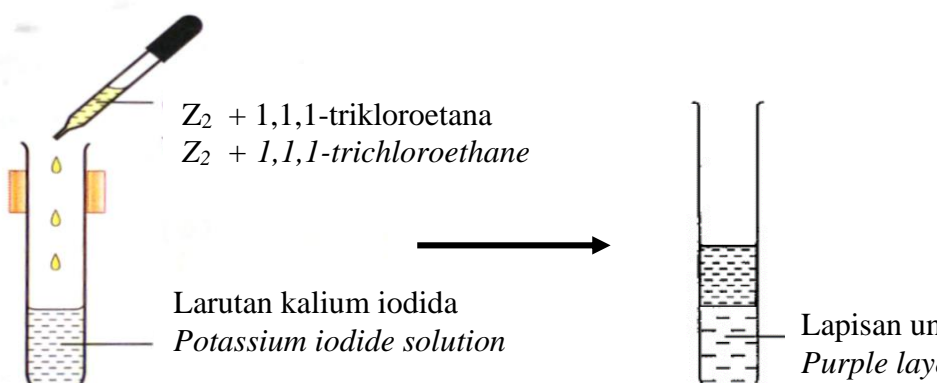


Y₂ + 1,1,1-trikloroetana
Y₂ + 1,1,1-trichloroethane

Larutan kalium bromida
Potassium bromide solution

Lapisan ungu
Purple layer

Eksperimen II
Experiment II



Z₂ + 1,1,1-trikloroetana
Z₂ + 1,1,1-trichloroethane

Larutan kalium iodida
Potassium iodide solution

Lapisan ungu
Purple layer

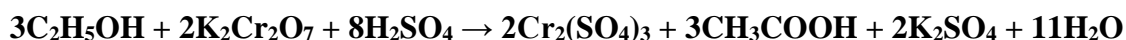
Rajah 10 / Diagram 10

Berdasarkan Rajah 10, kenal pasti halogen Y_2 and Z_2 .

Based on Diagram 10, identify halogen Y_2 and Z_2 .

	Y_2	Z_2
A	Klorin <i>Chlorine</i>	Iodin <i>Iodine</i>
B	Bromin <i>Bromine</i>	Iodin <i>Iodine</i>
C	Iodin <i>Iodine</i>	Bromin <i>Bromine</i>
D	Iodin <i>Iodine</i>	Klorin <i>Chlorine</i>

37. Polis menggunakan alat pernafasan untuk menganggar kandungan alkohol dalam nafas seseorang pemandu. Pemandu meniup melalui suatu tiub yang mengandungi hablur kalium dikromat(VI). Kuantiti perubahan warna dari jingga ke hijau menunjukkan tahap alkohol dalam nafas pemandu. Persamaan kimia berikut mewakili tindak balas yang berlaku.
Police use breathalysers to estimate the content of alcohol in a driver's breath. The driver blow through a tube containing crystals of potassium dichromate(VI). The amount of colour change from orange to green indicates to the levels of alcohol in the driver's breath. The following chemical equation represents the reaction that occurs.



Tentukan perubahan dalam nombor pengoksidaan bagi kromium.

Determine the change in the oxidation number of chromium.

- A** Tiada perubahan.
No changes.
- B** Bertambah dari -2 ke $+3$.
Increases from -2 to $+3$.
- C** Bertambah dari -2 ke $+3$.
Increases from -2 to $+3$.
- D** Berkurang dari $+6$ ke $+3$.
Decreases from $+6$ to $+3$.
38. Haba pembakaran propanol, C_3H_7OH ialah $-2016 \text{ kJ mol}^{-1}$. Apabila 0.3 g propanol dibakar dengan lengkap, haba yang dibebaskan digunakan untuk memanaskan 250 cm^3 air. Apakah suhu tertinggi bagi air jika suhu awal ialah 28.0°C ?
[Muatan haba tentu air = $4.2 \text{ Jg}^{-1}\text{C}^{-1}$; Jisim atom relatif : C = 12, O = 16, H = 1]
*The heat of combustion of propanol, C_3H_7OH is $-2016 \text{ kJ mol}^{-1}$. When 0.3 g of propanol is completely burnt, the heat given out is used to heat 250 cm^3 of water. What is the maximum temperature of the water if the initial temperature is 28.0°C ?
[Specific heat capacity of water = $4.2 \text{ Jg}^{-1}\text{C}^{-1}$; Relative atomic mass: C=12, O=16, H=1]*

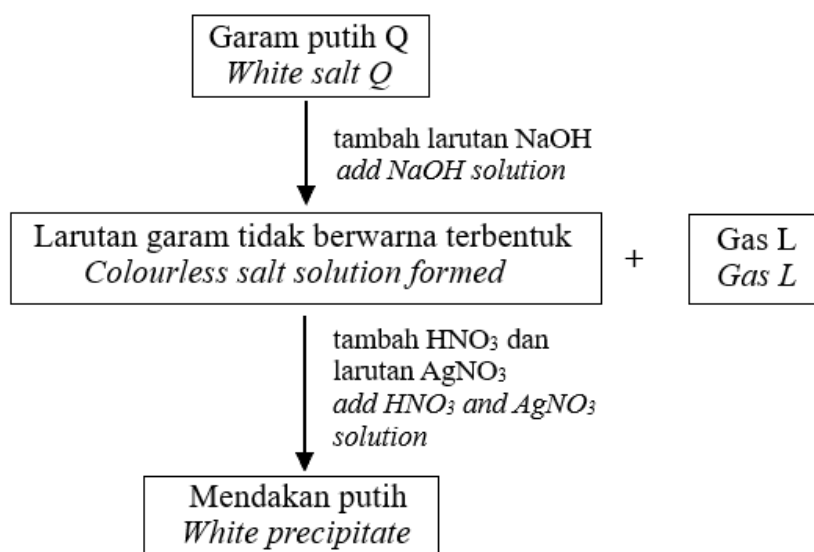
- A** 9.6°C
- B** 19.2°C
- C** 37.6°C
- D** 75.2°C

39. Sekumpulan pelajar telah menjalankan satu eksperimen untuk mengkaji faktor-faktor yang mempengaruhi kadar tindak balas. Ketulan kalsium karbonat berlebihan telah ditambah kepada 40 cm^3 asid hidroklorik 0.2 mol dm^{-3} dalam sebuah kelalang kon. Gas yang terbebas dikumpulkan di dalam sebuah buret. Jika eksperimen itu diulang dengan asid yang berbeza, keadaan asid yang manakah yang akan meningkatkan kadar tindak balas dan mengurangkan isi padu gas yang terbebas sebanyak separuh?
[Isipadu molar gas = $24 \text{ dm}^3 \text{ mol}^{-1}$ pada keadaan bilik]

*A group of students carried out an experiment to investigate factors that affect the rate of reaction. Excess of calcium carbonate granules was added to 40 cm^3 of 0.2 mol dm^{-3} of hydrochloric acid in a conical flask. The gas released is collected in a burette. If the experiment is repeated with different acids, which conditions of acids will increase the rate of reaction and reduce the volume of the gas released by half?
[Molar volume of gas = $24 \text{ dm}^3 \text{ mol}^{-1}$ at room conditions]*

- | | | | |
|----------|---|----------|---|
| A | $20 \text{ cm}^3 \text{ HNO}_3 \text{ } 0.4 \text{ mol dm}^{-3}$
$20 \text{ cm}^3 \text{ of } 0.4 \text{ mol dm}^{-3} \text{ HNO}_3$ | C | $20 \text{ cm}^3 \text{ H}_2\text{SO}_4 \text{ } 0.4 \text{ mol dm}^{-3}$
$20 \text{ cm}^3 \text{ of } 0.4 \text{ mol dm}^{-3} \text{ H}_2\text{SO}_4$ |
| B | $10 \text{ cm}^3 \text{ HNO}_3 \text{ } 0.4 \text{ mol dm}^{-3}$
$10 \text{ cm}^3 \text{ of } 0.4 \text{ mol dm}^{-3} \text{ HNO}_3$ | D | $40 \text{ cm}^3 \text{ H}_2\text{SO}_4 \text{ } 0.2 \text{ mol dm}^{-3}$
$40 \text{ cm}^3 \text{ of } 0.2 \text{ mol dm}^{-3} \text{ H}_2\text{SO}_4$ |

40. Rajah 11 menunjukkan satu siri ujian dijalankan ke atas garam Q.
Diagram 11 shows a series of test carried out on salt Q.



Rajah 11/ Diagram 11

Gas L menukarkan kertas litmus lembap kepada biru. Apakah garam Q?
Gas L turns moist red litmus paper to blue. What is salt Q?

- | | | | |
|----------|--|----------|--|
| A | Ammonium klorida
<i>Ammonium chloride</i> | C | Ammonium sulfat
<i>Ammonium sulphate</i> |
| B | Magnesium klorida
<i>Magnesium chloride</i> | D | Aluminium nitrat
<i>Aluminium nitrate</i> |

Jawapan Kertas 1
Answers Paper 1

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

LAMPIRAN

(Untuk rujukan guru)

JADUAL SPESIFIKASI UJIAN (JSU)

PRAKTIS KIMIA 4541/1: SET 2

CHEMISTRY 4541

TEST SPECIFICATION TABLE

CHEMISTRY 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	2.1 Basic concepts of matter													
	2.2 The development of the atomic model													
	2.3 Atomic structure	1												1
	2.4 Isotopes and its uses					2								1
3. The Mole Concept, Chemical Formula and Equation [F4]	3.1 Relative atomic mass and relative molecular mass	3												1
	3.2 Mole concept	4								31	32			3
	3.3 Chemical formula								33					1
	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	5												1
	4.5 Elements in Group 17													
	4.6 Elements in Period 3	6												1
	4.7 Transition elements	7												1
5. Chemical Bond	5.1 Basics of compound formation													
	5.2 Ionic bond													
	5.3 Covalent bond				8									1
	5.4 Hydrogen bond	10												1
	5.5 Dative bond				9									1
	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				11									1
	6.3 Strength of acids and alkalis					12								1
	6.4 Chemical properties of acids and alkalis													
	6.5 Concentration of aqueous solution													
	6.6 Standard solution	13												1
	6.7 Neutralisation									35				1
	6.8 Salts, crystals and their uses in daily life													
	6.9 Preparation of salts													
	6.10 Effect of heat on salts				14									1
	6.11 Qualitative analysis									40				1

Chapter	Sub-chapter	Remembering			Understanding			Applying			Analyzing			Total
		E	M	H	E	M	H	E	M	H	E	M	H	
7. Rate of Reaction [F4]	7.1 Determining rate of reaction												39	1
	7.2 Factors affecting rate of reaction													
	7.3 Application of factors that affect the rate of reaction in daily life													
	7.4 Collision theory	15												1
8. Manufactured Substances in Industry [F4]	8.1 Alloy and its importance													
	8.2 Composition of glass and its uses	16												1
	8.3 Composition of ceramics and its uses	18												1
	8.4 Composite materials and its importance													
9. Redox equilibrium [F5]	9.1 Oxidation and reduction	17											37	2
	9.2 Standard electrode potential									36				1
	9.3 Voltaic cell									34				1
	9.4 Electrolytic cell				19									1
	9.5 Extraction of metal from its ore	20												1
	9.6 Rusting	21												1
10. Carbon compound [F5]	10.1 Types of carbon compound													
	10.2 Homologous series													
	10.3 Chemical properties and interconversion of compounds between homologous series					22	23							2
	10.4 Isomers and naming based on IUPAC nomenclature					25								1
11. Thermochemistry	11.1 Heat change in reactions													
	11.2 Heat of reaction									38				1
	11.3 Application of endothermic and exothermic reactions in daily life													
12. Polymer Chemistry [F5]	12.1 Polymer		24											1
	12.2 Natural rubber													
	12.3 Synthetic rubber		26											1
13. Consumer and Industrial Chemistry [F5]	13.1 Oils and fats					27								1
	13.2 Cleaning agents													
	13.3 Food additives													
	13.4 Medicines and cosmetics					28								1
	13.5 Application of nanotechnology in industry		29											1
	13.6 Application of green technology in industrial waste management		30											1
Total		15	4		5	6	1	2	6				1	40
Ratio of E:M:H														
Level of Difficulty E : Easy M : Medium H : Hard														

MODUL KENYALANG CEMERLANG
SPM
TAHUN 2023

JABATAN PENDIDIKAN NEGERI SARAWAK

KIMIA 4541
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 2023. Sehubungan dengan itu, pada tahun 2023 ini, Sektor Pembelajaran, Jabatan Pendidikan Negeri Sarawak mengadakan **Program Modul Kenyalang Cemerlang SPM 4.0** untuk membantu guru dan calon SPM menghadapi peperiksaan SPM 2023.

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 2023 di semua sekolah menengah di negeri Sarawak.

Objektif Program

1. Memastikan calon SPM menguasai format baharu Peperiksaan SPM 2023.
2. Memastikan calon SPM mempunyai bahan pembelajaran yang berfokus ke arah peperiksaan SPM.
3. Meningkatkan pencapaian akademik calon SPM 2023.
4. Melonjakkan keputusan SPM 2023 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	3 – 22
3	Skema Jawapan/Pemarkahan	23 – 33
4	LAMPIRAN: Sampel Jadual Spesifikasi Ujian (JSU) untuk Praktis Kimia 4541/2: Set 2	34 – 35

Senarai Ahli Panel Pembina Modul Kenyalang Cemerlang SPM 4.0

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 Ngiik 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.	Tie Woon Yen	SMK Bandar Bintulu	Bintulu
11.	Law Hui Nong	SMK Tinggi Sarikei	Sarikei
12.	Victoria Petrus	SMK Tun Abdul Razak	Serian
13.	Dalimawaty Binti Ahmad	SMK Santubong	Kuching
14.	Catherine Law Fong Fong	SMK Deshon	Sibu

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 Terhadap • 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		

Bahagian A**Section A**

[60 markah /60 marks]

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

1. Jadual 1 menunjukkan nombor nukleon, nombor proton dan bilangan neutron bagi tiga zarah X, Y dan Z.

Table 1 shows the nucleon number, proton number and the number of neutrons of three particles X, Y and Z.

Zarah <i>Particles</i>	Bilangan proton <i>Number of proton</i>	Bilangan elektron <i>Number of electron</i>	Bilangan neutron <i>Number of neutron</i>
X	13	13	14
Y	17	17	20
Z	17	17	18

Jadual 1 / Table 1

- (a) Nyatakan maksud isotop.

State the meaning of isotope.

.....

[1 markah / 1 mark]

- (b) Pilih **dua** zarah yang merupakan isotop.

*Choose **two** particles which are isotopes.*

.....

[1 markah / 1 mark]

- (c) Nyatakan bilangan elektron valens bagi zarah X dan Y.

State the number of valence electrons of particles X and Y.

Zarah X :

Particles X:

Zarah Y :

Particles Y:

[2 markah / 2 marks]

- (c) Tulis perwakilan piawai bagi zarah Z dalam bentuk A_ZX .

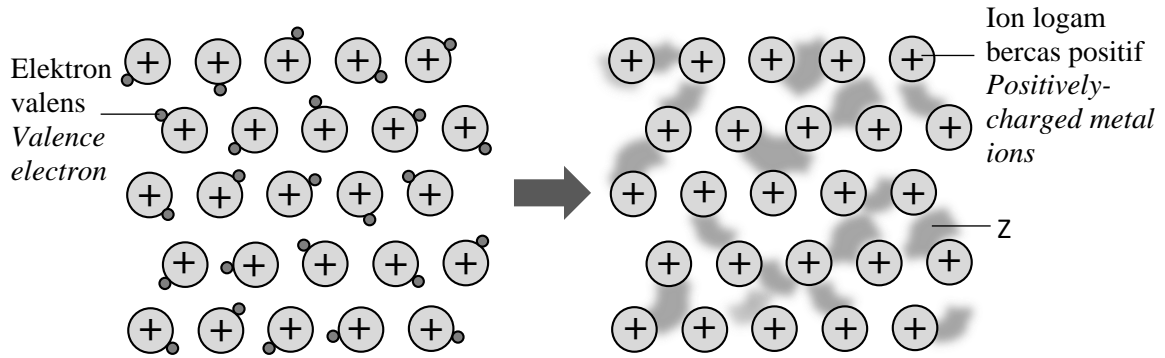
Write the standard representation for particle Z in the form of A_ZX .

.....

[1 markah / 1 mark]

2. Rajah 1.1 menunjukkan pembentukan ikatan logam.

Diagram 1.1 shows the formation of metallic bond.



Rajah 1.1 / Diagram 1.1

(a) Namakan satu bahan yang boleh membentuk ikatan logam.

Name a substance that can form metallic bond.

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

(b) Nyatakan susunan zarah-zarah dalam logam.

State the arrangement of particles in metal.

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

(c) Apakah yang dimaksudkan oleh elektron dinyahsetempatan?

What is meant by delocalised electron?

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

(d) Apakah yang diwakili oleh Z?

What is represented by Z?

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

(e) Huraikan secara ringkas pembentukan ikatan logam.

Briefly describe the formation of metallic bond.

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

- 3 Jadual 2 menunjukkan maklumat bagi tiga unsur yang terletak dalam kumpulan yang sama dalam Jadual Berkala Unsur.

Table 2 shows information of three elements that are located in the same group of the Periodic Table of Elements.

Bahan <i>Substance</i>	Formula Kimia <i>Chemical formulae</i>	Tindak balas kimia <i>Chemical reaction</i>
Litium <i>Lithium</i>	Li	Bertindak balas secara spontan dengan oksigen dan wap air dalam udara. <i>React spontaneously with the oxygen and water vapour in the air.</i>
Natrium <i>Sodium</i>	Na	
Kalium <i>Potassium</i>	K	

Jadual 2 / Table 2

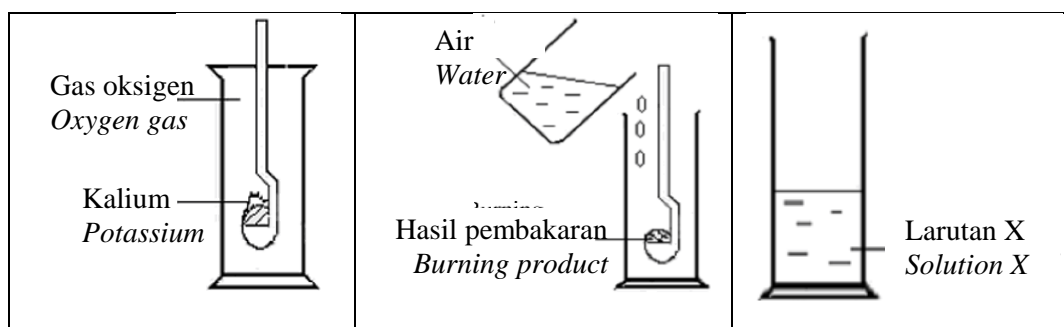
- (a) Dalam kumpulan manakah unsur-unsur ini ditempatkan dalam Jadual Berkala Unsur?
Which group does these elements belong to in the Periodic Table of Elements?

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

- (b) Bagaimanakah bahan-bahan kimia ini disimpan di dalam makmal sekolah supaya tidak terdedah kepada udara?
How are these chemical substances stored in the school laboratory so that will not be exposed to the air?

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

- (c) Rajah 3 menunjukkan susunan radas bagi eksperimen untuk mengkaji perubahan kimia yang berlaku pada kalium.
Diagram 3 shows the experiment set-up to investigate the chemical changes that occur on potassium.



Rajah 2 / Diagram 2

- (i) Tuliskan persamaan kimia yang seimbang bagi pembakaran kalium dalam gas oksigen.
Write a balanced chemical equation for combustion of potassium in oxygen gas.

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

- (ii) Namakan larutan X.
Name the X solution.

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

- (iii) Nyatakan perubahan warna kertas litmus apabila dicelup ke dalam larutan X.
State the colour change of litmus paper when it is dipped into the solution X.

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

4. Rajah 3 menunjukkan dua proses industri yang melibatkan minyak kelapa sawit.
Diagram 3 shows two industrial processes involving palm oil.



Rajah 3 / Diagram 3

Berdasarkan Rajah 4,
Based on Diagram 4,

- (a) kenal pasti proses I dan II.
identify process I and II.

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

- (b) apakah alkali X dan mangkin Y yang ditambah dalam proses I dan II?
what is alkali X and catalyst Y that are added in process I and II?

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

- (c) namakan sabun yang terhasil dalam proses I berdasarkan alkali X yang digunakan dalam 4(b).
name the soap formed in process I based on alkali X used in 4(b).

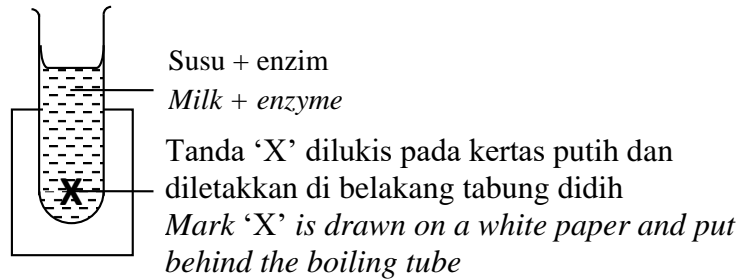
.....
[1 markah / 1 mark]

- (d) Bandingkan perbezaan antara minyak kelapa sawit dan marjerin.
Compare the difference between palm oil and margarine.

.....
.....

5. Rajah 4 menunjukkan susunan radas untuk mengkaji kesan suhu ke atas kadar pencernaan protein di dalam susu.

Diagram 4 shows the apparatus set-up to investigate the effect of temperature on the rate of protein digestion in milk.



Rajah 4 / Diagram 4

Masa diukur ialah masa yang diambil untuk enzim menyingkirkan semua protein susu.

Jadual 5 menunjukkan keputusan eksperimen yang diperolehi.

The time measured is the time taken for the enzyme to digest all the milk protein.

Table 5 shows the results of the experiment.

Suhu (°C) <i>Temperature (°C)</i>	15.0	25.0	35.0	45.0	55.0	65.0
Masa yang diambil untuk tanda 'X' kelihatan (minit) <i>Time taken for the mark 'X' to be visible (minute)</i>	12.0	7.0	2.5	4.0	7.0	19.0
$\frac{1}{\text{Masa}}$ (minit ⁻¹) / $\frac{1}{\text{Time}}$ (minute ⁻¹)						

Jadual 3 / Table 3

- (a) Berdasarkan eksperimen ini, nyatakan maksud kadar tindak balas.

Based on this experiment, state the meaning of rate of reaction.

.....

[1 markah / 1 mark]

- (b) Nyatakan **satu** pemerhatian bagi eksperimen ini.

*State **one** observation for this experiment.*

.....

[1 markah / 1 mark]

- (c) (i) Lengkapkan Jadual 5 dengan mengira nilai-nilai bagi $\frac{1}{\text{masa}}$. Bundarkan jawapan kepada dua tempat perpuluhan.

Complete Table 5 by calculating the values of $\frac{1}{\text{time}}$. Round off answers to two decimal places.

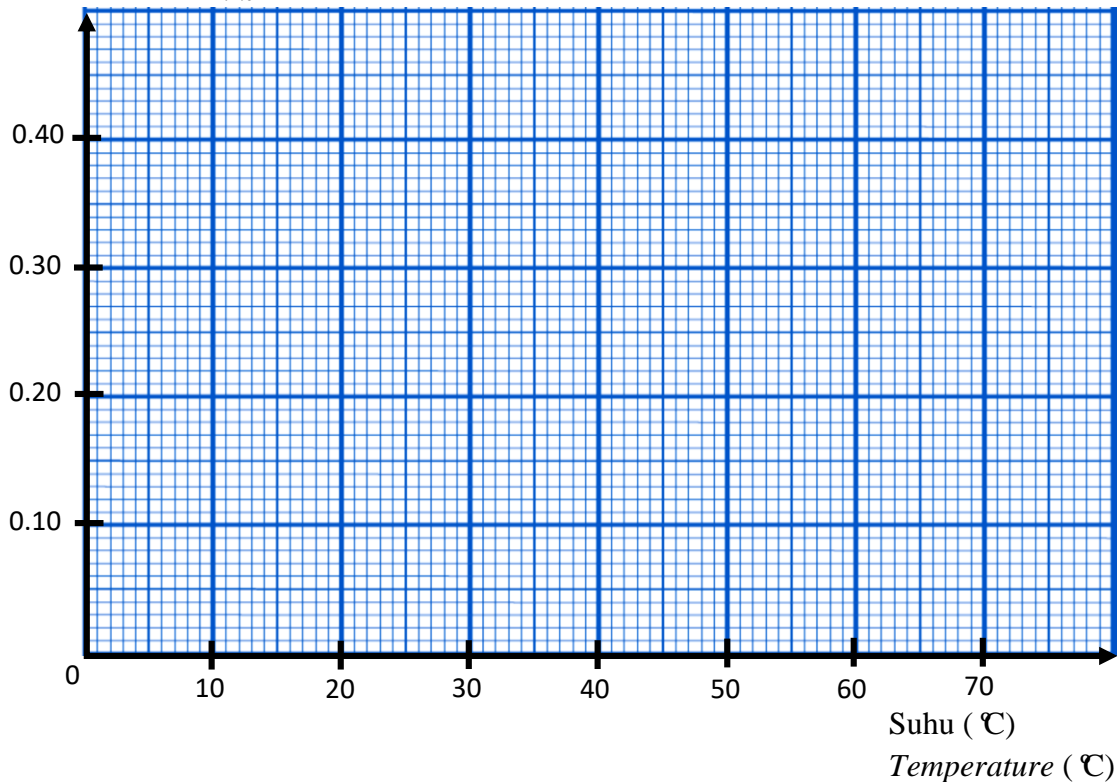
[1 markah / 1 mark]

- (ii) Plotkan graf $\frac{1}{\text{masa}}$ melawan suhu.

Plot of a graph of $\frac{1}{\text{time}}$ against temperature.

Kadar tindak balas, $\frac{1}{\text{Masa}}$ (min^{-1})

Rate of reaction, $\frac{1}{\text{Time}}$ (min^{-1})



[2 markah / 2 marks]

- (iii) Berdasarkan graf dalam 5(c)(ii), nyatakan kesan suhu terhadap kadar pencernaan protein dalam susu.

Based on the graph in 5(c)(ii), state the effect of temperature on the rate of protein digestion in milk.

.....

[1 markah / 1 mark]

- (iv) Terangkan jawapan anda di 5(c)(iii).

Explain your answer in 5(c)(iii).

.....

.....

[2 markah / 2 marks]

6. Jadual 4 menunjukkan keputusan bagi eksperimen untuk mengkaji sifat hidrogen klorida dalam pelarut A dan B.

Table 4 shows the results of an experiment to study the properties of hydrogen chloride in solvents A and B.

Eksperimen <i>Experiment</i>	Hidrogen klorida dalam <i>Hydrogen chloride in</i>	
	pelarut A <i>solvent A</i>	pelarut B <i>solvent B</i>
Tindak balas dengan kertas litmus biru <i>Reaction with blue litmus paper</i>	Tiada perubahan <i>No change</i>	Kertas litmus biru bertukar kepada merah <i>Blue litmus paper turns to red</i>

Jadual 4 / Table 4

- (a) (i) Cadangkan satu bahan untuk pelarut A dan pelarut B.

Suggest a substance for solvent A and solvent B.

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

- (ii) Terangkan mengapa terdapat perbezaan dalam pemerhatian pada kertas litmus biru dalam eksperimen yang menggunakan kedua-dua pelarut.

Explain why there is a difference in the observation on blue litmus paper in the experiment using both solvents.

.....
[3 markah /3 marks]

- (b) Satu spatula serbuk zink ditambah ke dalam bikar yang mengandungi 0.01 mol larutan yang terhasil dalam pelarut B.

A spatula of zinc powder is added into the beaker that contains 0.01 mol solution formed in solvent B.

- (i) Tulis persamaan kimia bagi tindak balas yang berlaku.

Write the chemical equation of the reaction that occurred.

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

- (ii) Hitung isi padu maksimum gas yang dibebaskan pada suhu bilik.

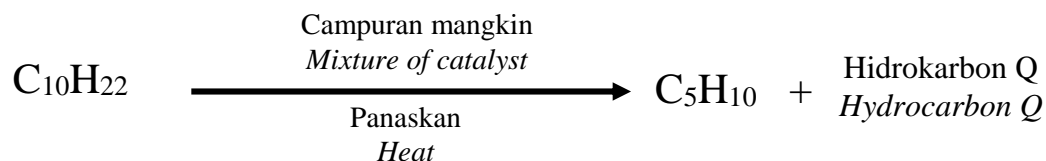
[Isi padu molar: 24 dm³ pada keadaan bilik]

Calculate the maximum volume of gas released at room temperature.

[Molar volume: 24 dm³ at room condition]

[2 markah /2 marks]

7. (a) Rajah 5.1 menunjukkan tindak balas yang digunakan dalam industri penghasilan hidrokarbon yang lebih kecil daripada hidrokarbon rantai panjang.
Diagram 5.1 shows the reaction used in industrial production of smaller hydrocarbon from long chain hydrocarbon.

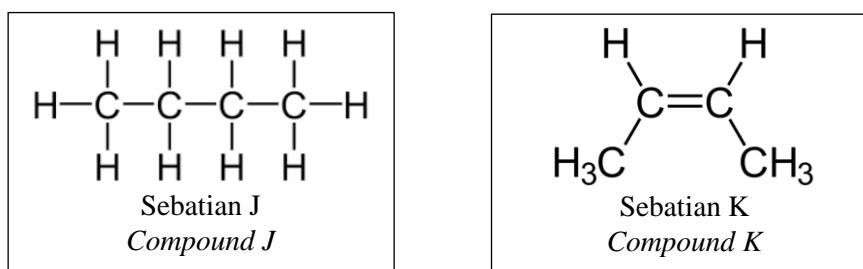


Rajah 5.1 / Diagram .1

- (i) Apakah maksud hidrokarbon?
What is the meaning of hydrocarbon?
-
 [1 markah / 1 mark]
- (ii) Namakan proses dalam Rajah 6.1.
Name the process in Diagram 6.1.
-
 [1 markah / 1 mark]
- (iii) Nyatakan mangkin campuran yang digunakan dalam proses ini.
State the mixture of catalyst used in this process.
-
 [1 markah / 1 mark]
- (iv) Hidrokarbon Q adalah suatu isomer.
 Lukis **dua** isomer bagi hidrokarbon Q.
Hydrocarbon Q is an isomer.
*Draw **two** isomers of hydrocarbon Q.*

[2 markah / 2 marks]

- (b) Rajah 5.2 menunjukkan dua hidrokarbon, sebatian J dan sebatian K.
Diagram 5.2 shows two hydrocarbon, compound J and compound K.



Rajah 5.2 Diagram 5.2

- (i) Nyatakan siri homolog bagi sebatian K.
State the homologous series of compound K.

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

- (ii) Hitung peratus jisim karbon per molekul bagi sebatian J dan K.
 [Jisim atom relatif: C = 12, H = 1]
Calculate the percentage of carbon by mass per molecule for compound J and K.
[Relative atomic mass: C = 12, H = 1]

[2 markah / 2 marks]

- (iii) Encik P ingin menggunakan sebatian J sebagai gas memasak.
 Adakah Encik P membuat pilihan yang betul? Jelaskan jawapan anda dari segi kejelagaan nyalaan.
Mr. P would like to use compound J as cooking gas.
Is Mr. P making the correct choice? Explain your answer in term of sootiness of flame.

.....

[2 markah / 2 marks]

8. Jadual 5.1 menunjukkan formula molekul dan haba pembakaran bagi dua jenis alkohol.
Table 5.1 shows the molecular formula and the heat of combustion of two alcohols.

Alkohol <i>Alcohol</i>	Formula molekul <i>Molecular formula</i>	Jisim molekul relatif <i>Relative molecular mass</i>	Haba pembakaran (kJ mol^{-1}) <i>Heat of combustion (kJ mol^{-1})</i>
A	$\text{C}_3\text{H}_7\text{OH}$	60	-2100
B	$\text{C}_4\text{H}_9\text{OH}$	74	-2877

Jadual 5.1 / *Table 5.1*

- (a) Nyatakan jenis tindak balas termokimia bagi pembakaran alkohol.
State the type of thermochemical reaction for the combustion of alcohol.

.....

[1 markah / 1 mark]

- (b) Tuliskan persamaan termokimia bagi alkohol A.
Write the thermochemical equation for alcohol A.

.....

[1 markah / 1 mark]

- (c) Lukis gambar rajah aras tenaga bagi tindak balas pembakaran alkohol A.
Draw the energy diagram for the combustion of alcohol A.

[2 markah / 2 marks]

- (d) Hitung jisim alkohol B yang diperlukan untuk terbakar dengan lengkap dalam gas oksigen yang berlebihan supaya suhu 0.25 kg air meningkat sebanyak 20°C.

[Ketumpatan air=1 g cm⁻³, muatan haba tentu=4.2 J g⁻¹ °C⁻¹].

Calculate the mass of alcohol B needed to burn completely in excess oxygen gas so that the temperature of 0.25 kg of water increases by 20°C.

[Density of water=1 g cm⁻³, specific heat capacity=4.2 J g⁻¹°C⁻¹].

[3 markah / 3 mark]

- (e) Jadual 5.2 menunjukkan nilai bahan api bagi empat jenis bahan api.

Table 5.2 shows the fuel values for four types of fuels.

Bahan api <i>Fuel</i>	Nilai bahan api (kJ g⁻¹) <i>Fuel value (kJ g⁻¹)</i>
Gas hidrogen <i>Hydrogen gas</i>	143.0
Gas metana <i>Methane gas</i>	55.0
Petrol <i>Petrol</i>	34.0
Metanol <i>Methanol</i>	22.7

Jadual 5.2 / Table 5.2

Berdasarkan Jadual 5.2, pilih bahan api yang paling sesuai untuk menggantikan petrol dalam kenderaan. Berikan sebab anda dari segi kesan terhadap alam sekitar.

Based on Table 5.2, choose the most suitable fuel to replace petrol in vehicles. Give your reason from the aspect of the effect of fuel on the environment.

.....

.....

.....

[3 markah / 3 marks]

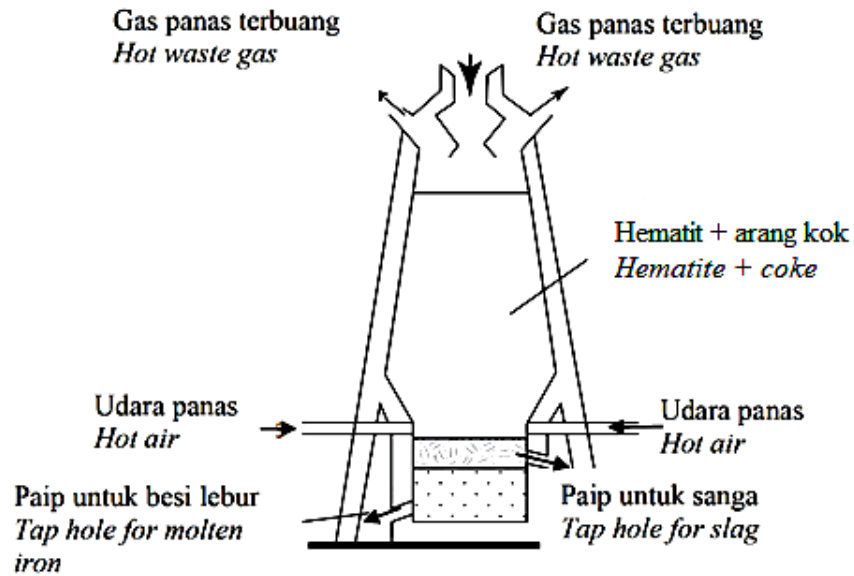
Bahagian B

Section B

[20 markah / 20 marks]

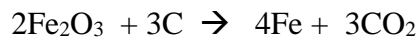
*Jawab mana-mana satu soalan dalam bahagian ini.**Answer any one question from this section.*

- 9 (a) Rajah 6.1 menunjukkan satu proses yang berlaku dalam perindustrian.
Diagram 6.1 shows a process that occurs in industry.



Rajah 6.1 / Diagram 6.1

Berdasarkan Rajah 7.1, 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 Diagram 7.1, the production of iron in industry through the reaction between iron ore, Fe_2O_3 and coke, C is shown in chemical equation below:

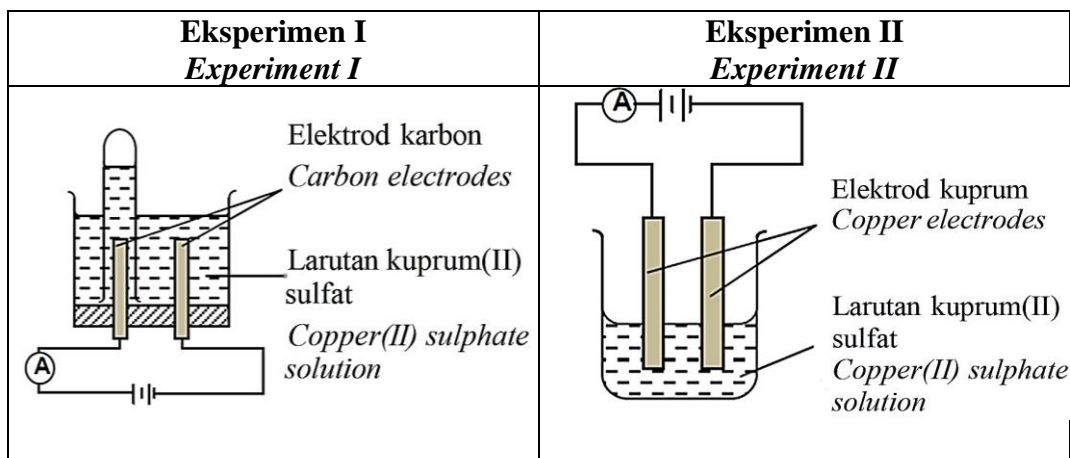


[Jisim atom relatif / *Relative atomic mass*: C = 12; O = 16 ; Fe = 56]

- (i) Jika kilang itu mampu memproses 440 kg bijih besi sehari dengan menggunakan karbon berlebihan, hitung jisim besi yang dihasilkan.
If the factory is able to process 440 kg iron ore a day by using excess carbon, calculate the mass of the iron produced.

[4 markah / 4 marks]

- (b) Jadual 6.1 menunjukkan susunan radas bagi dua eksperimen untuk mengkaji elektrolisis larutan kuprum(II) sulfat menggunakan elektrod yang berlainan.
Table 6.1 shows the apparatus set-up of two experiments to investigate the electrolysis of copper(II) sulphate solution using different electrodes.



Jadual 6.1 / Table 6.1

Jadual 6.2 menunjukkan sebahagian daripada nilai keupayaan elektrod piawai bagi sel setengah.

Table 6.2 shows a part of the standard electrode potential for half-cell.

Persamaan sel setengah <i>Half-cell equation</i>	$E^0 / \text{V (298 K)}$
$2\text{H}^+(\text{aq}) + 2\text{e}^- \rightleftharpoons \text{H}_2(\text{g})$	0.00
$\text{Cu}^{2+}(\text{aq}) + 2\text{e}^- \rightleftharpoons \text{Cu}(\text{s})$	+0.34
$\text{O}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l}) + 4\text{e}^- \rightleftharpoons 4\text{OH}^-(\text{aq})$	+0.40
$\text{S}_2\text{O}_8^{2-}(\text{aq}) + 2\text{e}^- \rightleftharpoons 2\text{SO}_4^{2-}(\text{aq})$	+2.01

Jadual 6.2 / Table 6.2

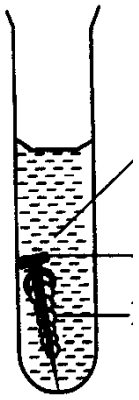
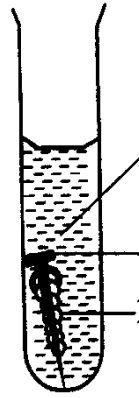
- (i) Terangkan mengapa terdapat perbezaan dalam pemerhatian di anod dalam Eksperimen I dan Eksperimen II. Tulis persamaan sel setengah yang berlaku di anod.
Explain why there is a difference in the observations at the anode in Experiment I and Experiment II. Write the half-cell equation that occurs at the anode.
- [5 markah /5 marks]
- (ii) Jika elektrolit dalam Eksperimen I diganti dengan larutan kuprum(II) klorida pekat, namakan hasil elektrolisis di anod.
 Nyatakan secara ringkas ujian pengesahan bagi hasil tersebut.
If the electrolyte in Experiment I is replaced with concentrated copper(II) chloride solution, name the product of electrolysis at the anode. Briefly state the confirmatory test for the product.
- [3 markah /3 marks]

- (ii) Keamatan warna biru bagi elektrolit dalam Eksperimen II tidak berubah selepas 30 minit. Terangkan mengapa.

The blue intensity of the electrolyte in Experiment II did not change after 30 minutes. Explain why.

[2 markah / 2 marks]

- (c) Jadual 6.3 menunjukkan dua set eksperimen yang dijalankan untuk mengkaji kesan logam lain terhadap pengaratan besi. Pemerhatian telah dicatat selepas satu hari.
Table 6.3 shows two sets of experiment which are carried out to study the effect of other metals on rusting of iron. The observation are recorded after one day.

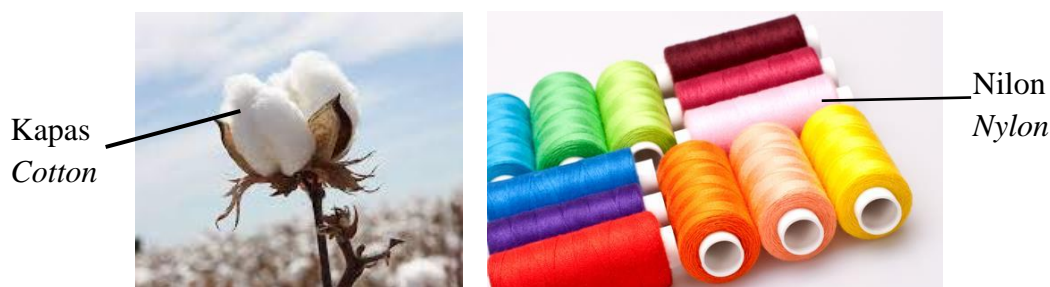
Set	Eksperimen <i>Experiment</i>	Pemerhatian <i>Observation</i>
I	 <p>Larutan agar-agar panas yang mengandungi kalium heksasianoferrat(III) <i>Hot agar solution which contains potassium hexacyanoferrate(III)</i></p> <p>Paku besi / iron nail</p> <p>P</p>	<p>Tiada tompok biru tua yang terbentuk</p> <p><i>No dark blue spot is formed</i></p>
II	 <p>Larutan agar-agar panas yang mengandungi kalium heksasianoferrat(III) <i>Hot agar solution which contains potassium hexacyanoferrate(III)</i></p> <p>Paku besi / iron nail</p> <p>Q</p>	<p>Tompok biru tua terhasil.</p> <p><i>Dark blue spot is formed.</i></p>

Jadual 6.3 / Table 6.3

Cadangkan logam P dan Q. Jelaskan pemerhatian dalam Set I dan Set II.
Suggest metal P and Q. Explain the observations in Set I and Set II.

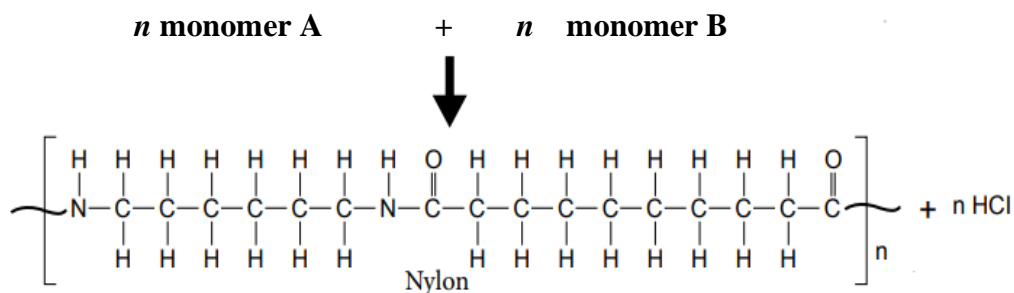
[6 markah / 6 marks]

- 10 (a) Rajah 7.1 menunjukkan contoh polimer semula jadi dan polimer sintetik yang sering digunakan dalam industri tekstil.
Diagram 78.1 shows the example of natural polymer and synthetic polymer that are often used in textile industry.



Rajah 7.1 / Diagram 7.1

- (i) Apakah maksud polimer?
What is the meaning of polymer? [1 markah/1 mark]
- (ii) Bandingkan polimer semulajadi dan polimer sintetik dari aspek berikut:
Compare the natural polymer and synthetic polymer in the following aspects:
- Sumber polimer
Source of polymer
 - Kesan ke atas alam sekitar
Impact on environment
- [4 markah / 4 marks]
- (iii) Rajah 7.2 mewakili tindak balas pempolimeran bagi menghasilkan polimer nilon.
Diagram 7.2 represents the polymerization reaction to produce nylon polymer.



Rajah 7.2 / Diagram 7.2

Lukis formula struktur bagi monomer-monomer untuk menghasilkan nilon.
Draw the structural formulae of the monomers used to produce nylon.

[2 markah / 2 marks]

- (b) (i) Berlari adalah senaman yang mudah dan digemari ramai. Kasut berlari yang baik harus diperbuat daripada getah sintetik yang dapat menyokong dan melindungi sistem rangka pelari.

Jogging is a simple exercise and loved by many people. Good running shoes are made from synthetic rubber that can provide support and protect the skeletal system of the runner.

Rajah 7.3 menunjukkan bahagian tapak kasut berlabel P dan Q. Bahagian P and Q diperbuat daripada dua jenis getah sintetik yang berlainan.

Diagram 7.3 shows the parts of shoes sole labelled P and Q. Part P and Q are made from two different types of synthetic rubbers.



Rajah 7.3 / Diagram 7.3

Jadual 7 menunjukkan data bagi purata bacaan yang dikumpul selepas 100 kali ujian bagi satu eksperimen untuk mengkaji kekenyalan getah sintetik P dan Q.

Table 7 shows the data of average reading collected after 100 trials from an experiment to study the elasticity of synthetic rubber P and Q.

Purata ketebalan bongkah getah sintetik <i>Average thickness of synthetic rubber cube</i>	Jenis getah sintetik <i>Type of synthetic rubber</i>	
	P	Q
Sebelum pemberat diletak di atas (cm) <i>Before the weight is placed above it (cm)</i>	3.30	1.20
Semasa pemberat diletakkan (cm) <i>When the weight is placed (cm)</i>	1.37	0.98
Selepas pemberat dialihkan (cm) <i>After the weight is removed (cm)</i>	3.30	1.18

Jadual 7 / Table 7

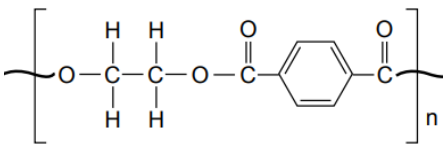
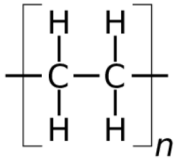


Berdasarkan Jadual 9, nyatakan jenis getah sintetik P dan Q. Berikan satu sebab mengapa getah sintetik P dipilih sebagai tapak tengah kasut manakala Q sebagai tapak luar kasut.

Based on Table 9, state the type of synthetic rubber P and Q. Give a reason why synthetic rubber P is chosen as midsole while Q as outsole of the shoes.

[4 markah / 4 marks]

- (c) (i) Polimer digunakan secara meluas dalam kehidupan harian kita. Rajah 7.4 memberikan dua contoh polimer yang dihasilkan daripada tindak balas yang berbeza.

Polymers are widely used in our daily life. Diagram 7.4 gives two examples of two polymers produced from different reactions.

Polimer <i>Polymer</i>	A	B
Formula struktur <i>Structural formula</i>		
Kegunaan <i>Uses</i>		

Rajah 7.4 / Diagram 7.4

Namakan polimer A dan B mengikut sistem penamaan IUPAC.

Name the polymer A and B according to IUPAC nomenclature system.

[2 markah / 2 marks]

- (ii) Banding dan bezakan polimer A dan polimer B dari segi tindak balas pempolimeran.

Compare and contrast polymer A and B in terms of polymerization reaction.

[4 markah/ 4 marks]

- (iii) Rajah 7.5 menunjukkan maklumat dua jenis cawan sekali pakai yang ada di pasaran.

Diagram 7.5 shows the information for two types of single-use cups available in market.

<p>Cawan bahan komposit A <i>Composite material cup A</i></p> 	<p>Cawan polimer B <i>Polymer cup B</i></p> 
<p>Diperbuat daripada pulpa tebu. <i>Made from sugarcane fiber pulp.</i></p> <p>Harga 50 biji = RM 16.00 <i>Price for 50 pieces = RM16.00</i></p>	<p>Diperbuat daripada polietena. <i>Made from polyethene.</i></p> <p>Harga 50 biji = RM 10.00 <i>Price for 50 pieces = RM10.00</i></p>

Rajah 7.5 / *Diagram 7.5*

Seorang penjaja minuman memerlukan cawan sekali pakai dalam kuantiti yang besar setiap hari. Anda perlu membantu beliau untuk memilih satu jenis cawan yang paling sesuai. Wajarkan pilihan anda.

A drink hawker needs single-use cup in large quantity daily. You need to help the hawker to choose a suitable single use cup. Justify your choice.

[3 markah / 3 marks]

Bahagian C

Section C

[20 markah /20 marks]

*Jawab semua soalan dalam bahagian ini.
Answer all question from this section.*

- 11 (a) Jadual 8 menunjukkan dua bahan yang berbeza bersama kegunaannya.
Table 8 shows two different substances and their uses.

Bahan Substance	Kegunaan Uses
Aloi P <i>Alloy P</i>	Membuat pingat dan tugu. <i>To make medals and statues.</i>
Kaca Q <i>Glass Q</i>	Untuk membuat alat radas kaca makmal dan alatan memasak. <i>To make laboratory glassware and glass cookware.</i>
Bahan Komposit R <i>Composite material R</i>	Untuk membuat topi keledar dan bampar kereta. <i>To make helmets and car bumper.</i>

Jadual 8 / Table 8

Berdasarkan Jadual 11, namakan aloi P, jenis kaca Q dan bahan komposit R. Berikan sifat khusus bagi setiap bahan untuk menyokong jawapan anda.

Based on Table 11, state the name of alloy P, type of glass Q and composite material R. Give the specific properties of each substance to support your answer.

[6 markah /6 marks]

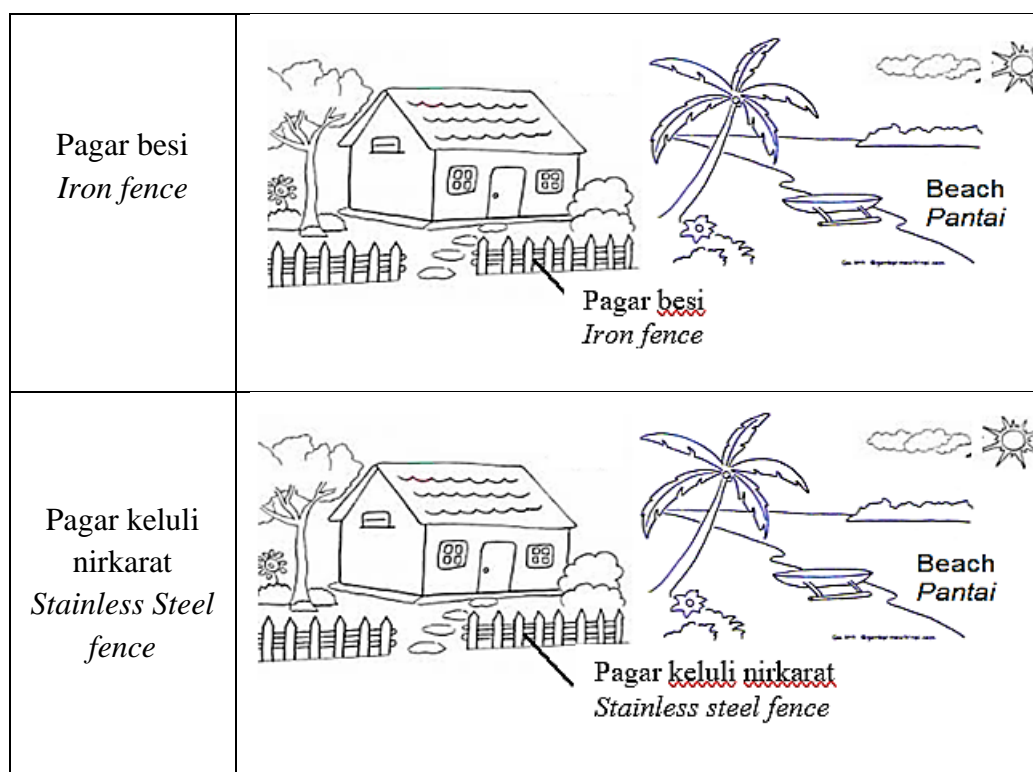
- (b) Konkrit yang diperkukuhkan ialah suatu bahan komposit yang lebih sesuai digunakan dalam pembinaan bangunan tinggi, jambatan dan pelantar minyak berbanding dengan konkrit. Terangkan mengapa konkrit yang diperkukuhkan lebih sesuai digunakan dalam pembinaan tersebut.

Reinforced concrete is a composite material which is more suitable to be used in the construction of high-rise buildings, bridges and oil rigs compared to concrete.

Explain why reinforced concrete is more suitable to be used in those constructions.

[4 markah /4 marks]

- (c) Rajah 8 menunjukkan dua rumah dengan pagar yang berbeza yang dibina di tepi pantai.
Diagram 8 shows two houses with different types of fences built at the beach.



Rajah 8 / *Diagram 8*

- (i) Pada pandangan anda, pagar manakah lebih sesuai digunakan untuk dibina di tepi pantai? Berikan sebab untuk jawapan anda itu.
In your opinion, which type of fence is more suitable to be used to be built at beach? Give reasons for your answer.

[4 markah /4 marks]

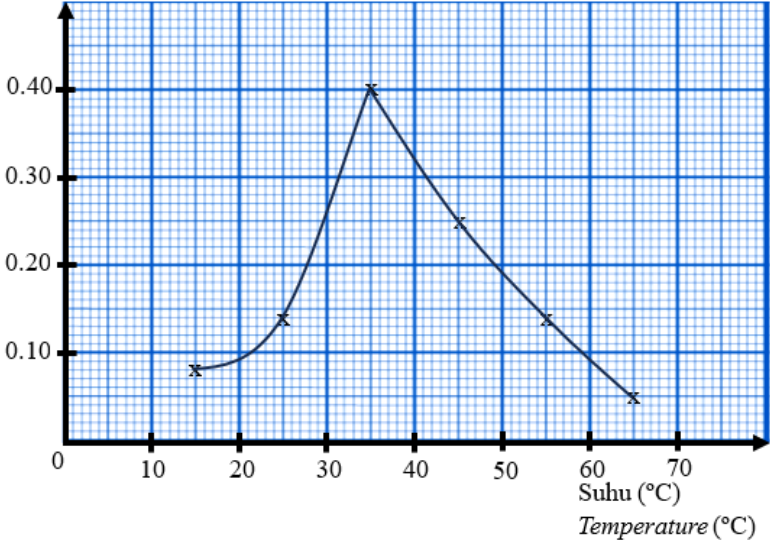
- (ii) Sekumpulan pelajar ingin mengkaji perbandingan sifat aloi dengan logam tulen. Sebagai seorang pelajar Kimia, sila huraikan satu eksperimen untuk menyiasat sama ada aloi lebih tahan terhadap kakisan dan lebih keras berbanding dengan logam tulen?
A group of students want to compare the properties between alloy and pure metal. As a Chemistry student, describe an experiment to investigate whether alloy is more resistant to corrosion and harder than pure metal.

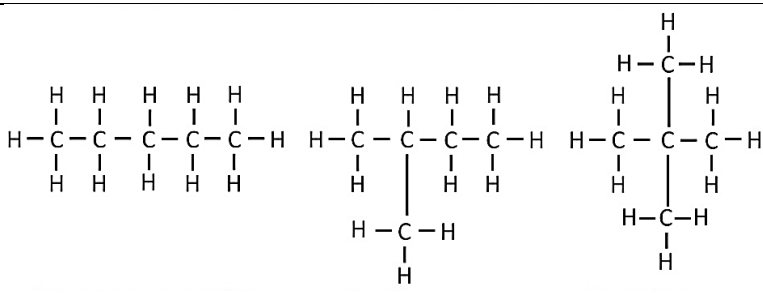
[6 markah /6 marks]

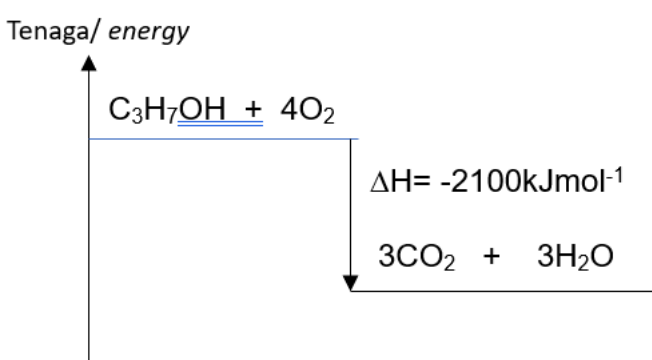
SKEMA JAWAPAN / PEMARKAHAN
PRAKTIS KIMIA 4541/2
SET 2

Soalan Question		Jawapan Answer	Markah Marks	
			Sub	Total
1	(a)	Atom dengan bilangan proton yang sama tetapi bilangan nukleon yang berbeza / <i>Atoms with the same proton number but different nucleon number</i> <i>// Atom with the same number of protons but different number of neutrons</i>	1	1
	(b)	Y dan Z <i>Y and Z</i>	1	1
	(c)	Zarah X : 3 <i>Particles X:</i> Zarah Y : 7 <i>Particles Y :</i>	1 1	2
	(d)	$^{35}_{17}\text{Z}$ // $^{35}_{17}\text{Cl}$	1	1
Jumlah / Total			5	
2.	(a)	Magnesium // (Mana-mana logam) <i>Magnesium // (Any metals)</i>	1	1
	(b)	Atom logam tersusun secara rapat dan teratur. <i>Metal atoms are arranged closely packed and orderly.</i>	1	1
	(c)	Elektron yang bebas bergerak dan tidak dimiliki oleh mana-mana atom atau ion. <i>Electron that moves freely and is not owned by any atom nor ion.</i>	1	1
	(d)	Lautan elektron <i>Sea of electrons</i>	1	1
	(e)	Ion logam bercas positif dan lautan elektron tertarik oleh daya tarikan elektrostatik yang kuat. <i>Positively-charged metal ions and sea of electrons are attracted by strong electrostatic attraction force.</i>	1	1
	(f)	Elektron dinyahsetempatan membawa cas dari terminal negatif ke terminal positif apabila elektrik dibekalkan. <i>Delocalised electrons carry charges from the negative terminal to the positive terminal when electricity is supplied.</i>	1	1
	(g)	Air mengandungi ion-ion bebas bergerak yang mengkonduksikan elektrik. <i>Water consists of free moving ions that conduct electricity.</i>	1	1
Jumlah / Total			7	
3.	(a)	Kumpulan 1 // <i>Group 1</i>	1	1
	(b)	Simpan di dalam minyak parafin <i>Stored in paraffin oil</i>	1	1

Soalan Question		Jawapan Answer						Markah Marks		
								Sub	Total	
	(c) (i)	1. Formula kimia bahan tindak balas dan hasil tindak balas yang betul. <i>Correct chemical formulae of reactants and products</i> 2. Persamaan kimia yang seimbang <i>Balanced chemical equation</i> $4K + O_2 \rightarrow 2K_2O$						1	2	
	(ii)	Kalium hidroksida <i>Potassium hydroxide</i>						1		1
	(iii)	Merah kepada biru <i>Red to blue</i>						1	1	
		Jumlah / Total						6		
4	(a)	Proses I / <i>Process I</i> : Saponifikasi / <i>Saponification</i> Proses II / <i>Process II</i> : Penghidrogenan / <i>Hydrogenation</i>						1	2	
	(b)	Alkali X / <i>Alkali X</i> : NaOH // KOH Mangkin Y / <i>Catalyst Y</i> : Nikel / <i>Nickel</i> // Platinum						1	2	
	(c)	Natrium palmitat / <i>Sodium palmitate</i> // Kalium palmitat / <i>Potassium palmitate</i>						1	1	
	(d)	Perbezaan dari segi <i>Difference in term of</i>	Minyak kelapa sawit <i>Palm oil</i>	Marjerin <i>Margarine</i>				1	2	
		Kedadaan fizik <i>Physical state</i>	Cecair <i>Liquid</i>	Pepejal <i>Solid</i>						
		Takat lebur <i>Melting point</i>	Rendah <i>Low</i>	Tinggi <i>High</i>			1			
		Jumlah / Total						7		
5	(a)	Pengurangan kuantiti protein susu per unit masa. <i>Decrease in the quantity of milk protein per unit time.</i>						1	1	
	(b)	Larutan putih menjadi jernih. <i>White solution becomes clear.</i>						1	1	
	(c) (i)	$\frac{1}{\text{Masa}}$ (minit ⁻¹)	0.08	0.14	0.40	0.25	0.14	0.05	1	1
		$\frac{1}{\text{Time}}$ (minute ⁻¹)								

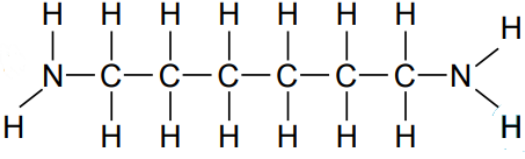
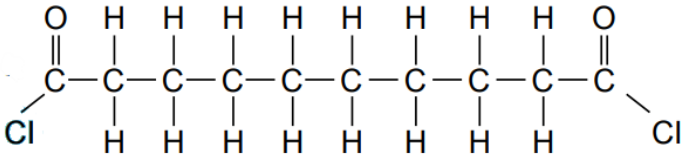
Soalan Question		Jawapan Answer	Markah Marks		
			Sub	Total	
	(ii)	Kadar tindak balas, $\frac{1}{\text{Masa}}$ (minit ⁻¹) Rate of reaction, $\frac{1}{\text{Time}}$ (minute ⁻¹) 	2	2	
	(iii)	Apabila suhu meningkat, kadar pencernaan protein meningkat dan kemudian, menurun. When temperature increases, rate of protein digestion increases, and then, decreases.	1	1	
	(iv)	Pada mulanya, kehadiran enzim sebagai mangkin meningkatkan kadar pencernaan protein. Initially, the presence of enzyme as catalyst increases the rate of protein digestion. Pada suhu tinggi, enzim menjadi terdenaturasi dan hilang kebolehan untuk meningkatkan kadar tindak balas. At high temperature, enzyme is denatured and loses its ability to increase the rate of protein digestion.	1 1	2	
		Total / Jumlah	8		
6	(a)	(i)	Pelarut A / Solvent A : Metilbenzena // tetraklorometana // sikloheksana / Methylbenzene // tetrachloromethane // cyclohexane Pelarut B / Solvent B : Air / Water	1 1	2
		(ii)	Tiada air hadir dalam pelarut A Hidrogen klorida wujud sebagai molekul / tiada ion hidrogen Hidrogen klorida dalam pelarut B mengandungi ion-ion yang bebas bergerak No water present in solvent A Hydrogen chloride exists as molecules / no hydrogen ions Hydrogen chloride in solvent B contain free moving ions	1 1 1	3
	(b)	(i)	$\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$ Formula kimia bahan dan hasil tindak balas betul Persamaan kimia seimbang	1 1	2

Soalan Question	Jawapan Answer	Markah Marks	
		Sub	Total
	<p><i>Correct formula of reactants and products</i></p> <p><i>Balanced chemical equation</i></p>		
	<p>(ii) Daripada persamaan kimia, 2 mol HCl menghasilkan 1 mol H₂ 0.01 mol HCl akan menghasilkan 0.005 mol H₂</p> <p>Isi padu maksimum gas yang dibebaskan = 0.005 x 24 dm³ = 0.12 dm³</p> <p><i>From the chemical equation,</i> <i>2 mol HCl produce 1 mol H₂</i> <i>0.01 mol HCl will produce 0.005 mol H₂</i></p> <p><i>Maximum volume of gas released = 0.005 x 24 dm³</i> <i>= 0.12 dm³</i></p>	1 1	2
	Jumlah / Total		9
7. (a)	(i) Sebatian yang mengandungi hidrogen dan karbon <u>sahaja</u> .// <i>Compound that contains hydrogen and carbon <u>only</u>.</i>	1	1
	(ii) Peretakan // <i>Cracking</i>	1	1
	(iii) Aluminium oksida dan silicon(IV) oksida / silicon dioksida // <i>Aluminium oxide and silicon(IV) oxide / silicon dioxide //</i> Al ₂ O ₃ dan / and SiO ₂	1	
	(iv) <div style="text-align: center;">  <p>[Mana-mana dua // Any two]</p> </div>	1+1	2
	(b) (i) Alkena // <i>Alkene</i>	1	1
	(ii) Sebatian J / <i>Compound J</i> : $\frac{4 \times 12}{(4 \times 12) + 10} \times 100 = 82.76\%$ Sebatian K / <i>Compound K</i> : $\frac{4 \times 12}{(4 \times 12) + 8} \times 100 = 85.71\%$	1 1	2

Soalan Question		Jawapan Answer	Markah Marks	
			Sub	Total
	(iii)	1. Ya <i>Yes</i> 2. Pembakaran sebatian J akan menghasilkan nyalaan yang kurang berjelaga. // <i>Combustion of compound J will produce less sooty flame.</i>	1 1	2
Total / Jumlah			10	
8	(a)	Exothermic	1	1
	(b)	$C_3H_7OH + 4O_2 \rightarrow 3CO_2 + 3H_2O \quad \Delta H = -2100kJmol^{-1}$	1	1
	(c)	P1: Aras tenaga yang betul / <i>correct energy level</i> P2: Label bahan dan hasil tindak balas, ΔH / <i>Label/ the reactants and product, ΔH</i> 	1 1	2
	(d)	P1: Haba yang dibebaskan / <i>Heat released</i> $= 250 \times 4.2 \times 20$ $= 21000J // 21kJ$ P2: bilangan mol alkohol B / <i>number of moles alcohol B</i> $= \frac{21}{2877}$ $= 0.0073 \text{ mol}$ P3: Jisim alkohol B / <i>mass of alcohol B</i> $= 0.0073 \times 74$ $= 0.54g$	1 1	3
	(e)	P1: Gas hidrogen/ <i>Hydrogen gas</i> P2: Ini adalah kerana gas metana, petrol dan metanol ialah sebatian karbon yang akan menghasilkan gas karbon dioksida daripada pembakaran lengkap dan gas karbon monoksida dan jelaga daripada pembakaran tidak lengkap. Hasil tindak balas ini boleh menyebabkan pencemaran alam sekitar.	1 1	3

Soalan Question		Jawapan Answer		Markah Marks					
				Sub	Total				
		<p><i>This is because methane gas, petrol and methanol are carbon compounds which will produce carbon dioxide gas from complete combustion and carbon monoxide gas and soot from incomplete combustion. These products can cause pollution to the environment.</i></p> <p>P3: Manakala pembakaran gas hidrogen hanya menghasilkan air yang tidak mencemarkan alam sekitar. <i>Whereas the combustion of hydrogen gas only produces water which does not pollute the environment.</i></p>		1					
		Jumlah / Total		10					
9	(a)	<p>Able to calculate the mass of iron produced correctly.</p> <p>1. Jisim molar / JFR Fe₂O₃ <i>Molar mass / RFM Fe₂O₃</i></p> <p>2. Bilangan mol <i>Number of mole</i></p> <p>3. Nisbah mol <i>Ratio of mole</i></p> <p>4. Jisim besi dengan unit yang betul <i>Mass of iron with correct unit</i></p> <p>Jisim molar / JFR Fe₂O₃ = 2(56)+ 3(16) // 160 <i>Molar mass / RFM Fe₂O₃</i></p> <p>No of mole = $\frac{440000}{160}$ // 2750 mol <i>Bilangan mol</i></p> <p>2 mol of Fe₂O₃ : 4 mol of Fe // 2750 mol of Fe₂O₃ : 5500 mol Fe</p> <p>Jisim Fe = 5500 x 56 // 308000 g // 308kg <i>Mass of Fe</i></p>		1 1 1 1	4				
	(b)	(i)	<table border="1" style="width: 100%;"> <thead> <tr> <th style="text-align: center;">Eksperimen I <i>Experiment I</i></th> <th style="text-align: center;">Eksperimen II <i>Experiment II</i></th> </tr> </thead> <tbody> <tr> <td>Gelembung gas tak berwarna terbebas <i>Colourless gas bubbles released</i></td> <td>Elektrod kuprum menipis <i>Copper electrode becomes thinner</i></td> </tr> </tbody> </table>	Eksperimen I <i>Experiment I</i>	Eksperimen II <i>Experiment II</i>	Gelembung gas tak berwarna terbebas <i>Colourless gas bubbles released</i>	Elektrod kuprum menipis <i>Copper electrode becomes thinner</i>	1	5
Eksperimen I <i>Experiment I</i>	Eksperimen II <i>Experiment II</i>								
Gelembung gas tak berwarna terbebas <i>Colourless gas bubbles released</i>	Elektrod kuprum menipis <i>Copper electrode becomes thinner</i>								

Soalan Question		Jawapan Answer		Markah Marks											
				Sub	Total										
		Elektrod karbon digunakan di anod Carbon electrode is used at anode	Elektrod kuprum digunakan di anod Copper electrode is used at anode	1											
		OH ⁻ dinyahcas <i>OH⁻ ion is discharged</i>	Cu mengion // oxidise <i>Cu ionize // mengoksida</i>	1											
		Nilai E ^o bagi OH ⁻ lebih negatif daripada SO ₄ ²⁻ <i>E^o value of OH⁻ is more negative than SO₄²⁻</i>	Cu merupakan elektrod aktif <i>Cu is active electrode</i>	1											
		4OH ⁻ → O ₂ (g) + 2H ₂ O(l) + 4e ⁻	Cu → Cu ²⁺ + 2e ⁻	1											
	(ii)	1. Gas klorin <i>Chlorine gas</i> 2. Masukkan kertas litmus biru lembap ke dalam tabung uji yang berisi gas <i>Insert the moist blue litmus paper into the test tube containing the gas</i> 3. Menjadi merah dan luntur <i>Becomes red and bleached</i>		1 1 1	3										
	(iii)	1. Kepekatan ion Cu ²⁺ tidak berubah <i>Concentration of Cu²⁺ ion does not change</i> 2. Kadar Cu mengion di anod sama dengan kadar ion Cu ²⁺ dinyahcas di katod. <i>The rate of Cu ionize at anode is the same as the rate of discharged of Cu²⁺ at cathode.</i>		1 1	2										
	(c)	P: Mg // Zn // Al Q: Pb // Cu // Ag <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 50%;">Set I</th> <th style="width: 50%;">Set II</th> </tr> </thead> <tbody> <tr> <td>P lebih elektropositif daripada Fe <i>P is more electropositive than Fe</i></td> <td>Fe lebih elektropositif daripada Q <i>Fe is more electropositive than Q</i></td> </tr> <tr> <td>P mengalami pengoksidaan <i>P undergoes oxidation</i></td> <td>Fe mengalami pengoksidaan <i>Fe undergoes oxidation</i></td> </tr> <tr> <td>Tiada Fe²⁺ hadir <i>No Fe²⁺ present</i></td> <td>Fe²⁺ hadir <i>Fe²⁺ present</i></td> </tr> <tr> <td>Paku besi tidak berkarat <i>Iron nail does not rust</i></td> <td>Paku besi berkarat <i>Iron nail rust</i></td> </tr> </tbody> </table>		Set I	Set II	P lebih elektropositif daripada Fe <i>P is more electropositive than Fe</i>	Fe lebih elektropositif daripada Q <i>Fe is more electropositive than Q</i>	P mengalami pengoksidaan <i>P undergoes oxidation</i>	Fe mengalami pengoksidaan <i>Fe undergoes oxidation</i>	Tiada Fe ²⁺ hadir <i>No Fe²⁺ present</i>	Fe ²⁺ hadir <i>Fe²⁺ present</i>	Paku besi tidak berkarat <i>Iron nail does not rust</i>	Paku besi berkarat <i>Iron nail rust</i>	1 1 1 1 1 1	6
Set I	Set II														
P lebih elektropositif daripada Fe <i>P is more electropositive than Fe</i>	Fe lebih elektropositif daripada Q <i>Fe is more electropositive than Q</i>														
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Paku besi tidak berkarat <i>Iron nail does not rust</i>	Paku besi berkarat <i>Iron nail rust</i>														
Total / Jumlah				20											

Soalan Question		Jawapan Answer	Markah Marks		
			Sub	Total	
10	(a)	(i)	<ul style="list-style-type: none"> Polimer ialah molekul berantai panjang yang terhasil daripada pencantuman banyak ulangan unit asas. <i>A polymer is a long chain molecule that is made from a combination of many repeating basic units.</i> 	1	1
		(ii)	<ul style="list-style-type: none"> polimer yang terhasil secara semula jadi dan dapat diperoleh daripada alam sekeliling. <i>polymers that are naturally available and can be obtained from our surroundings</i> Polimer yang dihasilkan oleh manusia melalui tindak balas kimia di makmal / kilang-kilang. <i>man-made polymers through chemical reactions in laboratories / factories.</i> Polimer semulajadi / kapas tidak menyebabkan pencemaran // kapas adalah polimer terbiodegradasi. <i>Natural polymer/ cotton does not cause pollution // cotton is biodegradable.</i> Polimer sintetik / nilon menyebabkan pencemaran alam sekitar / nilon tidak terbiodegradasi. <i>Synthetic polymer / nylon cause pollution // nylon is non-biodegradable.</i> 	1 1 1 1	4
		(iii)	<ul style="list-style-type: none">   	1 1	2
	(b)	(i)	<ul style="list-style-type: none"> P : Elastomer <i>Elastomer</i> Dapat dimampatkan dan kembali ke bentuk asal selepas dilepaskan.// menunjukkan kekenyalan yang sangat tinggi <i>can be compressed and can return to their original shape when released.// Possess high elasticity</i> Q : Termoplastik <i>Thermoplastic</i> Tahan lasak // dapat diacu dengan mudah <i>Durable // Can be molded easily</i> 	1 1 1 1	4
	(c)	(i)	<ul style="list-style-type: none"> A: Terilena <i>Terylene</i> B : Poliethene <i>Polyethene / polyethylene</i> 	1 1	2

Soalan Question		Jawapan Answer			Markah Marks	
					Sub	Total
	(ii)	Polimer <i>Polymer</i>	A / Terilena <i>A / Terylene</i>	B / Polietena <i>B / Polyethene</i>		
		Persamaan <i>Similarities</i>	<ul style="list-style-type: none"> Molekul berantai Panjang yang dibentuk melalui pempolimeran. <i>Long chain molecules formed through polymerization</i> Monomer-monomer merupakan sebatian karbon <i>Monomers are carbon compounds.</i> 		1	
		Perbezaan <i>Differences</i>	<ul style="list-style-type: none"> dihasilkan melalui pempolimeran kondensasi <i>produced through condensation polymerization</i> 	<ul style="list-style-type: none"> dihasilkan melalui pempolimeran tambahan <i>produced through addition polymerization</i> 	1	
			<ul style="list-style-type: none"> Melibatkan dua jenis monomer yang berbeza // monomer yang terlibat memiliki dua kumpulan berfungsi. <i>involves two different monomers // The monomers involved consist of two functional groups</i> 	<ul style="list-style-type: none"> Melibatkan satu jenis monomer sahaja // monomer yang terlibat memiliki satu kumpulan berfungsi sahaja. <i>The monomers involve are identical // The monomers involved consist of one functional group.</i> 	1	4
			<ul style="list-style-type: none"> Hasil pempolimeran ialah polimer dan satu molekul air. <i>The product of condensation polymerisation is a polymer and water molecule.</i> 	<ul style="list-style-type: none"> Hasil pempolimeran ialah polimer sahaja. <i>The product of polymerisation is a polymer only.</i> 	1	
		* mana-mana dua persamaan dan dua perbezaan <i>*any two similarities and differences</i>			Max 4	
	(iii)	<ul style="list-style-type: none"> Cawan bahan komposit A <i>Composite material cup A</i> Pulpa tebu boleh diurai oleh bakteria / bahan terbiodegradasi. 			1	
					1	3

Soalan Question		Jawapan Answer				Markah Marks													
						Sub	Total												
		<p><i>Sugarcane fiber pulp is easily decomposed by bacteria // biodegradable material.</i></p> <ul style="list-style-type: none"> Tidak menyebabkan masalah pencemaran seperti mikroplastik memasuki rantai makanan. <i>Not causing pollution such as microplastic entering food chain.</i> <p style="text-align: center;">Atau / or</p> <ul style="list-style-type: none"> Cawan polimer sintetik B <i>Synthetic polymer cup B</i> Kos lebih rendah // <i>lower cost.</i> Merupakan termoplastik yang mudah dikitar semula. <i>Is a type of thermoplastic that is easily recycled.</i> 				1													
		Total / Jumlah				20													
11	(a)	<table border="1"> <thead> <tr> <th>Bahan <i>Substance</i></th> <th>P</th> <th>Q</th> <th>R</th> </tr> </thead> <tbody> <tr> <td>Nama <i>Name</i></td> <td>Gangsa <i>Bronze</i></td> <td>Kaca Borosilikat <i>Borosilicate glass</i></td> <td>Kaca gentian <i>Fibre glass</i></td> </tr> <tr> <td>Sifat khusus <i>Specific properties</i></td> <td>Permukaan berkilat/ Tidak mudah berkarat// keras dan kuat <i>Shiny surface // Does not corrode easily//hard and strong</i></td> <td>Tahan suhu tinggi // Tahan terhadap bahan kimia// pengembangan haba rendah <i>Withstand high temperature// Resistant to chemicals //low thermal expansion</i></td> <td>Kekuatan regangan tinggi <i>Light, strong and hard</i></td> </tr> </tbody> </table>	Bahan <i>Substance</i>	P	Q	R	Nama <i>Name</i>	Gangsa <i>Bronze</i>	Kaca Borosilikat <i>Borosilicate glass</i>	Kaca gentian <i>Fibre glass</i>	Sifat khusus <i>Specific properties</i>	Permukaan berkilat/ Tidak mudah berkarat// keras dan kuat <i>Shiny surface // Does not corrode easily//hard and strong</i>	Tahan suhu tinggi // Tahan terhadap bahan kimia// pengembangan haba rendah <i>Withstand high temperature// Resistant to chemicals //low thermal expansion</i>	Kekuatan regangan tinggi <i>Light, strong and hard</i>				1 1 1	6
Bahan <i>Substance</i>	P	Q	R																
Nama <i>Name</i>	Gangsa <i>Bronze</i>	Kaca Borosilikat <i>Borosilicate glass</i>	Kaca gentian <i>Fibre glass</i>																
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	(b)	<ol style="list-style-type: none"> Konkrit diperkukuhkan terhasil apabila tetulang keluli atau jejaring dawai (bahan pengukuhan) dibenamkan ke dalam konkrit (bahan matriks). Konkrit kuat tetapi kekuatan regangan rendah Keluli mempunyai kekuatan regangan tinggi Kombinasi konkrit dan keluli menghasilkan bahan komposit yang mempunyai kekuatan mampatan tinggi dan kekuatan regangan tinggi 				1													
						1 1 1	4												

Soalan Question		Jawapan Answer	Markah Marks	
			Sub	Total
		<ol style="list-style-type: none"> 1. Reinforced concrete is made up of concrete and steel/ steel bars/ steel wires / polymer fibers 2. Concrete is strong but brittle/ weak in tension 3. Steel has high stretching strength 4. Combination of concrete and steel produced a tough and more tensile strength material 		
	(c)	<ol style="list-style-type: none"> 1. Keluli nirkarat 2. Keluli nirkarat tahan kakisan 3. Besi mudah berkarat 4. Air laut mengandungi garam yang merupakan elektrolit. <ol style="list-style-type: none"> 1. Stainless steel 2. Stainless steel resistant to corrosion. 3. Iron rusted easily 4. Sea water contain salt which is an electrolyte 	1 1 1 1	4
	(d)	<ol style="list-style-type: none"> 1. Bersihkan permukaan kepingan keluli nirkarat dan kepingan besi dengan menggunakan kertas pasir. Perhatikan keadaan permukaan kedua-dua kepingan. Catatkan pemerhatian anda. 2. Tuangkan air suling ke dalam bikar sehingga separuh penuh. 3. Rendamkan kedua-dua kepingan ke dalam bikar yang berisi air suling. 4. Biarkan kedua-dua bikar selama seminggu. 5. Selepas seminggu, keluarkan kedua-dua kepingan dan perhatikan semula keadaan permukaannya. 6. Catatkan pemerhatian anda. <ol style="list-style-type: none"> 1. Clean the surfaces of stainless steel and iron plates by using a sandpaper. Observe the surfaces of both plates. Record your observations. 2. Pour distilled water into a beaker until half filled. 3. Immerse both plates in a beaker containing 80 cm³ of distilled water. 4. Leave both beakers aside for one week. 5. After one week, remove both plates and observe the conditions of their surfaces. 6. Record your observations. 	1 1 1 1 1 1	6
Total / Jumlah				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	2			3															5
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																			
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	2			2			2												6
	4.5 Elements in Group 17																			
	4.6 Elements in Period 3																			
	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																			
	5.5 Dative bond																			
	5.6 Metallic bond	3			2															5
	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				2							3								5
	6.2 pH value																			
	6.3 Strength of acids and alkalis																			
	6.4 Chemical properties of acids and alkalis							2	2											4
	6.5 Concentration of aqueous solution																			
	6.6 Standard solution																			
	6.7 Neutralisation																			
	6.8 Salts, crystals and their uses in daily life																			
	6.9 Preparation of salts																			
	6.10 Effect of heat on																			

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	
7. Rate of Reaction [F4]	7.1 Determining rate of reaction	1			2	3		2												8
	7.2 Factors affecting rate of reaction																			
	7.3 Application of factors that affect the rate of reaction in daily																			
	7.4 Collision theory																			
8. Manufactured Substances in Industry [F4]	8.1 Alloy and its importance	2									2	2					2	4		12
	8.2 Composition of glass and its uses	2				4														6
	8.3 Composition of ceramics and its uses	2																		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																			
	9.4 Electrolytic cell					2				1	2	2		3						10
	9.5 Extraction of metal from its ore							2	2											4
	9.6 Rusting										2	2	2							6
10. Carbon compound [F5]	10.1 Types of carbon compound	2			1															3
	10.2 Homologous series	1																		1
	10.3 Chemical properties and interconversion of compounds between homologous series								2		2									4
	10.4 Isomers and naming based on IUPAC nomenclature								2											2
11. Thermochemistry [F5]	11.1 Heat change in reactions				1			2	1	3		3								10
	11.2 Heat of reaction																			
	11.3 Application of endothermic and exothermic reactions in daily life																			
12. Polymer Chemistry [F5]	12.1 Polymer	3			1															4
	12.2 Natural rubber				1															1
	12.3 Synthetic rubber					2			4	2	4		3							15
13. Consumer and Industrial Chemistry [F5]	13.1 Oils and fats	2																		2
	13.2 Cleaning agents	2			2			1												5
	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		24	0	0	17	11	0	8	12	7	7	13	9	0	6	0	0	2	4	120
Ratio of E:M:H																				
Level of Difficulty		E : Easy M : Medium H : Hard																		