NAMA : _____

KELAS : _____

SULIT

JABATAN PELAJARAN NEGERI SABAH

SIJIL PELAJARAN MALAYSIA 2009 4541/1

EXCEL II
CHEMISTRY SPM
Kertas 1
September 2009

1 Jam 15 minit Satu jam lima belas minit

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1. *Kertas soalan ini adalah dalam dwibahasa.*
2. *Soalan dalam Bahasa Inggeris mendahului soalan yang sepadan dalam Bahasa Malaysia.*
3. *Calon dikehendaki membaca dengan teliti arahan di dalam kertas soalan ini.*

DO NOT OPEN THE QUESTION PAPER UNTIL INSTRUCTED
(*JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU*)

1. This question paper consists of **50** questions. *(Kertas soalan ini mengandungi **50** soalan).*
4. Answer **all** questions. *(Jawab **semua** soalan).*
5. Answer each question by **blackening** the correct space on the objective sheet. *(Jawab setiap soalan dengan **menghitamkan** ruangan yang betul pada kertas jawapan*).
4. **Blacken** only one space for each question. *(**Hitamkan** satu ruangan sahaja bagi setiap soalan).*
5. If you wish to change your answer, erase the blackened mark that you have made. Then blacken the space for the new answer. *(Sekiranya anda hendak menukarkan jawapan, padamkan tanda yang telah dibuat dan hitamkan jawapan yang baru).*
6. The diagrams in the question provided are not drawn to scale unless stated. *(Rajah yang mengiringi soalan tidak dilukiskan mengikut skala kecuali dinyatakan).*
7. You may use a non-programmable scientific calculator. *(Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogram.*

Kertas soalan ini mengandungi 24 halaman berrcetak

[Lihat sebelah]
SULIT

1 Diagram 1 shows the symbol for sodium atom
Rajah 1 menunjukkan simbol atom natrium

$^{23}_{11}Na$

Diagram 1
Rajah 1

Which of the following is true based on the symbol in Diagram 1.
Antara berikut yang manakah benar berdasarkan simbol dalam Rajah 1

	Proton number *Nombor proton*	Nucleon number *Nombor nukleon*	Number of electron *Bilangan elektron*
A	11	23	11
B	11	11	23
C	12	23	11
D	12	11	23

2 The cooling curve for liquid naphthalene is shown in Diagram 2.
Graf bagi cecair naftalena semasa penyejukan ditunjukkan pada Rajah 2.

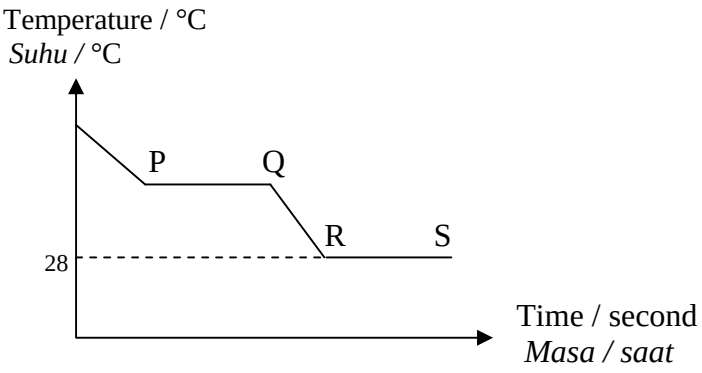


Diagram 2
Rajah 2

Based on the graph, liquid naphthalene freezes at the end point of
Berdasarkan graf , cecair naftalena membeku pada takat akhir …

A P
B Q
C R
D S

3 How many moles of nitrogen atoms are there in 2 moles of ammonium phosphate , $(NH_4)_3 PO_4$?
Berapakah bilangan mol atom nitrogen dalam 2 mol ammonium fosfat , $(NH_4)_3 PO_4$?

A 2
B 4
C 6
D 8

4 A mass of copper contains 6.02×10^{24} of particles. What is the number of moles of the copper .
Suatu jirim kuprum mempunyai 6.02 × 10^{24} zarah. Berapakah bilangan mol kuprum tersebut?

A 0.1 mol
B 1.0 mol
C 10.0 mol
D 100.0 mol

5 Diagram 3 shows the electron arrangement of atom X.
Rajah 3 menunjukkan susunan bagi atom X.

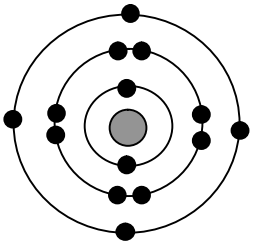


Diagram 3
Rajah 3

State the group of element X in the Periodic Table.
Nyatakan kumpulan unsur X dalam Jadual Berkala.

A Group 2
Kumpulan 2
B Group 13
Kumpulan 13
C Group 14
Kumpulan 14
D Group 15
Kumpulan 15

6 Which of the following is characteristic of bromine?
Antara yang berikut, manakah merupakan ciri bagi bromine?

A Dissolves in water to form an alkaline solution.
Larut ke dalam air untuk membentuk larutan beralkali.
B Turn moist blue litmus paper to red.
Mengubah kertas litmus biru lembap kepada merah.
C It is more electronegative than chlorine.
Ia lebih elektronegatif daripada klorin.
D At room temperature, it exist as reddish brown gas.
Pada suhu bilik, ia wujud sebagai gas berwarna perang kemerahan.

7 How many single covalent bond is / are present in water molecule?
Berapakah ikatan kovalen tunggal wujud dalam molekul air?

A 1
B 2
C 3
D 4

8 Aluminium oxide has both acidic and basic properties, therefore it is
Aluminium oksida mempunyai kedua – dua sifat asid dan bes, oleh itu aluminium oksida

A a metalloid oxide
oksida logam
B a base oxide
oksida bes
C an amphoteric oxide
oksida amfoterik
D an acid oxide
oksida asid

9 Which of the following substances has a pH value of less than 7?
Antara unsur berikut yang manakah mempunyai nilai pH kurang daripada 7?

A Toothpaste
Ubat gigi
B Orange juice
Jus oren
C Sugar
Gula
D Soap
Sabun

10 Which of the following is the best description of a salt?
Manakah antara yang berikut keterangan terbaik mengenai garam?

A It is formed when the hydrogen ions in an acid is replaced by metal or ammonium ions
Ia terbentuk apabila ion hidrogen dalam asid disesarkan oleh logam atau ion ammonium.
B It is composed of discrete molecules attracted by weak van der Waals' forces of attraction.
Ia menguraikan molekul diskrit yang ditarik oleh daya tarikan van der Waals' yang lemah.
C It is used mainly as food preservatives.
Kegunaan utamanya adalah sebagai pengawet makanan.
D It is formed when metal reacts with an alkali.
Ia terbentuk apabila logam bertindak balas dengan alkali.

11 Which of the following statements correctly describe a strong alkali?
Antara pernyataan berikut yang manakah menghuraikan alkali kuat dengan betul?

I Has a high pH value
Mempunyai nila pH yang tinggi

II Ionises partially in water
Mengion dengan separa lengkap dalam air

III Has a high concentration of hydroxide ions
Mempunyai kepekatan ion hidrogen yang tinggi

IV Exists as molecules in water
Wujub sebagai molekul dalam air

A I and II only
I dan II sahaja

B II and IV only
II dan IV sahaja

C I and III only
I dan III sahaja

D III and IV only
III dan IV sahaja

12 Diagram 4 shows the arrangement of atoms in a substance.
Rajah 4 menunjukkan susunan atom dalam suatu bahan.

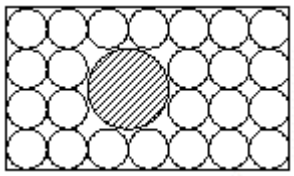


Diagram 4
Gambarajah 4

Which substance may have the arrangement of atoms as shown above?
Bahan manakah mungkin mempunyai susunan atom seperti di atas?

A Alloy
Aloi

B Metal
Logam

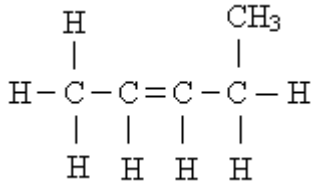
C Polymer
Polimer

D Composite material
Bahan komposit

13 Cyclohexene is classified as an unsaturated hydrocarbon because
Sikloheksena dikelaskan sebagai hidrokarbon tidak tepu kerana

A its contains only carbon and hydrogen .
ia mengandungi karbon dan hidrogen sahaja.
B it is a liquid at room temperature.
ia adalah cecair pada suhu bilik.
C it is insoluble in water but soluble in organic solvents.
ia tidak larut dalam air tetapi larut dalam pelarut organik.
D it has a carbon-carbon double bond.
ia mempunyai ikatan dubel antara atom karbonnya.

14 What is the IUPAC name of the given compound?
Apakah nama IUPAC bagi sebatian ini?



A 4-methylbut-2-ene
4-metilbut-2-ena
B Pent-2-ene
Pent-2-ena
C 1-methylbut-2-ene
1-metilbut-2-ena
D Pent-3-ene
Pent-3-ena

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

	Oxidation ***Pengoksidaan***	**Reduction** ***Penurunan***
A	Gain of oxygen *Menerima oksigen*	Loss of hydrogen *Kehilangan hydrogen*
B	Loss of oxygen *Kehilangan oksigen*	Gain of hydrogen *Menerima hydrogen*
C	Loss of electron *Kehilangan elektron*	Gain of proton *Menerima proton*
D	Increase in oxidation number *Pertambahan nombor pengoksidaan*	Decrease in oxidation number *Pengurangan nombor pengoksidaan*

16 Hardi is not feeling well. He went to the clinic and the doctor prescribed paracetamol.
Hardi merasa tidak sihat. Dia pergi ke klinik dan doctor memberinya paracetamol.

What type of medicine of paracetamol?
Apakah jenis ubat parasetamol?

A Analgesic
Analgesik
B Antibiotic
Antibiotik
C Psychotherapentic
Psikoteraputik
D Antipsychotic
Antipsikotik

17 Diagram 4 shows the electronic structure of an ion R^{2+}.
Rajah 4 menunjukkan struktur elektron bagi ion R^{2+}.

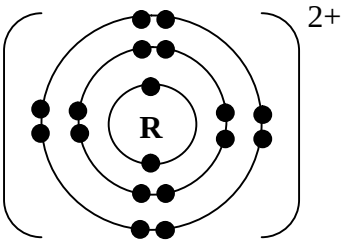


Diagram 4
Rajah 4

The chemical symbol for atom R is
Simbol kimia bagi atom R ialah

A $^{32}_{14}R$
B $^{32}_{16}R$
C $^{32}_{18}R$
D $^{32}_{20}R$

18 The following equation represents the reaction between aluminium and chlorine.
Persamaan berikut mewakili tindak balas antara aluminium dan klorin.

$$2\ Al + 3\ Cl_2 \rightarrow 2\ AlCl_3$$

Which of the following statement is correct ?
Antara pernyataan berikut, yang manakah betul?

A 2 mol of aluminium atoms react with 3 mol of chlorine atoms
2 mol atom aluminium bertindak balas dengan 3 mol atom klorin

B 2 mol of aluminium atoms react with 3 mol of chlorine molecules
2 mol atom aluminium bertindak balas dengan 3 mol molekul klorin

C 2 mol of aluminium atoms react with 3 mol of chlorine atoms producing 2 mol of aluminium chloride.
2 mol atom aluminium bertindak balas dengan 3 mol atom klorin untuk menghasilkan 2 mol aluminium klorida

D 2 mol of aluminium atoms react with 6 mol of chlorine molecules producing 2 mol of aluminium chloride.
2 mol atom aluminium bertindak balas dengan 6 mol molekul klorin untuk menghasilkan 2 mol aluminium klorida

19 Particles P and Q have the following composition as shown in Table 1.
Zarah - zarah P dan Q mempunyai komposisi seperti yang ditunjukkan pada Jadual 1.

Particle *Zarah*	Electrons *elektron*	Neutrons *Neutron*	Protons *Proton*
P	18	18	17
Q	17	18	17

Table 1
Jadual 1

Which of the following statements are true about P and Q.
Antara pernyataan berikut adalah benar tentang P dan Q

I P and Q are isotopes
P dan Q adalah isotop

II P and Q are positively charged.
P dan Q adalah bercas positif

III P and Q are the same element.
P dan Q adalah unsur yang sama

IV P and Q have the same nucleon number.
P dan Q mempunyai nombor nukleon yang sama.

A I and III only
I dan III sahaja

B I and IV only
I dan IV sahaja

C II , III and IV only
II , III dan IV sahaja

D I , III and IV only
I , III dan IV sahaja

20 Table 2 shows the proton numbers and nucleon numbers of two elements.
Jadual 2 menunjukkan nombor proton dan nombor nukleon bagi dua unsur.

Element *Unsur*	Proton number *Nombor proton*	Nucleon number *Nombor nucleon*
P	10	20
Q	18	40

Table 2
Jadual 2

Which of the following is true about element P and Q ?
Antara berikut yang manakah benar tentang unsur P dan Q?

A Both elements are monoatomic.
Kedua – dua unsur merupakan monoatom.

B Element P is more reactive than element Q
Unsur P lebih reaktif daripada Q.

C Element P has a higher boiling point than element Q.
Unsur P mempunyai takat didih yang lebih tinggi daripada Q.

D Both elements react with calcium to form a compound with the formula CaP and CaQ respertively.
Kedua – dua unsur bertindak balas dengan kalsium untuk membentuk sebatian yang berformula CaP dan CaQ masing – masing.

21 Element P and oxygen are placed in the same group in the Periodic Table. Which of the following is true about P?
Unsur P dan oksigen diletakkan dalam kumpulan yang sama dalam Jadual Berkala. Antara berikut, yang manakah benar tentang P?

A P forms an acidic oxide
P membentuk oksida asid

B P is a reduction agent
P adalah agen penurunan

C P reacts with carbon to form a compound with the formula of CP_4
P bertindak balas dengan karbon untuk membentuk sebatian dengan formula CP_4

D P reacts with magnesium to form a compound with the formula of MgP_2
P bertindak balas dengan magnesium untuk membentuk sebatian dengan formula MgP_2

22 The electron arrangement of atom B is 2.8.6 and atom E has four valence electrons. What is the formula of the compound formed between B and E ?
Susunan elektron bagi atom B ialah 2.8.6 dan atom E mempunyai empat elektron valens. Apakah formula sebatian yang terbentuk antara B dengan E?

A EB_2
B EB_4
C B_2E
D B_4E

23 You are given two different compounds. One of the compounds is calcium chloride and the other is ethanol. Which of the following physical properties can be used to differentiate the two compounds?
Anda diberi dua sebatian yang berlainan. Satu daripada sebatian adalah kalsium klorida dan satu lagi adalah etanol. Antara ciri fizikal berikut, yang manakah boleh digunakan untuk membezakan dua sebatian tersebut?

I Melting point
Takat lebur

II Solubility in water
Keterlarutan dalam air

III Physical state
Keadaan fizikal

IV Electrical conductivity in liquid state
Pengkonduksian elektrik dalam keadaan cecair

A I , II and III only
I , II dan III sahaja

B I , III and IV only
I , III dan IV sahaja

C II , III and IV only
II , III dan IV sahaja

D I , II , III and IV
I , II , III dan IV

24 Diagram 5 shows a simple cell using copper rod and a metal Z.
Rajah 5 menunjukkan sebuah sel ringkas menggunakan rod kuprum dan logam Z.

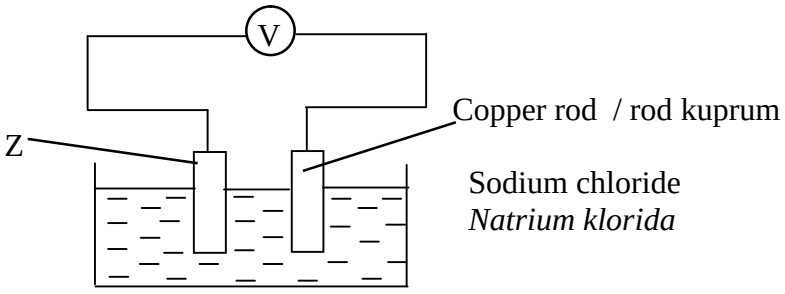


Diagram 5
Rajah 5

Which of the following metals is if the cell generates the lowest voltage?
Antara yang berikut , logam manakah di Z dalam sel akan menghasilkan voltan yang paling rendah?

A Aluminium
Aluminium

B Lead
Plumbum

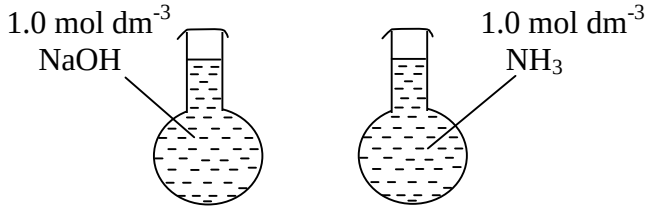
C Zinc
Zink

D Iron
Ferum

25 A white solid, Y, changes colour to yellow and emits a brown gas when heated. However after cooling, the residue changes back to white.
What is solid Y?
Satu pepejal putih, Y, berubah kepada kuning dan membebaskan gas berwarna perang apabila dipanaskan. Selepas disejukkan, baki berubah semula kepada warna putih. Apakah pepejal Y itu?

A Lead(II) nitrate
Plumbum(II) nitrat
B Zinc nitrate
Zink nitrat
C Copper(II) nitrate
Kuprum(II) nitrat
D Iron(II) nitrate
Ferum(II) nitrat

26



Which of the following statements is true of the two aqueous solutions?
Antara berikut yang manakah pernyataan adalah benar bagi kedua – dua larutan akueus tersebut?

A Both solutions show the same colour with universal indicator.
Kedua – dua larutan menunjukkan warna yang sama dengan penunjuk semesta.
B 40 cm^3 of each solution requires 20 cm^3 of 2.0 mol dm^{-3} nitric acid for complete neutralisation.
Setiap larutan dengan isipadu 40 cm^3 memerlukan 20 cm^3 acid nitrik 2.0 mol dm^{-3} *untuk peneutralan lengkap.*
C The pH values of both solutions are less than 7
Nilai pH bagi kedua – dua laruatan adalah kurang dariapda 7.
D Both solutions have the same number of moles of hydroxide ions.
Kedua – dua larutan mempunyai bilangan mol ion hidrogen yang sama.

27 Diagram 6 shows the apparatus set up for electroplating an iron spoon with silver.
Rajah 6 menunjukkan susunan radas bagi satu proses penyaduran sudu besi dengan perak.

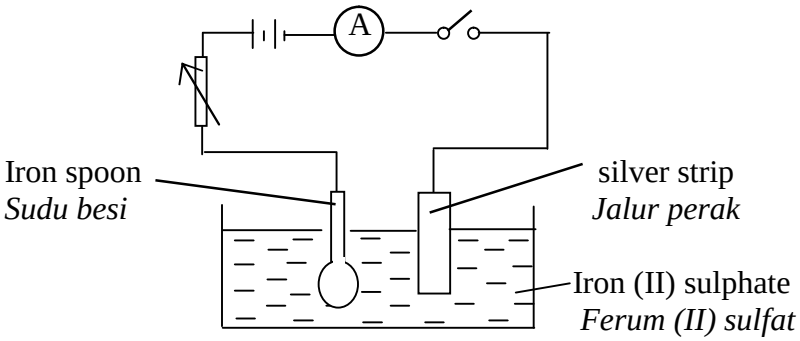


Diagram 6
Rajah 6

The iron spoon cannot be electroplated in this experiment because …
Sudu besi tidak boleh disadurkan di dalam eksperimen ini kerana …

I iron (II) sulphate is used as electrolyte.
Ferum(II)sulfat digunakan sebagai elektrolit.

II an ammeter is used.
ammeter digunakan

III an iron spoon is used as anode
sudu besi digunakan sebagai anod

IV a silver strip is used as cathode
jalur perak digunakan sebagai katod

A I and II only
I dan II sahaja

B II and IV only
II dan IV sahaja

C III and IV only
III dan IV sahaja

D I , III and IV only
I, III dan IV sahaja

28 The following information are some of the uses of a manufactured substance, Z, in industry.
Maklumat berikut menunjukkan beberapa kegunaan bahan buatan, Z, dalam industri

- Manufacture of urea
  Penghasilan urea
- As a cooling agent in refgerator
  Sebagai bahan penyejuk dalam peti sejuk
- Manufacture of explosives
  Penghasilan bahan letupan

Which substance is suitable as Z?
Bahan yang manakah sesuai sebagai Z?

A Polymer
Polimer
B Ammonia
Ammonia
C Sulphuric acid
Asid sulfurik
D Composite material
Bahan komposit

29 The molecular formula of compound X is C_2H_6O. The following are the properties of compound X:
Formula molekul sebatian X ialah C_2H_6O. Berikut adalah ciri-ciri bagi sebatian X:

- X can be prepared by a fermentation process.
  X boleh disediakan menerusi proses penapaian.
- X can be oxidized to Y.
  X boleh dioksidakan kepada Y.
- X can react with Y to form Z and water.
  X boleh bertindak balas dengan Y untuk menghasilkan Z dan air.

Which of the following is true about the homologous series of X, Y and Z?
Antara berikut yang manakah betul mengenai siri homolog X, Y dan Z?

	X	Y	Z
A	Alcohols *Alkohol*	Carboxylic acid *Asid karbosilik*	Esters *Ester*
B	Alcohols *Alkohol*	Esters *Ester*	Carboxylic acids *Asid karbosilik*
C	Carboxylic acids *Asid karbosilik*	Alcohols *Alkohol*	Esters *Ester*
D	Carboxylic acids *Asid karbosilik*	Esters *Ester*	Alcohols *Alkohol*

30 Diagram 7 shows the apparatus set-up used to study the rate of reaction of calcium carbonate and hydrochloric acid.
Rajah 7 menunjukkan susunan radas yang digunakan untuk mengkaji kadar tindak balas kalsium karbonat dengan asid hidroklorik.

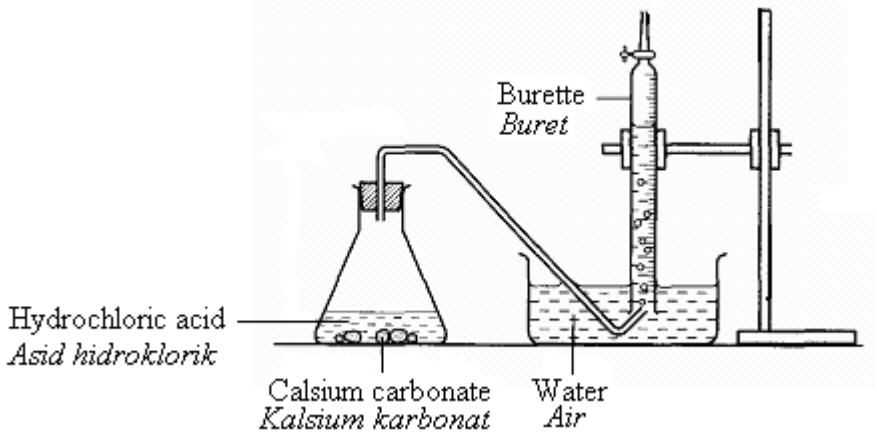


Diagram 7
Rajah 7

The rate of the above reaction can be increased by
Kadar bagi tindak balas di atas boleh ditingkatkan dengan

A using marble chips of smaller sizes.
menggunakan saiz ketulan marmar yang lebih kecil
B lowering the temperature of the hydrochloric acid.
merendahkan suhu asid hidroklorik.
C using a larger conical flask.
menggunakan kelalang kon yang lebih besar.
D adding water to the hydrochloric acid.
menambahkan air ke dalam asid hidroklorik.

31 The following equation shows the reaction between hydrogen sulphide and chlorine.
Persamaan berikut menunjukkan tindak balas antara hidrogen sulfide dengan klorin.

$$H_2S\ (g) + CI_2\ (g) \longrightarrow S\ (s) + 2HCI\ (g)$$

Which statement is true about this reaction?
Pernyataan manakah benar mengenai tindak balas ini?

A Hydrogen sulphide is reduced to sulphur.
Hidrogen sulfide diturunkan kepada sulfur.
B Chlorine is the reducing agent.
Klorin ialah agen penurunan.
C The oxidation number of sulphur increase.
Nombor pengoksidaan sulfur bertambah.
D The oxidation number of chlorine increase.
Nombor pengoksidaan klorin bertambah.

32 Different pairs of metals are used as electrodes X and Y in the simple cell shown in Diagram 8.
Satu pasangan logam berlainan dijadikan elektrod X dan Y seperti yang ditunjukkan dalam Rajah 8..

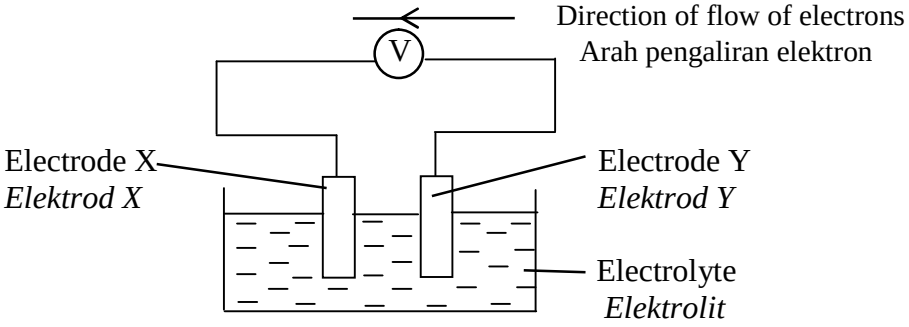


Diagram 8
Rajah 8

Which pair causes oxidation to occur an electrode Y?
Pasangan manakah yang menyebabkan proses pengoksidaan berlaku di elektrod Y?

	Electrode X *Electrod X*	Electrode Y *Electrod Y*
A	Copper *Kuprum*	Lead *Plumbum*
B	Zinc *Zinc*	Tin *Stanum*
C	Copper *Kuprum*	Silver *Argentum*
D	Lead *Plumbum*	Iron *Ferum*

33 Which of the following reaction causes the beaker to become hot?
Antara tindak balas berikut, yang manakah menyebabkan bikar menjadi panas?

A Adding water to solid ammonium nitrate
Menambahkan air kepada pepejal ammonium nitrat
B Adding water to solid sodium hydroxide
Menambahkan air kepada pepejal natrium hidroksida
C Adding water to solid potassium nitrate
Menambahkan air kepada pepejal kalium nitrat
D Adding water to solid ammonium sulphate
Menambahkan air kepada pepejal ammonium sulfat

34 An organic compound X has the following properties:
Suatu bahan organik X mempunyai sifat berikut:

- release a gas which turns lime water chalky when it is added with calcium carbonate.
  membebaskan gas yang mengeruhkan air kapur apabila dicampurkan dengan kalsium karbonat.
- produces a substance which has a sweet smell when it is reacted with an alcohol.
  menghasilkan bahan yang berbau wangi apabila ditindakbalaskan dengan suatu alkohol.

Which substance could be X?
Bahan yang manakah mungkin X?

A Ethena
Etana
B Ethanol
Etanol
C Ethanoic acid
Asid etanoik
D Ethyl ethanoate
Etil etanoat

35 What is the purpose of adding biological enzymes such as amylase or protease to a detergent?
Apakah tujuan menambah enzim biologi seperti amilase atau protease ke dalam detergen?

A To avoid the formation of a thick foam.
Mengurangkan pembentukan buih tebal.
B To keep the detergent dry.
Memastikan detergen kering.
C To remove organic stains from the cloth.
Menyingkirkan kesan organik pada kain.
D To bleach the cloth.
Memutihkan kain.

36 Which statement describes an endothermic reaction correctly?
Pernyataan yang manakah benar menerangkan tindak balas endotermik ?

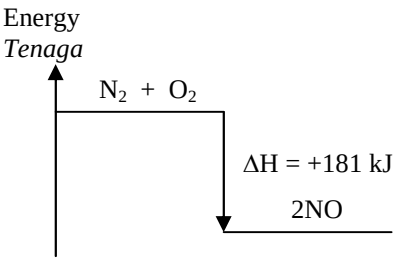
A ΔH of the reaction is negative.
ΔH tindak balas adalah negatif.
B The temperature of the surrounding increases.
Suhu persekitaran meningkat.
C The reactant release energy to the surrounding.
Bahan tindak balas membebaskan tenaga ke persekitaran.
D The products have greater total energy content than the reactants.
Jumlah kandungan tenaga hasil tindak balas lebih tinggi berbanding bahan tindak balas.

37 The reaction between nitrogen and oxygen can be represent by the following equation:
Tindak balas antara nitrogen dan oksigen diwakili oleh persamaan berikut:

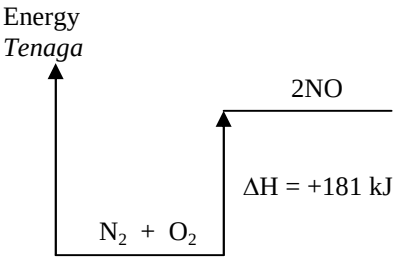
$$N_2\,(g) + O_2\,(g) \longrightarrow 2NO\,(g) \qquad \Delta H = +181\ kJ$$

Which of the following energy level diagrams represents the above reaction?
Manakah antara gambarajah aras tenaga berikut mewakili tindakbalas di atas?

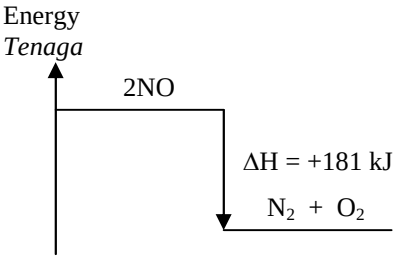
A



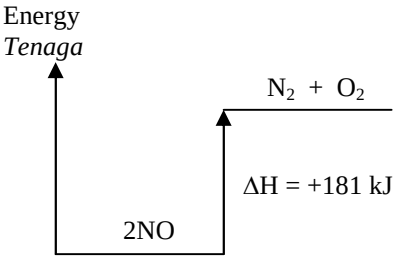
B



C



D



38 Choose the correct function of food additives
Pilih fungsi bahan tambah makanan yang betul.

	Food additives ***Bahan tambah makanan***	**Function** ***Fungsi***
A	Stabilisers *Penstabil*	To prevent the stabilization of food *Untuk menghalang penstabilan makanan*
B	Preservatives *Bahan awet*	To prevent the growth of microorganism *Untuk menghalang pembiakan mikroorganisma*
C	Flavourings *Bahan perasa*	To prevent the loss of taste of food *Untuk menghalang kehilangan rasa makanan*
D	Antioxidants *Antioksida*	To prevent aging process *Untuk menghalang proses penuaan*

39 11.2 g of iron react with chlorine to form 32.5 g of a compound. What is the molecular formula of the compound?
[Relative atomic mass : Fe , 56 ; Cl , 35.5]
11.2 g besi bertindak balas dengan klorin untuk membentuk 32.5 g sebatian. Apakah formula molekul pada sebatian tersebut ?
[Jisim atom relatif : Fe , 56 ; Cl , 35.5]

A $FeCl$
B $FeCl_2$
C $FeCl_3$
D Fe_2Cl_3

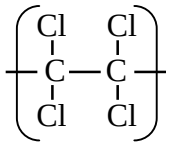
40 When 150 cm^3 of 0.25 mol dm^{-3} H_3PO_4 is diluted with water to 750 cm^3 , the concentration of hydrogen ion is
Apabila 150 cm^3 H_3PO_4 0.25 mol dm^{-3} dicairkan dengan air menjadi 750 cm^3 , kepekatan ion hidrogen ialah

A 0.10 mol dm^{-3}
B 0.15 mol dm^{-3}
C 0.20 mol dm^{-3}
D 0.25 mol dm^{-3}

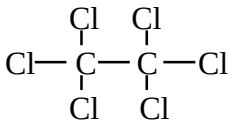
41 The burning of 0.6 g of M causes the temperature of 100 cm^3 water to increase by 12^oC. What is the heat of combustion of M?
[Relative molecular mass of M = 60; specific heat capacity of water = 4.2 J g^{-1} $^oC^{-1}$]
Pembakaran 0.6 g bahan M menyebabkan suhu 100 cm^3 air meningkat sebanyak 12^oC. Apakah haba pembakaran bagi bahan M?
[Jisim molekul relatif M = 60; Muatan haba tentu air = 4.2 4.2 J g^{-1} $^oC^{-1}$]

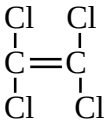
A 50.4 Kj mol^{-1}
B 72.0 kJ mol^{-1}
C 302.4 kJ mol^{-1}
D 504.0 kJ mol^{-1}

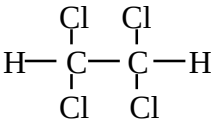
42 The addition polymerisation of substance P produces substance Q. Q can be represented by the following formula :
Pempolimeran penambahan bahan P menghasilkan bahan Q. Q boleh diwakili dengan formula berikut :

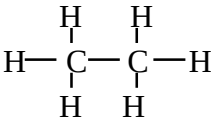


Which of the following will accurately represent monomer P ?
Antara berikut yang manakah mewakili monomer P dengan tepat.

A 

B 

C 

D 

43 What is the volume of 1.5 mol dm^{-3} sulphuric acid, H_2SO_4 required to neutralise 60 cm^3 of 1 mol dm^{-3} sodium hydroxide , NaOH solution?
Berapakah isipadu diperlukan oleh acid sulfurik 1.5 mol dm^{-3},*H_2SO_4 untuk meneutralkan 60 cm^3 larutan natrium hidroksida 1 mol dm^{-3}, NaOH ?*

A 10 cm^3
B 15 cm^3
C 20 cm^3
D 25 cm^3

44 Diagram 9 shows the graph of the volume of gas against time for the reaction between calcium carbonate and dilute hydrochloric acid.
Rajah 9 menunjukkan graf isipadu gas melawan masa bagi tindak balas antara kalsium karbonat dengan asid hidroklorik cair.

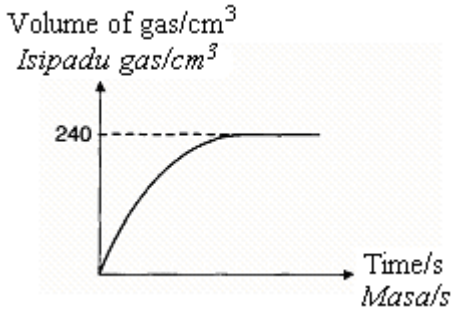


Diagram 9
Rajah 9

What is the mass of calcium carbonate that reacts in this experiment?
[Relative formula mass: $CaCO_3$ = 100;
Molar volume = 24 dm^3 mol^{-1} at room condition]
Apakah jisim kalsium karbonat yang bertindak balas dalam eksperimen ini?
[Jisim formula relatif: $CaCO_3$ = 100;
Isipadu molar = 24 dm^3 mol^{-1} pada keadaan bilik]

A 1 g
B l0 g
C 20 g
D 24 g

45 Which of the following shows the correct oxidation numbers of sulphur in its compounds?
Manakah antara berikut menunjukkan nombor pengoksidaan yang betul bagi sulfur dalam sebatiannya?

	SO_2	SO_3	H_2SO_4	H_2SO_3
A	+4	+4	+3	+4
B	-2	+4	+2	+6
C	+4	+6	+6	+4
D	-2	+3	+2	+3

46 Diagram 10 shows the set-up of apparatus to prepare ethyl ethanoate in the laboratory.
Rajah 10 menunjukkan susunan radas untuk menyediakan etil etanoat dalam makmal.

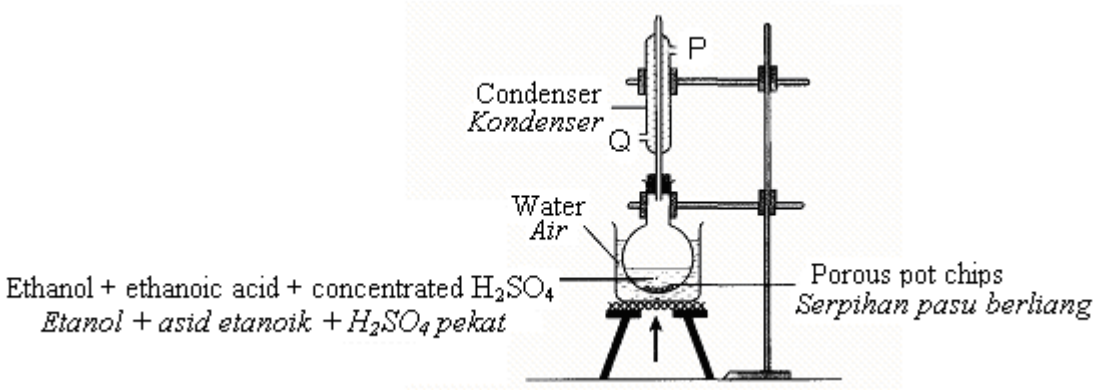


Diagram 10
Rajah 10

Which of the following statements are true about the experiment?
Manakah antara berikut benar mengenai eksperimen ini?

I The water is in from P and is out from Q.
Air masuk melalui P dan keluar melalui Q.
II Concentrated sulphuric acid is used as a catalyst.
Asid sulfurik pekat digunakan sebagai mangkin.
III The distillate obtained is a colourless liquid with a fragrant smell.
Hasil sulingan yang diperolehi adalah cecair tidak berwarna dan berbau wangi.
IV The porous pot chips are added to prevent bumping and ensure smooth boiling.
Serpihan pasu berliang dimasukkan untuk mencegah pembuakan dan memastikan pendidihan berjalan lancer.

A I, II and III only
I, II dan III sahaja
B I, II and IV only
I, II dan IV sahaja
C II, III and IV only
II, III dan IV sahaja
D I, II, III and IV
I, II, III dan IV

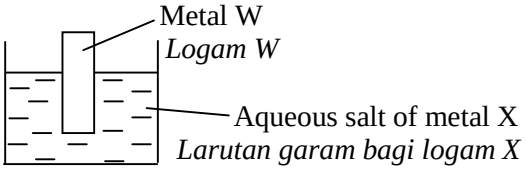
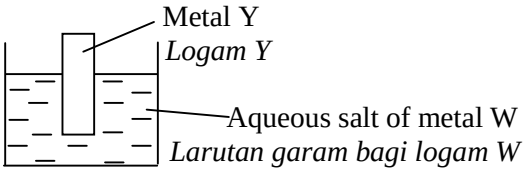
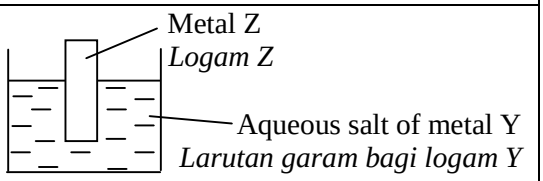
47 The following shows three reactions involving metals P, Q R and S.
Berikut menunjukkan tiga tindak balas yang melibatkan logam P, Q, R dan S.

$P + QO \rightarrow PO + Q$
$S + PO \rightarrow SO + P$
$R + SO \rightarrow RO + S$

Which of the following shows the ascending order of reactivity of the metals with oxygen?
Manakah antara berikut menunjukkan kereaktifan logam terhadap oksigen secara menaik?

A S, R, Q, P
B S, P, R, Q
C P, S, Q, R
D P, S ,R, Q

48 Three different beaker were set up as shown in Table 3.
Tiga bikar berlainan disediakan seperti ditunjukkan pada Jadual 3.

Observation *Pemerhatian*	Diagram *Rajah*
Metal X displaced *Logam X tersesar*	
Metal W displaced *Logam W tersesar*	
Metal Y displaced *Logam Y tersesar*	

Which of sequences below shows the order of increasing reactivity of the four metals?
Antara berikut yang manakah menunjukkan urutan menaik kereaktifan keempat – empat logam tersebut?

A Z , Y , W and X
Z , Y , W dan X
B X , W , Y and Z
X , W , Y dan Z
C W , Y , X and Z
W , Y , X dan Z
D Y , Z , W and X
Y , Z , W dan X

49 Diagram 11 shows the graphs obtained from three experiments that used the following reactants.
Rajah 11 menunjukkan graf yang diperolehi dari tiga eksperimen dengan menggunakan bahan tindak balas yang berikut.

Experiment *Eksperimen*	Reactants *Bahan tindak balas*
X	10 cm^3 HCl 0.5 M + 1.0 g Mg powder 10 cm^3 HCl 0.5 M + 1.0 g serbuk Mg
Y	10 cm^3 HCl 0.5 M + 1.0 g Mg ribbon 10 cm^3 HCl 0.5 M + 1.0 g pita Mg
Z	10 cm^3 HCl 1.0 M + 1.0 g Mg powder 10 cm^3 HCl 1.0 M + 1.0 g serbuk Mg

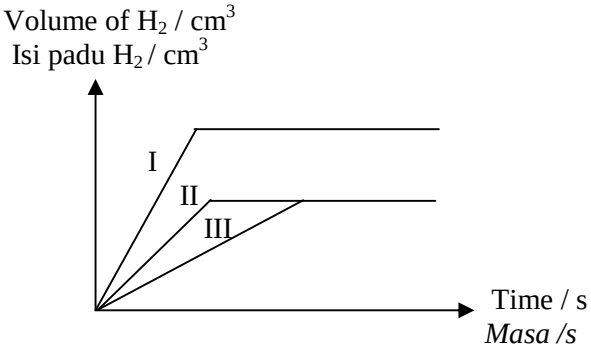


Diagram 11
Rajah 11

Which of the following is correct match?
Antara berikut yang manakah padanan betul?

	X	Y	Z
A	III	I	II
B	II	III	I
C	II	I	III
D	I	III	II

50 Given below is the thermochemical equation of the formation of nitrogen dioxide.
Di bawah adalah persamaan termokimia bagi pembentukan nitrogen dioksida.

$$\frac{1}{2}N_2\,(g) + O_2\,(g) \rightarrow NO_2\,(g), \quad \Delta H = +33 \text{ kJ mol}^{-1}$$

The thermochemical equation shows that
Persamaan termokimia itu menunjukkan

A 1 mole of nitrogen when reacted absorbs 33 kJ of heat energy.
1 mol nitrogen apabila bertindak balas menyerap 33 kJ tenaga haba.
B 1 mole of oxygen when reacted releases 33 kJ of heat energy.
1 mol oksigen apabila bertindakbalas membebaskan 33 kJ tenaga haba.
C 1 mole of nitrogen dioxide when formed absorbs 33 kJ of heat energy.
1 mol nitrogen dioksida apabila terbentuk menyerap 33 kJ tenaga haba.
D 1 mole of nitrogen dioxide when formed releases 33 kJ of heat energy.
1 mol nitrogen dioksida apabila terbentuk membebaskan 33 kJ tenaga haba.

End of Questions

JAWAPAN KERTAS 1 Matematik EXCEL 2 SPM 2009

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

NAME :_____

CLASS :_____

JABATAN PELAJARAN NEGERI SABAH

SIJIL PELAJARAN MALAYSIA 4541/2

EXCEL II
CHEMISTRY SPM
PAPER 2
SEPTEMBER 2009

2 JAM 30 MINIT Dua jam tiga puluh minit

DO NOT OPEN THE QUESTION PAPER UNTIL INSTRUCTED
(JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU)

2. Tuliskan No. Kad Pengenalan dan Angka Giliran anda pada ruangan yang disediakan.
3. Kertas soalan ini adalah dalam dwibahasa
4. Soalan dalam B. Inggeris mendahului soalan yang sepadan dalam B. Melayu
5. Calon dibenarkan menjawab keseluruhan atau sebahagian soalan samada dalam B. Inggeris atau B. Melayu
6. Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini

Untuk Kegunaan Pemeriksa			
Kod Pemeriksa :			
Bahagian	Soalan	Markah Penuh	Markah Diperolehi
A	1	11	
	2	10	
	3	10	
	4	11	
	5	9	
	6	9	
B	7	20	
	8	20	
C	9	20	
	10	20	
Total Marks / Jumlah			

THIS QUESTION PAPER CONSIST OF 22 PRINTED PAGES

INFORMATION FOR CANDIDATES
MAKLUMAT UNTUK CALON

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

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

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

   Jawab semua soalan dalam ***Bahagian A****. Tulis jawapan bagi* ***Bahagian A*** *dalam ruang yang disediakan dalam kertas soalan ini.*

3. Answer **one** question from **Section B** and one question from **Section C**. Write your answers for **Section B** and **Sectioin C** on the lined pages at the end of the question paper. Answer questions in **Section B** and **Section C** in detail. You may use questions, diagrams, tables, graphs and other suitable methods to explain your answer.

   Jawab satu soalan daripada ***Bahagian B*** *dan satu soalan dari* ***Bahagian C****. Tulis jawapan bagi* ***Bahagian B*** *dan* ***Bahagian C*** *pada helaian tambahan yang dibekalkan oleh pengawas peperiksaan. Jawab soalan dalam* ***Bahagian B*** *dan* ***Bahagian C*** *dengan terperinci.*

   Anda boleh menggunakan persamaan, rajah, jadual, graf dan cara lain yang sesuai untuk menjelaskan jawapan anda.

4. Show your working. It may help you to get marks.

   Tunjukkan kerja mengira. Ini membantu anda mendapatkan markah.

5. If you wish to cancel any answer, neatly cross out the answer.

   Sekiranya anda hendak menukar jawapan, batalkan dengan kemas jawapan yang telah dibuat. Kemudian tulis jawapan yang baru.

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

   Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.

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

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

8. The time suggested to answer **Section A** is 90 minutes, **Section B** is 30 minutes and **Section C** is 30 minutes.

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

9. You may use a non-programmable scientific calculator.
   Anda dibenarkan menggunakan kalkulatur saintifik yang tidak boleh deprogram.

10. Hand in this question paper at the end of the examination

    Serahkan kertas jawapan anda diakhir peperiksaan.

SECTION A
[60 marks]
Answer ALL Questions
Jawab SEMUA soalan

1. Diagram 1 shows the chemical symbols which represent four particles W, X, Y and Z.
Rajah 1 di bawah menunjukkan simbol kimia yang mewakili empat partikel W, X, Y dan Z.

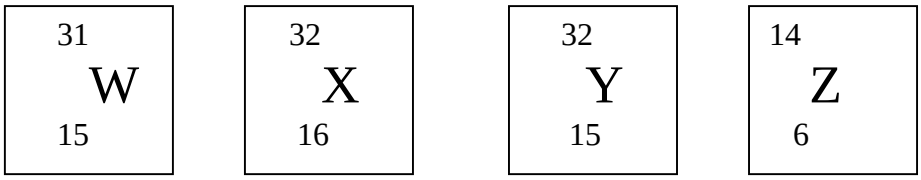


DIAGRAM 1
RAJAH 1

(a) (i) What is the nucleon number of W?
Apakah nombor nukleon bagi W?

_____

(ii) State the number of neutrons in an atom of W.
Nyatakan bilangan neutron bagi atom W.

_____

[2 marks]

(b) (i). State the number of electrons in an atom of
Nyatakan bilangan elektron bagi atom X.

_____

(ii). Draw a diagram to show the arrangement of electrons around the nucleus of an atom X.
Lakarkan rajah yang menunjukkan susunan elektron pada nukleus atom X.

[2 marks]

(c) What is the number of valence electrons in an atom of Y?
Berapakah bilangan elektron valens bagi atom Y?

_____

[1 mark]

(d) (i) State a pair of isotopes from the particles in figure above.
Nyatakan pasangan isotop-isotop dalam partikel rajah di atas.

_____

(ii) State the reason for your answer in (d) (i).
Nyatakan alasan bagi jawapan anda di (d) (i).

_____

_____

[2 marks]

(e) (i) Atom of Z is radioaisotope. Give a use of atoms Z.
Atom Z merupakan isotop. Nyatakan kegunaan atom Z.

_____

(ii) State the number of protons in an atom of Z.
Nyatakan bilangan proton dalam atom Z.

_____

[2 marks]

(f) An isotope of Z has 7 neutrons. Write the symbol for the isotope.
Isotop bagi Z mempunyai 7 neutron. Tuliskan simbol bagi isotop tersebut.

[2 marks]

2 Table 1 shows a list of elements represented by letters U, V, W, X , Y and Z with their nucleon numbers and proton numbers.

Jadual 1 menunjukkan senarai unsur yang diwakili oleh huruf U, V, W, X, Y dan Z dengan nombor nukleon dan nombor proton.

Symbol ***Simbol***	U	V	W	X	Y	Z
Nucleon number ***Nombor Nukleon***	23	12	16	39	19	20
Proton number ***Nombor Proton***	11	6	8	19	9	10

Table 1
Jadual 1

Based on the table 1, answer the following question.
Berdasarkan Jadual 1, sila jawab soalan berikut.

(a) List all the elements that are members of the same Group in the Periodic Table.
Senaraikan semua unsur yang menjadi ahli Kumpulan yang sama dalam Jadual Berkala.

_____

[*1 mark*]

(b) Name the group and the period of element X.
Namakan kumpulan dan kala bagi unsur X.

_____

[1 *marks*]

(c) Name and state one use of element Z
Namakan dan nyatakan satu kegunaan element Z.

_____

[*2 marks*]

(d) (i) Choose one element react with water to produce hydrogen gas?
Pilih satu unsur yang bertindak dengan air untuk menghasilkan gas hidrogen.

_____

[*1 mark*]

(ii) Write a balanced chemical equation for the reaction in (d)(i) for one of the elements.
Tuliskan persamaan kimia seimbang bagi tindakbalas dalam (d)(i) untuk salah satu unsur.

_____

[*1 mark*]

(e) Name the most electropositive element in the table and explain why.
Namakan unsur yang paling elektropositif dalam jadual dan jelaskan mengapa.

_____

_____

_____

[*2 marks*]

(f) Briefly state the electron transfer in the formation of bond between U and W.
Secara ringkas nyatakan pemindahan elektron dalam pembentukan ikatan antara U dan W.

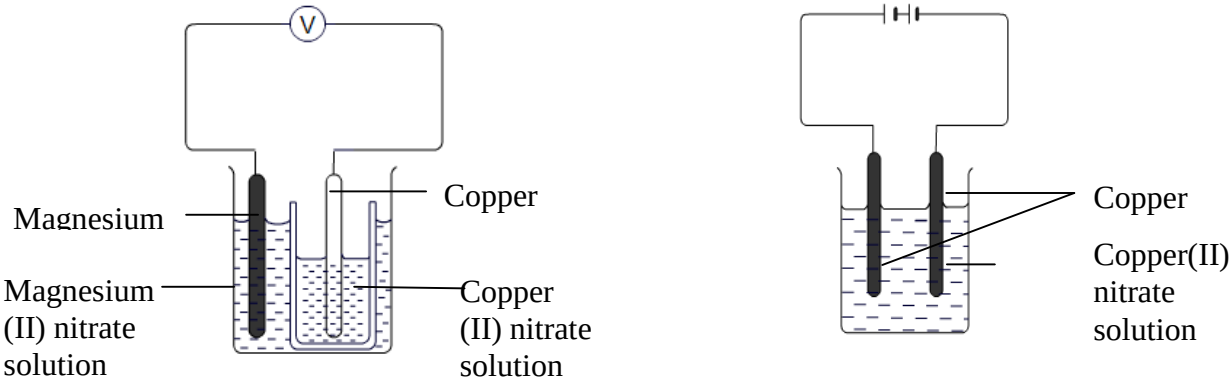
_____

_____

_____

[*2 marks*]

3 Diagram 2 below shows two type of cell.
Rajah 2 di bawah menunjukan dua jenis sel.



Cell A
Sel A

Cell B
Sel B

DIAGRAM 2
RAJAH 2

(a) Write the formula of all ions present in the copper(II) nitrate solution.

Tuliskan formula semua ion yang hadir dalam larutan kuprum (II) nitrat.

_____

[1 mark]

(b) (i) State the observation at the cathode of cell B.

Nyatakan pemerhatian pada katod dalam sel B.

_____

_____

[1 mark]

(ii) State the observation at the anode of cell B.

Nyatakan pemerhatian pada anod dalam sel B

_____

_____

[1 mark]

(c) (i) Name the reducing agent in the cell B.
Namakan agen penurunan dalam sel B

_____

[1 mark]

(ii) Name the product formed at the anode if copper electrodes in cell B are replaced by carbon electrodes.
Namakan hasil yang terbentuk di anod jika elektrod kuprum dalam sel B digantikan dengan menggunakan elektrod karbon.

_____

[1 mark]

(d) Based on cell A,
Berdasarkan sel A.

(i) In which direction do electrons flow through the circuit in cell A ?

Show your answer on Diagram 2.

Dalam arah manakah elektron akan mengalir dalam litar pada sel A. Tunjukkan jawapan anda dalam Rajah 2.

[1 mark]

(ii) Name the reaction that occurs at the magnesium plate.

Namakan tindakbalas yang berlaku dalam plat magnesium.

_____

[1 mark]

(iii) State the changes in oxidation number for magnesium in this reaction.

Nyatakan perubahan nombor pengoksidaan bagi magnesium dalam tindakbalas ini.

_____

[1 mark]

(iv) What happens to the cell voltage if the copper plate is replaced with silver plate ?

Apakah yang berlaku kepada voltan sel jika plat kuprum digantikan dengan plat argentum.

_____

[1 mark]

(v) What is the colour change of the electrolyte in cell A ?

Apakah perubahan warna elektrolit dalam sel A ?

_____

[1 mark]

4. An experiment was carried out to study the effect of heat on the rate of reaction between sodium thiosulphate, $Na_2S_2O_3$ and sulphuric acid, H_2SO_4. The time taken for formation of fixed quantity of sulphur was recorded. The results of the experiment were recorded as shown in Table 2.
Satu eksperimen telah dijalankan untuk mengaji kesan suhu ke atas tindak balas antara larutan natrium tiosulfat, $Na_2S_2O_3$ dengan asid sulfurik, H_2SO_4. Masa untuk pembentukan suatu kuantiti tertentu sulfur direkodkan. Keputusan eksperimen dicatatkan dalam Jadual 2.

Temperature / °C *Suhu / °C*	30	40	50	55	60	65
Time take for the formation of a fixed quantity of sulphur (s) *Masa bagi pembentukan suatu kuantiti tertentu sulfur (s)*	50	19	13	10	8	6
1 / time (s^{-1}) *1 / masa (s^{-1})*						

TABLE 2 / JADUAL 2

[Relative atomic mass: Na=23; S=32; O=16. Molar volume of gas = 24 dm^3 mol^{-1} at room condition]

(a) What is the colour of sulphur formed?
Apakah warna sulfur yang terbentuk

_____
[1 mark]

(b) What is meant by rate of reaction in this experiment ?
Apakah yang dimaksudkan dengan kadar tindak balas dalam eksperimen ini?

_____

_____
[1 mark]

(c) Write an equation for the reaction occured in this experiment.
Tuliskan persamaan tindakbalas yang berlaku dalam eksperimen ini.

_____
[1 mark]

(d) (i) Complete Table 2 by writing the values of 1 / time.
Lengkapkan Jadual 2 dengan menentukan nilai bagi 1 / masa.

[2 marks]

(ii) Draw a graph of temperature against 1 / time on the graph paper provided.

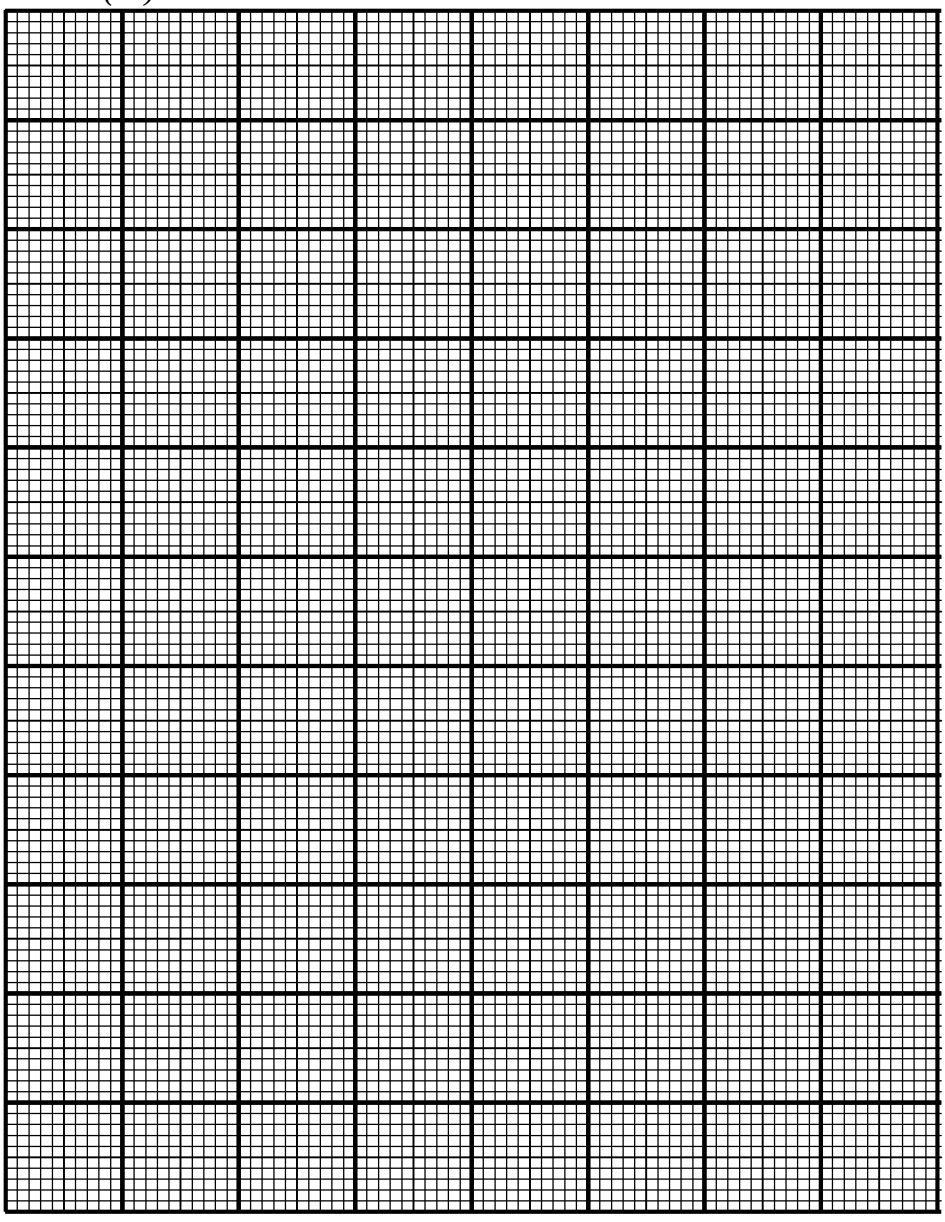
Lukiskan graf suhu melawan 1 / masa menggunakan kertas graf yang dibekalkan

Graph of temperature against 1 / time

Graf suhu melawan 1 / masa

1 / time (s^{-1})

1/ masa (s^{-1})



Temperature / *suhu* ($^{\circ}C$)

[2 marks]

(iii) The rate of reaction is directly proportional to 1 / time. Based on the graph in d(ii) predict the rate of reaction at 80° C

Kadar tindak balas berkadar terus dengan 1 / masa. Berdasarkan graf anda dalam d(ii) ramalkan kadar tindak balas pada suhu 80° C

[1 mark]

(e) Explain the effect of heat to the reaction between sodium thiosulphate solution and sulphuric acid according to the collision theory.

Terangkan kesan suhu terhadap kadar tindakbalas antara larutan natrium tiosulfat dengan asid sulfurik dengan menggunakan teori perlanggaran.

[3 marks]

5 Table 3 shows molecular formulae of 4 carbon compounds.
Jadual 3 menunjukkan formula molekul bagi 4 sebatian karbon.

Compound ***Sebatian***	**Molecular Formula** ***Formula molekul***
A	C_4H_8
B	C_4H_{10}
C	C_4H_9OH
D	C_2H_5COOH

Table 3
Jadual 3

(a) Write the general formula of the homologous series of compound B.
Tuliskan formula umum bagi siri homolog sebatian B.

_____

[1 mark]

(b) State the functional group of compound A and compound D
Nyatakan kumpulan berfungsi bagi sebatian A dan sebatian D.

Compound*[Sebatian]* A :

_____

Compound*[Sebatian]* D :

_____

[2 marks]

(c) Compound B shows isomerism. Draw the structural formula of **one** isomer of compound B.
Sebatian B menunjukkan isomerisme. Lukiskan formula struktur bagi satu isomer sebatian B.

[1 mark]

5 (d) Compound D and compound C are reacted with the presence of the concentrated sulphuric acid.
Sebatian D dan sebatian C bertindak balas dengan kehadiran asid sulfurik pekat

(i) Name the product formed from the reaction.
Namakan hasil yang terbentuk daripada tindak balas

_____

[1 mark]

(ii) State one special characteristic of the product formed.
Nyatakan satu ciri istimewa bagi hasil yang terbentuk

_____

[1 mark]

(e) Compound A burns in excess oxygen to produce carbon dioxide and water.
Sebatian A dibakar dalam oksigen berlebihan menghasilkan carbon dioksida dan air.

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

_____

[1 mark]

(ii) 11.2 g of compound A burns in excess oxygen, calculate number of carbon dioxide molecules formed.
11.2 g sebatian A dibakar dalam oksigen berlebihan, hitungkan bilangan molekul carbon dioksida yang terbentuk.
[Relative atomic mass C = 12, O = 16 and
Avogadro number = 6.03×10^{23}]
[*Jisim atom relatif C = 12, O = 16 dan nombor Avogadro* = 6.03×10^{23}]

[2 marks]

6.

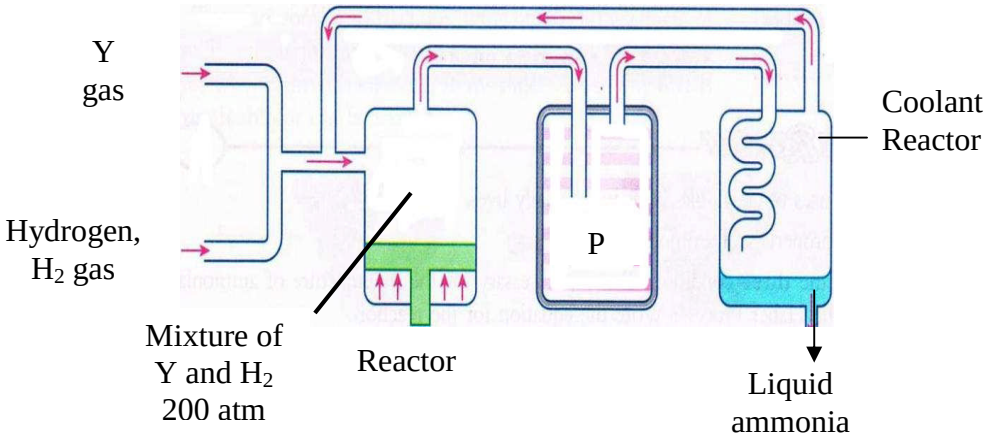


DIAGRAM 3
RAJAH 3

A schematic diagram 3, shown the process to produce liquid ammonia using mixture of Y gas and hydrogen gas in industry. The liquid ammonia are produce as end product.
Rajah 3 menunjukkan proses pemghasilan ammonia cecair dengan menggunakan campuran gas Y dan gas hidrogen dalam industri. Hasil akhir proses ini akan menghasilkan ammonia cecair.

(a) State the suitable Y gas are used in this process ?
Nyatakan gas Y yang sesuai digunakan dalam proses ini

_____

[1 mark]

(b) Write the chemical equation for the process produce ammonia?
Tuliskan persamaan kimia untuk proses penghasilan ammonia?

_____

[1 mark]

(c) (i) Name catalyst P in this process.
Namakan mangkin P dalam proses ini.

_____

(ii). State the suitable pressure and temperature for this process.
Nyatakan keadaan tekanan dan suhu yang sesuai untuk proses ini,

_____

[2 marks]

(d) State the name of ammonia producing process.
Namakan proses penghasilan ammonia.

_____

[1 mark]

(e)

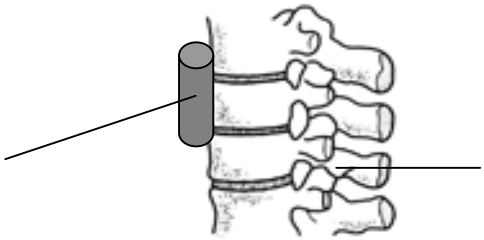


Diagram 4
Rajah 4

An othorphedic implant material K to support the spinal cord when its injured during fall form the horse. This material K is very strong and weightless.
Pakar tulang telah memasang bahan K untuk menyokong tulang belakang seorang atlit yang cedera apabila terjatuh dari kuda yang ditunggangnya. Bahan K ini amat kuat dan ringan.

(i) State the other characteristic of Material K ?
Nyatakan sifat bahan K selain yang dinyatakan diatas?

_____

[1 mark]

(ii) State the meaning of composite material.
Nyatakan maksud bahan komposit.

_____

_____

[1 mark]

(iii) Draw the atom arrangement for material K.
Lakarkan susunan atom bagi material K.

1 mark]

(iv) Give other example of composite material ?
Berikan contoh lain bahan komposit ?

_____

[1 mark]

SECTION B

BAHAGIAN B

[20 marks]
[20 markah]

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

7. (a) (i) Define the acid-base titration. [2 marks]
Takrifkan maksud asid- bes.

(ii) What is neutral point (end point)? [1 mark]
Apakah takah neutral (takat akhir) ?

(b) Give three methods and suitable examples used to prepare a soluble salt. [6 marks]
Berikan empat kaedah yang digunakan untuk menyediakan garam larut.

(c) Three set of experiments are carried out to determine the end point during the neutralization of potassium hydroxide, KOH solution with sulphuric acid, H_2SO_4 using titration method as shown in Diagram 5.
Rajah 5 menunjukkan 3 set eksperimen yang dijalankan untuk menentukan takat akhir peneutralan larutan kalium hidrosida, KOH dengan asid sulfurik, H_2SO_4 melalui kaedah pentitratan.

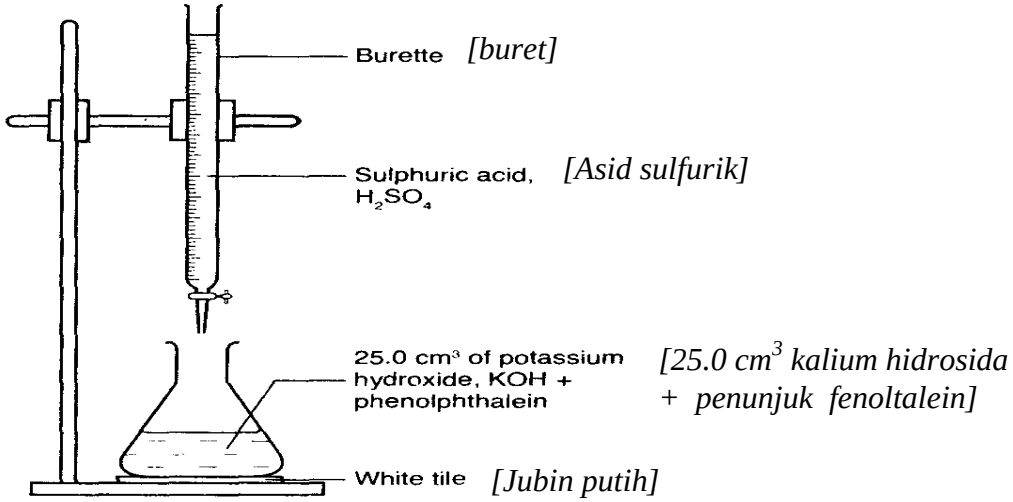


DIAGRAM 5
RAJAH 5

Table 4 shows the result of the experiment.
Jadual 4 menunjukkan keputusan eksperimen.

Titation number *Nombor Pentitratan*	1	2	3
Final burette reading (cm^3) *Bacaan akhir buret(cm^3)*	24.25	25.25	24.65
initial burette reading (cm^3) *Bacaan awal buret(cm^3)*	0.15	1.20	0.60
Volume of sulphuric acid (cm^3) *Isipadu asid sulfuric (cm^3)*	24.10	24.05	24.05

Table 4
Jadual 4

(i) What is the volume of 0.1 mol dm^{-3} sulphuric acid, H_2SO_4 required to exactly neutralise 25.0 cm^3 of potassium hydroxide, KOH solution?
[2 marks]
Apakah isipadu asid sulfurik, 1 mol dm^{-3} yang diperlukan untuk meneutralkan 25.0 cm^3 larutan kalium hidrosida

(ii) Calculate the concentration of potassium hydroxide, KOH solution, in g dm^{-3}, based on the results in Table 4.
[Relative atomic mass of H = 1, O = 16 and K = 39] [8 marks]

Berdasarkan keputusan dalam jadual 4 hitungkan kepekatan dalam g dm^{-3} bagi larutan kalium hidroksida, KOH.
[Jisim atom relatif: H = 1, O = 16 dan K = 39]

(iii) States the use of the white tile in this activity? [1 marks]
Apakah kegunaan jubin putih dalam aktiviti ini?

8 (a) A student carried out an experiment to determine the heat of combustion of ethanol using the set-up of apparatus as shown in Diagram 6 .

Seorang pelajar menjalankan satu eksperimen untuk menentukan haba pembakaran etanol dengan susunan radas seperti yang ditunjukkan dalam Rajah 6.

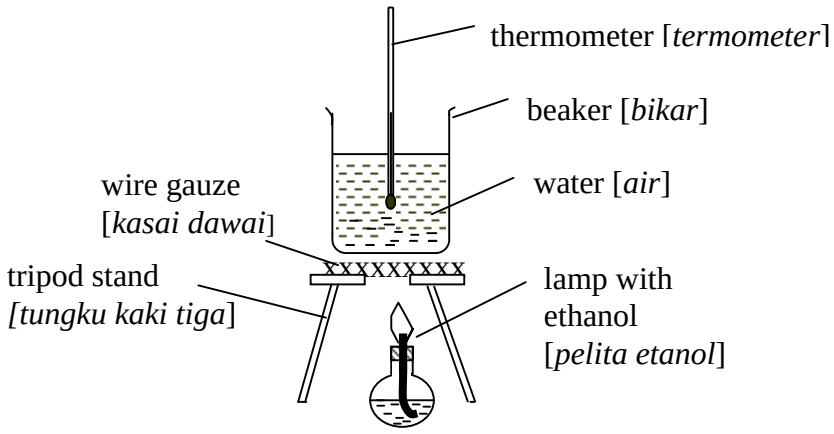


DIAGRAM [*RAJAH*] 6

(i) It was found that the heat of combustion of ethanol obtained from the experiment was lower than the theoritical value. Suggest **four** methods in which the set-up of apparatus in Diagram 6 can be improved to obtain more accurate result.

*Didapati bahawa haba pembakaran etanol yang ditentukan dari eksperimen adalah lebih rendah daripada nilai teori.Cadangkan **empat** cara untuk memperbaiki susunan radas Rajah 6 untuk memperoleh nilai yang lebih tepat.*

[4 marks]

(ii) After correcting his set-up of apparatus, the student found that the heat of combustion of ethanol obtained from the experiment is 1200 kJ mol^{-1}, still less than the theoritical value of 1370 kJ mol^{-1}. Identify **two** other sources of error that may have cause this.

*Selepas memperbaiki susunan radasnya, pelajar tersebut mendapati haba pembakaran etanol yang ditentukan dari ekperimen ialah 1200 kJ mol^{-1}, masih lebih rendah daripada nilai teori yang sebanyak 1370 kJ mol^{-1}. Kenalpastikan **dua** punca lain yang mungkin menimbulkan perbezaan ini*

[2 marks]

(b) The heat of combustion of four types of alcohols are given in Table 4.

Haba pembakaran empat jenis alkohol adalah diberi dalam Jadual 4

Alcohol [*alcohol*]	**Number of carbon atom per molecule [*bilangan atom karbon per molekul*]**	**Relative molecule mass [*Jisim atom relatif*]**	**Heat of combustion [*Haba pembakaran*] / kJ mol^{-1}**
Methanol [metanol]	1	32	710
Ethanol [*etanol*]	2	46	1370
Propanol [*propanol*]	3	60	2000
Butanol [*buatnol*]	4	74	2670
Pentanol [*pentano*l]	5	88	

TABLE *[JADUAL]* 4

(i) Plot a graph of heat of combustion against the number of carbon atom per molecule on the graph paper provided.

Lukiskan graf haba pembakaran melawan bilangan atom karbon per molekul pada kertas graf yang disediakan

[3 marks]

(ii) Estimate the heat of combustion of pentanol from the graph in (b) (i).

Anggarkan haba pembakaran pentanol dari graph di (b) (i)

[2 marks]

(iii) Based on the graph in (b) (i), state the relationship between the number of carbon atoms per molecule and the value of the heat of combustion.
Explain your answer.
Berdasarkan pada graf anda dalam (b) (i), nyatakan hubungan antara bilangan atom karbon per molekul dan nilai haba pembakaran. Terangkan jawapan anda.

[2 marks]

(c) (i) Write a balance equation for the complete combustion of ethanol.

Tuliskan persamaan seimbang bagi pembakaran lengkap etanol.

[1 mark]

(ii) Using the value in Table 4, calculate the mass of ethanol that is required to increase the temperature of 500 cm^3 of water by 50^{0}C.
[Specific heat of water = 4.2 Jg^{-1}C^{-1}; water density = 1 g cm^{-3}]

Gunakan nilai dalam jadual 4 , hitungkan jisim etanol yang diperlu untuk meningkatkan suhu 500 cm^3 air sebanyak 50^{0}C.

[Muatan haba tentu air = 4.2 Jg^{-1}C^{-1}; ketumpatan air = 1 g cm^{-3}]

[4 marks]

(iii) Draw the energy level diagram for the combustion of ethanol.
Lukiskan gambar rajah aras tenaga bagi pembakaran etanol. [2 marks]

SECTION C
BAHAGIAN C

[20 marks]

[20 markah]

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

9. (a) Diagram 6 shows the classification of hydrocarbons.
Rajah 6 menunjukkan pengelasan hidrokarbon.

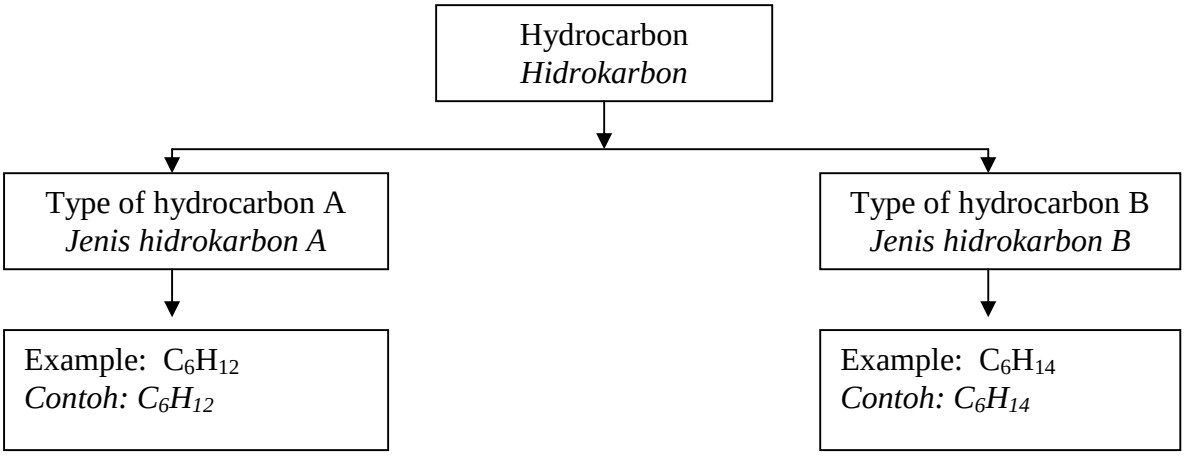


Diagram 6
Rajah 6

Based on the example, name the types of hydrocarbons, A and B.
Explain your answer.
Berdasarkan contoh-contoh, namakan jenis hidrokarbon A dan B.
Terangkan jawapan anda.

[4 marks]

(b) C_6H_{12} and C_6H_{14} are two liquids at room temperature. Describe briefly two experiments which can be conducted to distinguish C_6H_{12} from C_6H_{14}.

C_6H_{12} dan C_6H_{14} adalah cecair pada suhu bilik. Terangkan secara ringkas dua eksperimen yang boleh dijalankan untuk membezakan C_6H_{12} daripada C_6H_{14}.

[8 marks]

(c) With the help of a labelled diagram, explain how liquid C_6H_{12} is manufactured.
Dengan bantuan gambarajah berlabel, terang bagaimana C_6H_{12} dihasilkan.

[8 marks]

10 (a) The iron grills of houses situated near beaches become rusty easier than those situated away from beaches. Explain this phenomenon.

Jerigi pintu rumah yang terletak berdekatan pantai lebih mudah berkarat dibandingkan dengan rumah yang jauh dari pantai. Terangkan fenomena ini.

[2 marks]

(b) Diagram 7 shows the changes undergoes by iron(II) ion.
Rajah 7 menunjukkan perubahan yang berlaku pada ion Ferum (II)

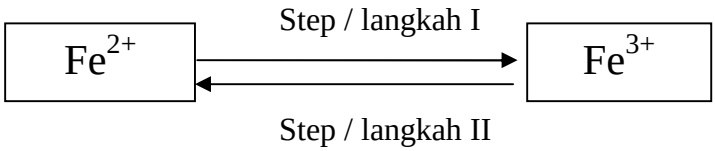


Diagram 7
Rajah 7

Based on electron transfer, explain the oxidation and reduction reaction in step I and II by using suitable named reagent. Include observation and ionic equations for each step.

Berdasarkan konsep pemindahan electron. Terangkan proses pengoksidaan dan penurunan dalam langkah I dan II dengan menggunakan nama reagen yang sesuai. Penerangan anda hendaklah menyatakan pemerhatian dan persamaan ionik yang sesuai bagi langkah I dan II.

[6 marks]

(c) Diagram 8 below shows the set up of apparatus for an experiment to investigate electron transfer through a solution. Given that P is negative terminal and Q is positive terminal.

Rajah 8 di bawah menunjukkan susunan radas bagi satu eksperimen untuk menyiasat pemindahan elekton melalui suatu larutan. Diberi elektrod P sebagai terminal negatif dan Q sebagai terminal positif.

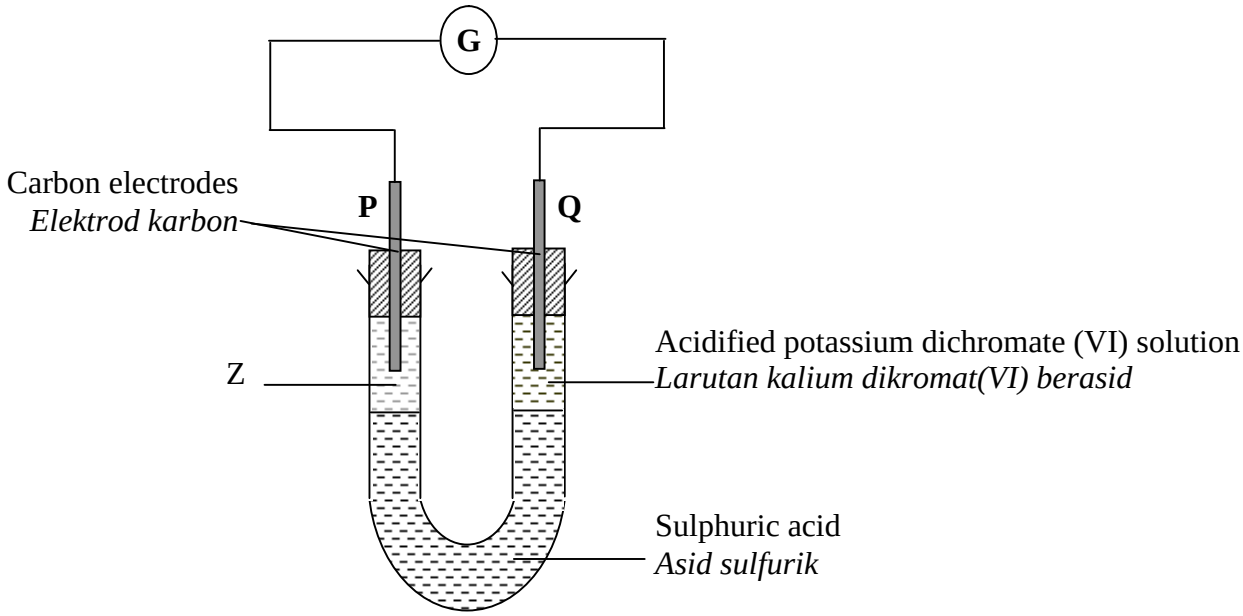


Diagram 8
Rajah 8

(i) Complete the half equation that available at electrode Q.
Lengkapkan persamaan setengah yang berlaku pada elekrod Q.

$$Cr_2O_7^{2-} + 14H^+ + 6e^- \longrightarrow \_\_\_\_\_ + \_\_\_\_\_$$

[1 mark]

(ii) Name Z , the reactant that act as reducing agent in this experiment.
Namakan bahan Z yang bertindak sebagai agen penurunan dalam eksperimen ini.

[1 mark]

(iii)Write the half equations for the reactions that occur at the negative terminal.
Tulisakan persamaan setengah bagi tindakbalas yang berlaku di terminal negatif

[2 marks]

(iv)Based on your answer in (c) (ii), describe the oxidation and reduction process in terms of the electron transfer that occurs at the negative and positive terminals. State also the changes that can be observed after 20 minutes.

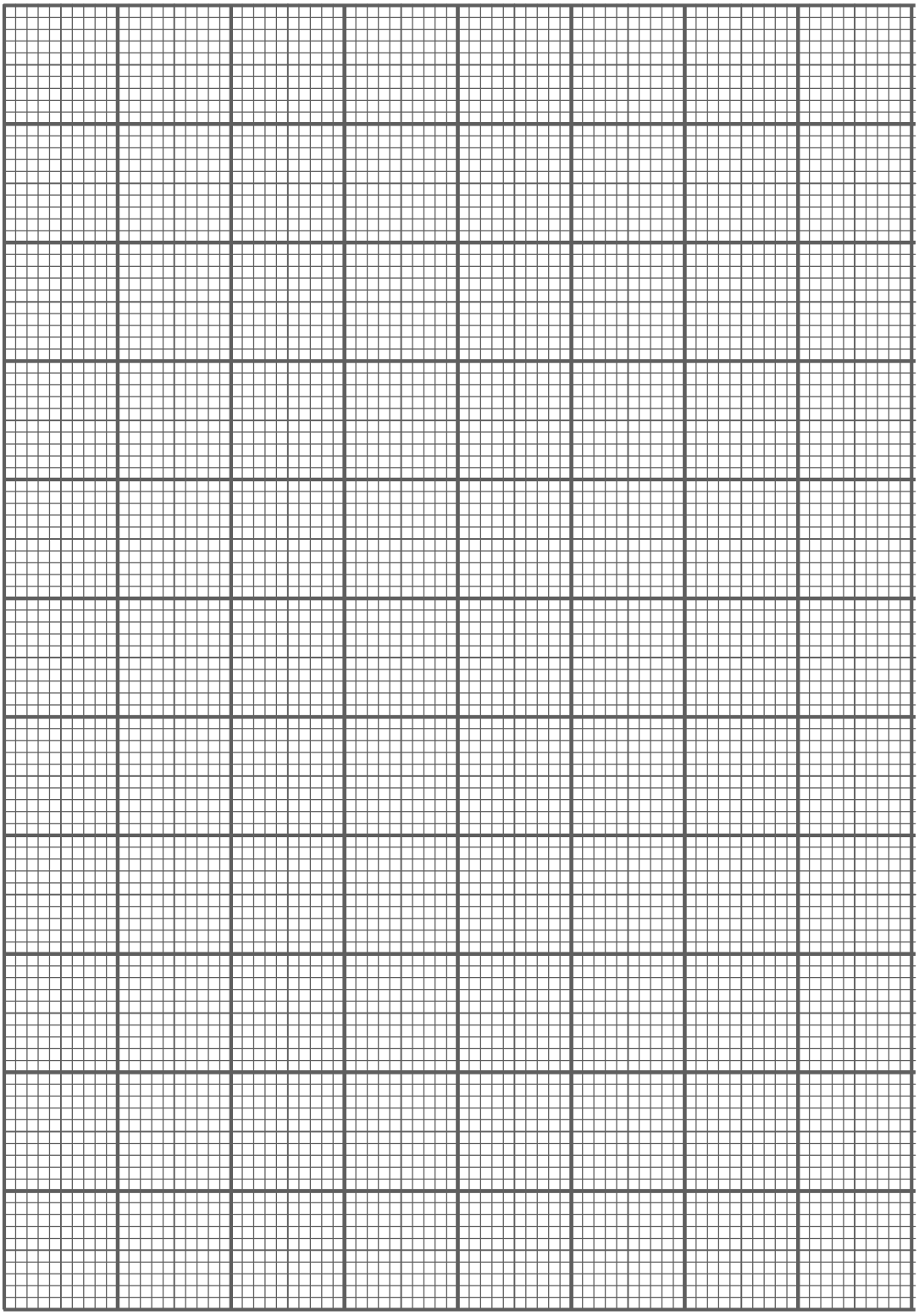
Berdasarkan jawapan anda dalam c(ii), terangkan proses pengoksidaan dan penurunan dari segi pemindahan elektron yang berlaku pada terminat negatif dan positif terminal. Nyatakan juga perubahan yang dapat diperhatikan selepas 20 minit.

[8 marks]

****** ENDS OF QUESTION PAPER *****
***** KERTAS SOALAN TAMAT ******

Graph of heat of combustion versus number of carbon atom per molecule

Graf haba pembakaran melawan bilangan atom karbon per molekul



THE PERIODIC TABLE OF ELEMENTS

1 H Hydrogen 1																	2 He Helium 4
3 Li Lithium 7	4 Be Beryllium 9											5 B Boron 11	6 C Carbon 12	7 N Nitrogen 14	8 O Oxygen 16	9 F Fluorine 19	10 Ne Neon 20
11 Na Sodium 23	12 Mg Magnesium 24											13 Al Aluminium 27	14 Si Silicon 28	15 P Phosphorus 31	16 S Sulfur 32	17 Cl Chlorine 35	18 Ar Argon 40
19 K Potassium 39	20 Ca Calcium 40	21 Sc Scandium 45	22 Ti Titanium 48	23 V Vanadium 51	24 Cr Chromium 52	25 Mn Manganese 55	26 Fe Iron 56	27 Co Cobalt 59	28 Ni Nickel 59	29 Cu Copper 64	30 Zn Zinc 65	31 Ga Gallium 70	32 Ge Germanium 73	33 As Arsenic 75	34 Se Selenium 79	35 Br Bromine 80	36 Kr Krypton 84
37 Rb Rubidium 86	38 Sr Strontium 88	39 Y Yurium 89	40 Zr Zirconium 91	41 Nb Niobium 93	42 Mo Molybdenum 96	43 Tc Technetium 98	44 Ru Ruthenium 101	45 Rh Rhodium 103	46 Pd Palladium 106	47 Ag Silver 108	48 Cd Cadmium 112	49 In Indium 115	50 Sn Tin 119	51 Sb Antimony 122	52 Te Tellurium 128	53 I Iodine 127	54 Xe Xenon 131
55 Cs Cesium 133	56 Ba Barium 137	57 La Lanthanum 139	72 Hf Hafnium 179	73 Ta Tantalum 181	74 W Tungsten 184	75 Re Rhenium 186	76 Os Osmium 190	77 Ir Iridium 192	78 Pt Platinum 195	79 Au Gold 197	80 Hg Mercury 201	81 Tl Thallium 204	82 Pb Lead 207	83 Bi Bismuth 209	84 Po Polonium 210	85 At Astatine 210	86 Rn Radon 222
87 Fr Francium 223	88 Ra Radium 226	89 Ac Actinium 227	104 Unq Unnil-quadium 257	105 Unp Unnil-pentium 260	106 Unh Unnil-hexium 263	107 Uns Unnilseptium 262	108 Uno Unniloctium 265	109 Une Unnilenium 266									

Proton number
Symbol
Name of element
Relative atomic mass

10 Ne Neon 20

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

4541/2
SPM
CHEMISTRY
2009
PAPER 2
2½ HOURS

UNIT PENILAIAN DAN PEPERIKSAAN
SEKTOR PENGURUSAN AKADEMIK
JABATAN PELAJARAN SABAH

PEPERIKSAAN EXCEL II 2009

ANSWER SCHEME

CHEMISTRY

Paper 2

ANSWER SCHEME EXCELL CHEMISTRY FORM 5 2009.

SECTION A :

Question No. 1.

(a) (i) 31 1 m
(ii) 16 1 m
(b) (i) 16 1 m

(ii)  Corret number of electron in shells 1 m

(c) 6 1 m
(d) (i) W and Y 1 m

(ii) Because they have same numbers of proton//proton number
but difference numbers of neutron//nucleon number. 1 m

(e) (i) to estimate the age of fossils/artifacts. 1 m
(ii) 6 1 m
(f)

$$^{15}_{6}Z$$

2 m

Total marks : 11 marks

Question No. 2 :

(a) U, X 1 m
(b) Group 1 and Period 4 [all Group and Period correct] 1 m
(c) Neon. 1 m
Used to fill advertising light bulb// Used as an indicator light. 1 m
(d) (i) U 1 m
(ii) $2U + H_2O \rightarrow 2UOH + H_2$ // $2X + H_2O \rightarrow 2XOH + H_2$ 1 m
(e) X. Its valence electrons can released more easily compare to element U,
Because atom X is size is larger than atom U. 2 m
(f) A valence electron at the outermost shell of atom U 1 m
is transferred to atom W to achieve stable octet electron arrangement 1 m

Total marks : 10 marks

Question No. 3 :

3 (a) Cu^{2+} , H^{+}, SO_4^{2-} , OH^{-} 1 m

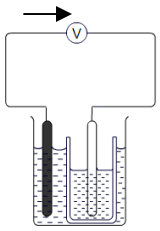
(b) (i) size of copper become bigger//mass of copper increase 1 m

(ii) size of copper become smaller//mass of copper decrease 1 m

(c) (i) Copper 1 m

(ii) Oxygen 1 m

(d) (i)



1 m

(ii) Oxidation 1 m

(iii) 0 to +2 1 m

(iv) increase 1 m

(v) Intersity of blue colour in copper (II) nitrate solution decrease 1 m

Total Marks : 10 marks

Question No. 4 :

4. (a). Yellow 1 m

(b). The change in quatity of sulphur formed with time 1 m

rate of reaction = quantity of sulphur (g) / time (s)

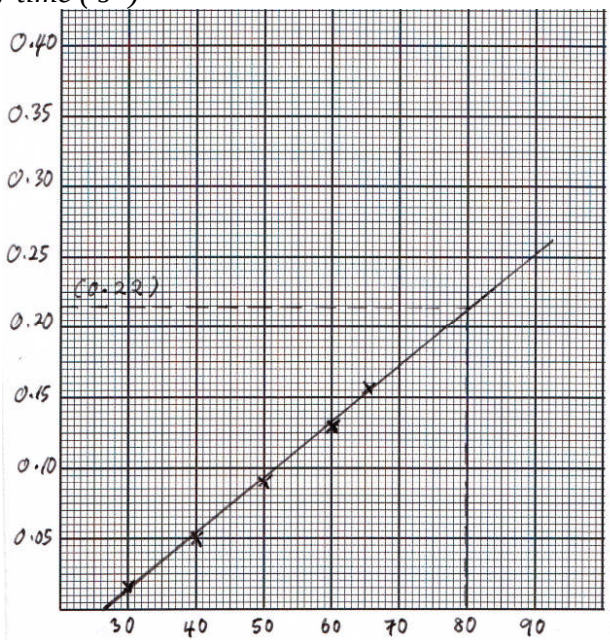
(c). $Na_2S_2O_3 + 2H_2SO_4 \rightarrow 2NaCl + S + SO_2 + H_2$ 1m

(d). (i) 0.02 , 0.05, 0.08, 0.10, 0.13, 0.17 all correct 2m

> 4 correct 1m

(ii) graph temperature against 1/ time

1/ time (s^{-1})



Temperature / ˚C

Labelled all axes and scale 1m
More than 4 point plotted correct Graph smooth and correct shape 1m

4. (iii). 0.22 +/- 0.01 [must be shown in graph] 1m

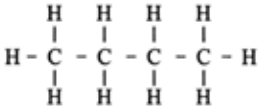
4(e.)

Increase in the temperature will increase kinetic energey of $S_2O_3^{2-}$ and H^+ ion 1m
therefore frequency of collision between the ions is greater 1m
thus the frequency of effective collision will increase 1m
so rate of reaction will increase

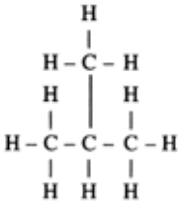
Total marks : 11

Question No. 5 :

5 (a) C_nH_{2n+2} 1m
(b) (i) Compound A : Carbon-carbon double bond / - C = C – 1m
(ii) Compound D : Carboxyl group / - COOH 1m
(c)



or



(either one for 1m)

(d) (i) butyl propanoate 1m
(ii) fruity smell 1m

(e) (i) $C_4H_8 + 6O_2 \longrightarrow 4CO_2 + 4H_2O$ 1m
(ii) molar mass C_4H_8 = 56 g mol^{-1}
Number of mole C_4H_8 = 11.2 / 56 = 0.2 mol 1m
Number of molecule of C_4H_8 = 0.2 / 1 x 4 x 6.03 x 10^{23} 1m

Question No. 6 :

6. (a). Nitrogen gas / $N_{2\,(g)}$ 1 m

(b). $N_2 + 3H_2 \rightarrow 2NH_3$ 1 m

(c). (i.) Iron powder / Ferum powder / serbuk besi 1 m

(ii.) high pressure (150 – 1000) atm

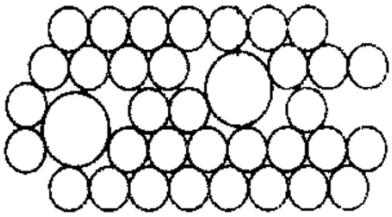
temperature (400 – 550) ˚C all correct 1 m

(d.) Haber process 1 m

(e.) (i) not rusty 1 m

(ii) composite material is consist of **two or more difference substances combined** to create **the new substance which have superior properties** 1 m

(iii).



at least 3 layer 1 m

(iv.) fiber glass , superconductor, photochromatic glass (any one) 1 m

Total : 9 marks

SECTION B :

Question no. 7 :

7	**Answers/ Explanation**	**Score**
	a)(i) Asid-base titration is a quantitative analysis method where a certain volume of acid of known concentration is delivered from a burette to completely neutralize of an alkaline solution of unknown concentration, or vice versa, with the help of a suitable indicator.	2
	(ii) Neutral point is where the neutralization occurs completely. //All hydrogen ions, H^+, in acid react completely with all hydroxide ions,OH^-, in alkali. // $H^+ (aq) + OH^- (aq) \rightarrow H_2O (l)$	1
	b) (a) Reaction of an acid with a base	1
	e.g. $HCl + CuO \rightarrow CuCl_2 + H_2O$	1
	(b) Reaction of an acid with a metal	1
	e.g. $2HCl + Mg \rightarrow MgCl_2 + H_2$	1
	(c) Reaction of an acid with a metal hdroxide	1
	e.g. $2HCl + Cu(OH)_2 \rightarrow CuCl_2 + 2H_2O$	1
	(d) Reaction of an acid with a carbonate	1
	e.g. $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$	1

[any three right answers]

c) (i) Average volume of sulfuric acid, H_2SO_4 used,

$= \frac{24.10 + 24.05 + 24.05}{3}$ 1

$= 24.07\ cm^3$ [**must have unit]** 1

(ii) Number of moles of sulphuric acid, H_2SO_4 =MV

$= 0.1 \times (\frac{24.07}{1000})$ 1

$= 0.002407$ mol 1

$2KOH + H_2SO_4 \rightarrow K_2SO_4 + 2H_2O$

2 mol 1 mol 1

From the equation, 1 mole of sulphuric acid, H_2SO_4 neutralises 2 moles of potassium hydroxide,KOH. 1

.: 0.002407 mole of sulphuric acid neutralises (0.002407 x 2) or 0.004814 mole of potassium hydroxide, KOH. 1

Volume of potassium hydroxide, KOH solution

$= \frac{25.0}{1000} = 0.025\ dm^3$ 1

.: Molarity of potassium hydroxide, KOH solution

$= \frac{0.004814\ mol}{0.025\ dm^3}$ 1

$= 0.193\ mol\ dm^{-3}$

.: Concentration of potassium hydroxide, KOH solution

$= 0.193 \times (39 + 16 + 1)\ g\ dm^{-3}$

$= 10.81\ g\ dm^{-3}$ 1

[must have unit]

iii) To enable the change in colour of the contents in the conical flask to be seen clearly. 1

Maximum mark : 20 marks

Question no. 8

8. (a) (i) use a wind shield during the experiment to minimize the heat lost to the moving air in the surrounding 1m

do not use/remove wire gauze due to allow the flame from the combustion of alcohols touches the bottom of the copper can. 1m

Replace beaker with copper can because copper is a good absorbance of heat. 1m

Cover beaker with kadbod due to minimize lost heat to surrounding. 1m

(a) (ii) the combustion of alcohol is incomplete. Soot can be seen at the bottom of the copper can/beaker.

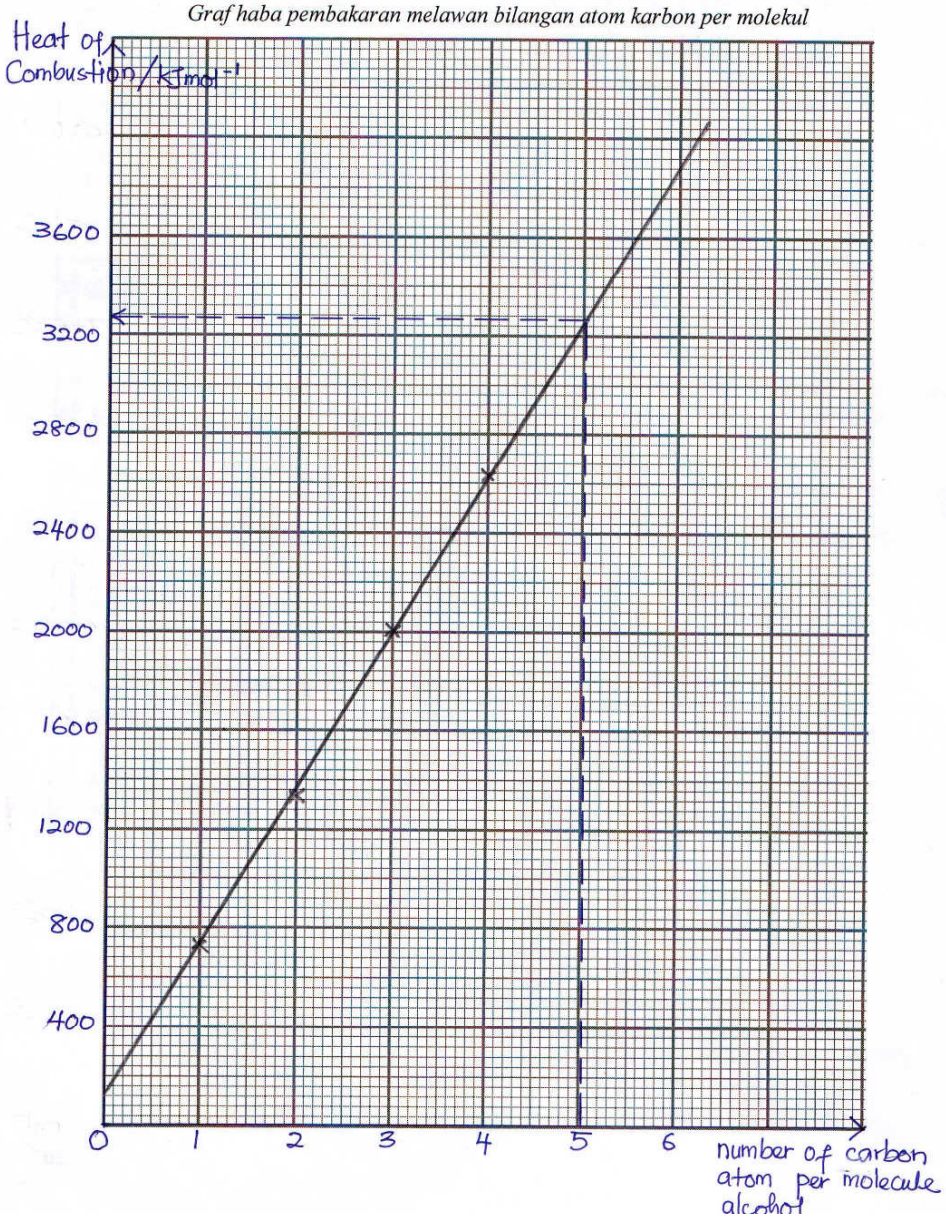
- Heat loses to surroundings and some is absorbed by the tripod stand, copper can and thermometer.
- Alcohols escape to the surroundings because they are volatile liquids.

[any two]
2m

8. (b) (i)

Graph of heat of combustion versus number of carbon atom per molecule

Graf haba pembakaran melawan bilangan atom karbon per molekul



(b) (ii) (3280 +/- 5) $kJmol^{-1}$ 1m

[depends on your graph paper size.
Teacher is asked to draw it first before distribute to student.]

(iii) When the number of carbon atoms in the alcohol molecules increases, the heat of combustion also increase. 1m

More heat energy is required to break down the intermolecular forces between molecules. 1m

8. (c) (i) $C_2H_5OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O$ 2m

(c) (ii) molar mass of C_2H_5OH = 2(12) + 6(1) + 16 = 46 $gmol^{-1}$ 1m

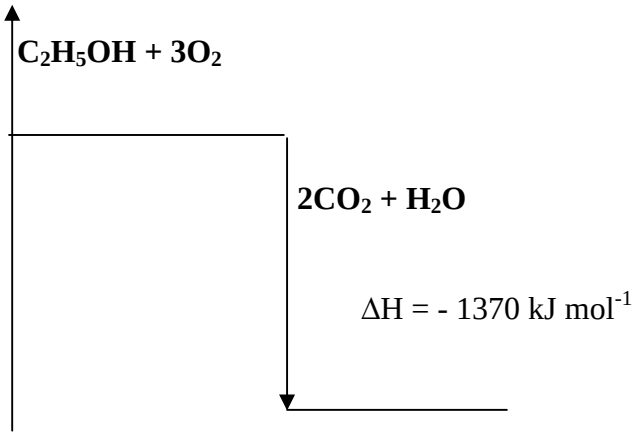
Heat given out = 500 x 4.2 x 50 = 105 kJ 1m

Mass of ethanol needed to release 105 kJ of heat

$$= \frac{46 \text{ g} \times 105 \text{ kJ}}{1370 \text{ kJ}} = 3.53 \text{ g}$$

= 3.53 g [must have unit] 1m

(c) (iii) Energy



2m

SECTION C

Question No. 9

9(a)

- C_6H_{12} has the general formula C_nH_{2n} [1]
- Thus, A is an unsaturated hydrocarbon [1]
- C_6H_{14} has the general formula C_nH_{2n+2} [1]
- Thus, B is a saturated hydrocarbon [1]

Maximum: 4 marks

9(b)

Experiment 1:

1. 2 cm^3 of liquid C_6H_{12} are poured into a test tube. [1]
2. 3 drops of bromine water are added into liquid C_6H_{12}. [1]
3. The mixture in the test tube is shaken. [1]
4. The change in the mixture is observed and recorded. [1]
5. Steps 1 to 4 are repeated replacing with liquid C_6H_{14}. [1]

Experiment 2:

1. 2 cm^3 of liquid C_6H_{12} are poured into a test tube. [1]
2. 3 drops of acidified potassium manganate(VII) solution are added to liquid C_6H_{12}. [1]
3. The mixture in the test tube is shaken. [1]
4. The change in the mixture is observed and recorded. [1]
5. Steps 1 to 4 are repeated replacing with liquid C_6H_{14}. [1]

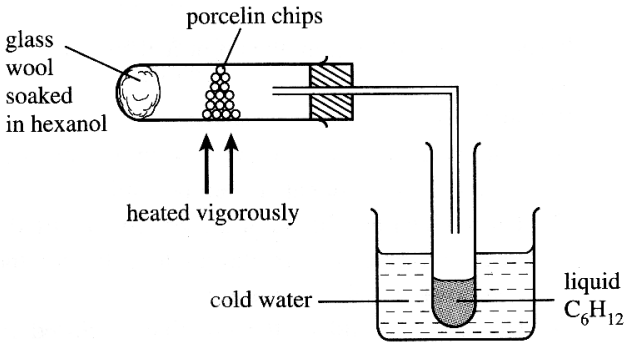
Substance	**Bromine water**	**Acidified potassium manganate(VII) solution**
Liquid C_6H_{12}	Brown colour is decolourized	Purple colour is decolourized
Liquid C_6H_{12}	Brown colour is unchanged	Purple colour is unchanged

Liquid C_6H_{12} is unsaturated hydrogen and [1]
liquid C_6H_{12} is a saturated hydrocarbon. [1]

Maximum: 8 marks

9(c)

(c)



[2 *m*]

Procedure:

- A ball of glass wool is soaked in hexanol and then inserted into a boiling tube. [1]
- Porcelin chips are placed in the boiling tube as shown in the diagram [1]
- The porcelin chips are strongly heated[1] then the glass wool soaked with hexanol is heated [1]
- The liquid produced is collected in a test tube. [1]
- Equation:

  $C_6H_{13}OH \rightarrow C_6H_{12} + H_2O$ [1]

Maximum: 8 mark

Question no. 10 ;

10. (a)

Rusting occurs faster in the presence of salt solutions in sea water. [1]

Salt solution increases the electrical conductivity of water. [1]

10. (b)

Step	Reagent added	Observation	Ionic equation
I	Bromine/ Chlorine water [1m]	Brown bromine water turns colourless/ The pale green iron(II) solution turns yellow [1m]	$Fe^{2+} \longrightarrow Fe^{3+} + e^-$ [1m]
II	Zinc/ Magnesium powder [1m]	Brown iron(III) solution turns pale green/ Green precipitate is formed which is soluble in excesssodium hydroxide solution [1m]	$Fe^{3+} + e^- \longrightarrow Fe^{2+}$ [1m]

$\mathbf{Cr_2O_7^{2-} + 14H^+ + 6e^-} \longrightarrow 2Cr^{3+} + 7H_2O$ 1m

(c)

At the negative terminal:

Iron(II) ion releases one / loses one electron	1m
and is oxidised to iron(III) ion	1m
$Fe^{2+} \rightarrow Fe^{3+} + e^-$	1m
The green coloured solution of iron(II) sulphate turns brown	1m
The electron flows from the negative terminal// carbon immersed in iron(II) sulphate solution to the positive terminal// carbon immersed in potassium dichromate(VI) solution 1m	

At the positive terminal:

Dichromate (VI) accepted electron and turn to chromium (III)	1m
and is reduced to chromium ions, Cr^{3+}	1m
$\mathbf{Cr_2O_7^{2-} + 14H^+ + 6e^-} \rightarrow 2Cr^{3+} + 7H_2O$	1m
The orange coloured of chromium (VI) turns to green colour of chromium(III)	1m
The deflection of the galvanometer needle shows that there is a flow of current	1m

maximum marks : 20 marks

***** END OF MARKING SCHEME****

SULIT

NAME :_____

CLASS :_____

JABATAN PELAJARAN NEGERI SABAH

SIJIL PELAJARAN MALAYSIA 2009 4541/3

EXCEL 2
CHEMISTRY SPM
Paper 3
Sept 2009
1 ½ jam

Satu jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Tuliskan* **nombor kad pengenalan** *dan* **angka giliran** *anda pada ruang yang disediakan.*
2. *Kertas soalan ini adalah dalam dwibahasa*
3. *Soalan dalam bahasa Inggeris mendahului soalan yang sepadan dalam bahasa Melayu.*
4. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam bahasa Inggeris atau bahasa Melayu.*
5. *Calon dikehendaki membaca maklumat di halaman 2 kertas soalan ini.*

Untuk kegunaan Pemeriksa		
Kod Pemeriksa:		
Soalan	*Markah Penuh*	*Markah diperoleh*
1	*33*	
2	*17*	
JUMLAH	*50*	

Kertas soalan ini mengandungi 8 halaman bercetak

INFORMATION FOR CANDIDATES
MAKLUMAT UNTUK CALON

1. This question paper consists of **two** questions. Answer **all** questions.
*Kertas soalan ini mengandungi **dua** soalan. Jawab **semua** soalan.*

2. Write your answers for **Question 1** in the spaces provided in the question paper.
*Jawapan anda bagi **Soalan 1** hendaklah ditulis pada ruang yang disediakan dalam kertas soalan ini.*

3. Write your answer for **Question 2** on the lined papers provided by the invigilators. You may use equations, diagrams, tables, graphs and other suitable methods to explain your answers.
*Jawapan anda bagi **Soalan 2** hendaklah ditulis pada kertas bergaris yang dibekalkan oleh pengawas peperiksaan. Anda boleh menggunakan persamaan, rajah, jadual, graf dan cara lain yang sesuai untuk menjelaskan jawapan anda.*

4. Show your working. It may help you to get marks.
Tunjukkan kerja mengira, ini membantu anda mendapatkan markah.

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

6. The marks allocated for each question or sub-part of a question is shown in brackets.
Markah yang diperuntukkan bagi setiap soalan atau ceraian soalan ditunjukkan dalam kurungan.

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

8. You may use a non-programmable scientific calculator.
Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh deprogram.

9. You are advised to spend 60 minutes to answer **Question 1** and 30 minutes to answer **Question 2**.
*Anda dinasihati supaya mengambil masa 60 minit untuk menjawab **Soalan 1** dan 30 minit untuk menjawab **Soalan 2**.*

10. Detach **Question 2** from this question paper. Tie the lined paper together with this question paper and hand in to the invigilator at the end of the examination.
*Ceraikan **Soalan 2** daripada kertas soalan ini. Ikat kertas bergaris bersama – sama kertas soalan ini dan serahkan kepada pengawas peperiksaan pada akhir peperiksaan.*

Answer **all** questions.
Jawab semua soalan

1.

copper, zinc, magnesium, aluminium, iron *kuprum, zink, magnesium, aluminium, besi*

An experiment is conducted to arrange the above elements based on the potential difference between two different metal electrodes.
Diagram 1.1 shows the set-up of apparatus using zinc and copper as electrodes, and 0.2 mol dm^{-3} copper(II) sulphate solution as electrolyte.

Satu eksperimen dijalankan untuk menyusun unsur-unsur di atas berdasarkan beza keupayaan antara dua elektrod logam berlainan.
Rajah 1.1 menunjukkan susunan radas menggunakan zink dan kuprum sebagai elektrod, dan larutan kuprum(II)sulfat 0.2 mol dm^{-3} sebagai elektrolit.

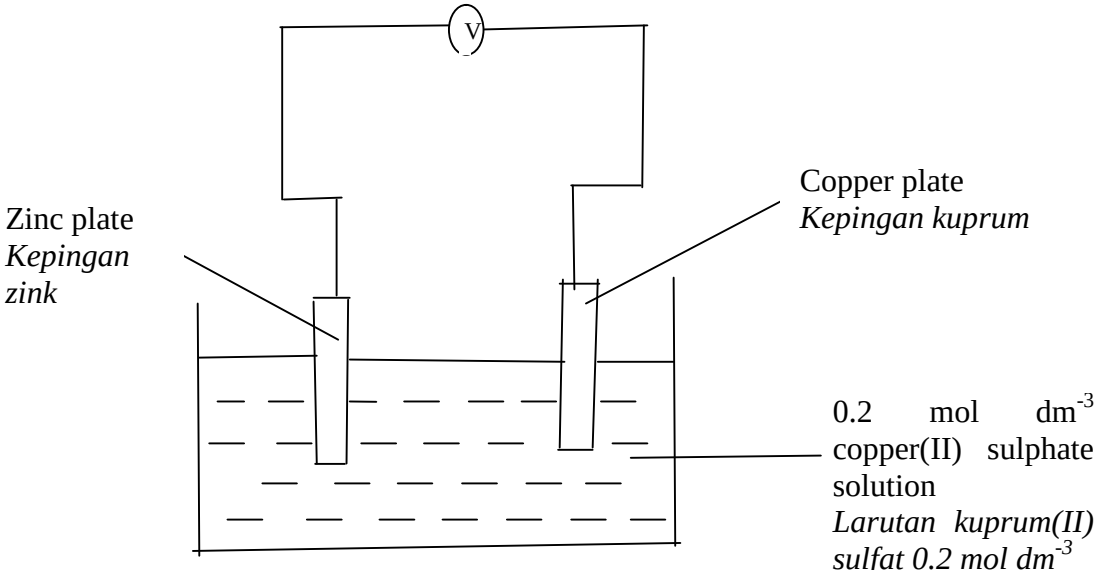


Diagram 1.1

The experiment is repeated by replacing the zinc plate with iron, magnesium, and aluminium. In each of the experiments, the copper plate is used as the positive electrode, and fresh copper(II) sulphate solution is used.

Eksperimen ini diulangi dengan menggantikan kepingan zink dengan besi, magnesium, dan aluminium. Dalam setiap eksperimen, kepingan kuprum diguna sebagai elektrod positif, dan larutan kuprum(II)sulfat yang baru diguna.

(a) Based on the above information, state all the variables in this experiment.
Berdasarkan maklumat di atas, nyatakan semua pembolehubah eksperimen ini.

(i) Manipulated variable :……
Pembolehubah dimanipulasi

(ii) Responding variable :…….
Pembolehubah bergerakbalas

(iii) Constant variable :……. [3]
Pembolehubah dimalarkan

(b) State the hypothesis for this experiment.
Nyatakan hipotesis bagi eksperimen ini.

……[3]

Diagram 1.2 shows the changes at the electrodes after a period of time.
Rajah 1.2 menunjukkan perubahan pada elektrod selepas satu tempoh masa.

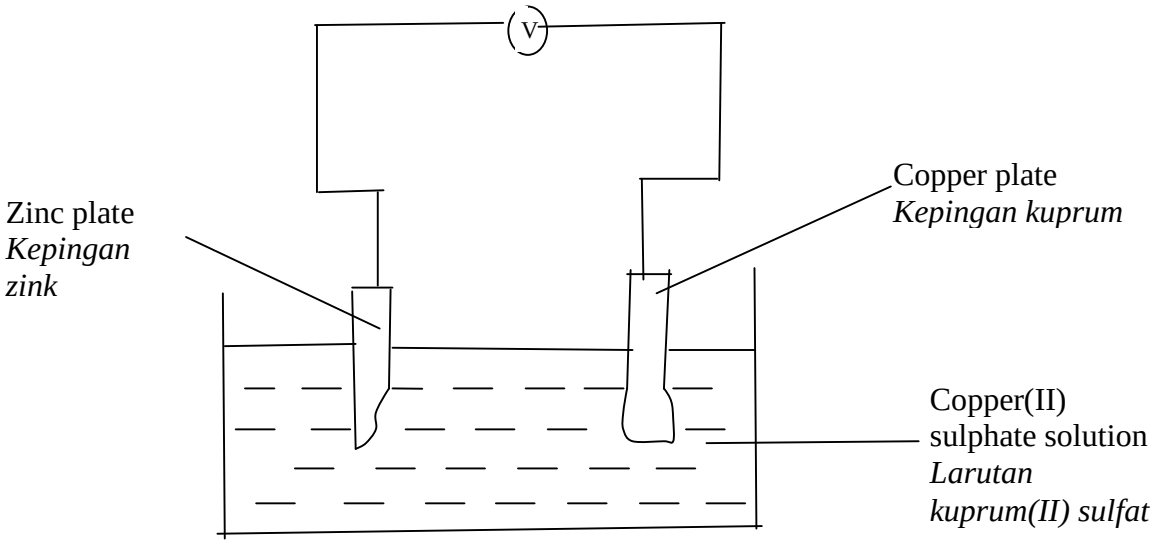


Diagram 1.2

(c) What changes can be observed on the
Apakah perubahan pada

(i) zinc plate?
kepingan zink?

…….

(ii) copper plate?
Kepingan kuprum?

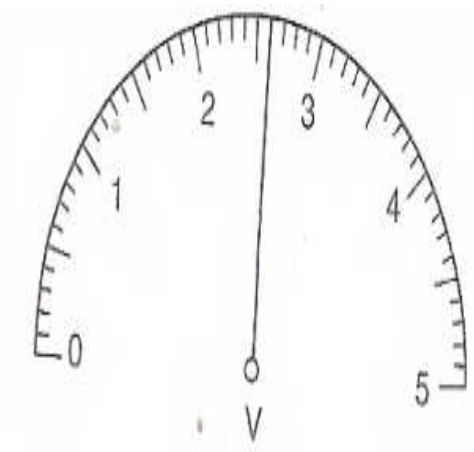
……..

(iii) copper(II) sulphate solution?
larutan kuprum(II)sulfat?

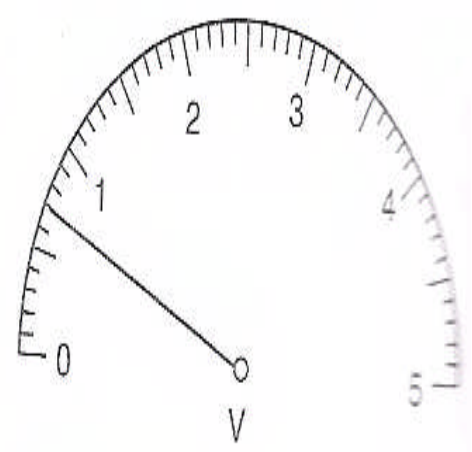
…….. [3]

(d) Table 1.1 shows the readings of the voltmeter for the different pairs of metal electrodes. Record the voltmeter readings on the spaces provided. [3]

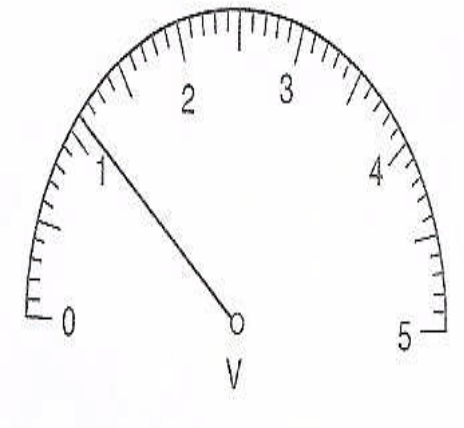
Jadual 1.1 menunjukkan bacaan voltmeter bagi pasangan elektrod logam berlainan. Catatkan bacaan voltmeter pada ruangan yang diberikan.



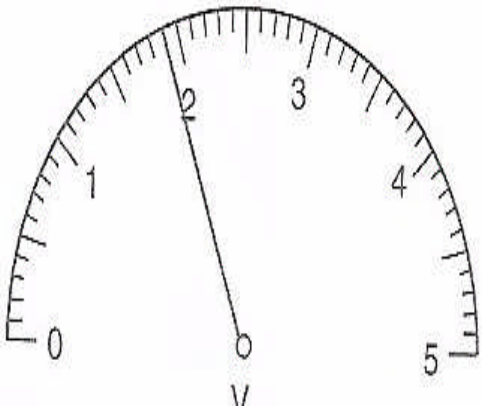
Magnesium and copper pair
Voltmeter reading:_____V
Pasangan magnesium dan kuprum
Bacaan voltmeter



Iron and copper pair
Voltmeter reading:_____V
Pasangan besi dan kuprum
Bacaan voltmeter



zinc and copper pair
Voltmeter reading:_____V
Pasangan zink dan kuprum
Bacaan voltmeter



aluminium and copper pair
Voltmeter
reading:_____V
Pasangan aluminium dan kuprum
Bacaan voltmeter

Table 1.1
Jadua1.1

(e) Construct a suitable table to record your results. [3]
Bina satu jadual yang sesuai untuk mencatat keputusan diperoleh anda.

(f) Write down the operational definition for the experiment.
Tuliskan definisi operasi bagi eksperimen ini.

…….

……. [3]

(g) Which metal produces the highest potential difference with copper? Make inference based on your answer.

Yang mana satukah logam menghasilkan beza keupayaan yang tertinggi dengan kuprum? Berikan inferens berdasarkan jawapan anda.

…….

…….[3]

(h) For the pair of zinc and copper electrodes, what is the direction of the flow of electrons through the external circuit? Explain your answer.

Bagi pasangan elektrod zink dan kuprum, apakah arah pengaliran elektron melalui litar luar? Jelaskan jawapan anda.

……..

…….[3]

(i) Arrange the elements in decreasing tendency to donate electrons. [3]
Susun unsur-unsur ini berdasarkan kecenderungan melepaskan elektron.

Decreasing tendency to donate electron

kecenderungan melepaskan elektron menurun

(j) Predict the potential difference obtained from the voltaic cell using aluminium and iron as electrodes.
State the negative terminal.

Ramalkan beza keupayaan yang dihasilkan dari sel voltan yang menggunakan aluminium dan besi sebagai elektrod
Nyatakan terminal negatif.

…… [3]

(k) Suggest three importance of the electrochemical series.
Cadangkan tiga kepentingan siri elektrokimia.

……

……

……..[3].

2

Chlorine, Bromine and Iodine are halogen elements.
Halogens are generally good oxidizing agents. Chlorine is added to water in a swimming pool or in a water treatment plant to kill microorganisms. It can do this due to its oxidizing power.

Klorin, Bromin, dan iodin adalah unsur halogen.
Pada amnya, halogen adalah agen pengoksidaan. Klorin ditambahkan ke dalam air kolam renang atau logi rawatan air untuk membunuh kuman. Ini adalah kerana klorin mempunyai kuasa pengoksidaan.

Plan a laboratory experiment to compare the ability of chlorine, bromine, and iodine as oxidizing agent in halogen displacement reactions.

Rancang satu eksperimen dalam makmal untuk membanding kebolehan klorin, bromin, dan iodin sebagai agen pengoksidaan dalam tindak balas penyesaran halogen.

Your planning should include the following aspects:
Perancangan anda hendaklah mengandungi perkara-perkara berikut:

(a) Statement of the problem
Penyataan masalah
(b) All the variables
Semua pembolehubah

(c) Statement of the hypothesis
Penyataan hipotesis

(d) List of substances and apparatus
Senarai bahan dan radas

(e) Procedure of the experiment
Prosedur eksperimen

(f) Tabulation of data
Penjadualan data [17]

END OF QUESTION PAPER

KERTAS SOALAN TAMAT

SEKTOR PENGURUSAN AKADEMIK
JABATAN PELAJARAN NEGERI SABAH

PEPERIKSAAN EXCEL II
SIJIL PELAJARAN MALAYSIA 2009 4541/3(PP)
Chemistry
Kertas 3
Peraturan Pemarkahan

UNTUK KEGUNAAN PEMERIKSA SAHAJA

AMARAN

Peraturan pemarkahan ini **SULIT.** Kegunaannya khusus untuk pemeriksa yang berkenaan sahaja. Sebarang maklumat dalam peraturan pemarkahan ini tidak boleh dimaklumkan kepada sesiapa. Peraturan pemarkahan ini tidak boleh dikeluarkan dalam apa – apa bentuk media.

Peraturan pemarkahan ini mengandungi 12 halaman bercetak

Question	Rubric	Score
1(a)	Able to state **all** the variables correctly **(i) Manipulated variable** Type of metal / electrode // negative terminal **(ii) Responding variable** Voltmeter reading // Potential difference **(iii) Constant variable** Concentration of copper(II) sulphate solution //Copper(II) sulphate solution // Electrolyte	3
	Able to state **any two** correct variables	2
	Able to state **any one** correct variable	1
	No response or wrong response	0
1(b)	Able to state the relationship correctly between the manipulated variable and the responding variable with direction. <u>Sample answers</u> The further the position between two metals in the electrochemical series, the higher the potential difference / voltmeter reading.	3
	Able to state the relationship between the manipulated variable and responding variable less accurately. <u>Sample answer</u> The further the position between two metals, the higher / lower the potential difference / voltmeter reading //	2
Question	**Rubric**	**Score**
	The potential difference increases when the distance between two metals increases.	

	Able to state the idea of hypothesis Sample answer The voltmeter reading is different when different pairs of metals are used.	1
	No response or wrong response.	0
1(c)	Able to state **all** the observations correctly. (i) Becomes thinner / shorter // mass decrease (ii) Becomes thicker / longer // mass increase (iii) Blue colour becomes paler / lighter / colourless	3
	Able to state **any two** of the observations correctly.	2
	Able to state **any one** of the observations correctly	1
	No response or wrong response.	0
1(d)	Able to give **all** the voltmeter readings correctly. Magnesium and copper pair Voltmeter reading: 2.6 V Iron and copper pair Voltmeter reading: 0.7 V Zinc and copper pair Voltmeter reading: 1.1 V	3
Question	Rubric	Score
	Aluminium and copper pair Voltmeter reading: 1.9 V	

<table>
<tr><td></td><td>Able to give any two / three voltmeter readings correctly //
Able to give all voltmeter readings correctly without unit.</td><td>2</td></tr>
<tr><td></td><td>Able to give any one voltmeter reading correctly with unit / without unit.

No response or wrong response.</td><td>1

0</td></tr>
<tr><td>1(e)</td><td>Able to construct a table to record the voltmeter readings for the experiments with the following aspects

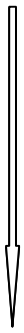
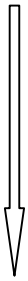
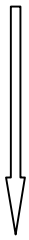
1. Correct titles
2. Readings and units

<u>Sample answer</u>

<table>
<tr><td>Pairs of metals/elements/electrode // Negative terminal</td><td>Voltmeter reading / Potential difference (V)</td></tr>
<tr><td>Magnesium and copper // Magnesium</td><td></td></tr>
<tr><td>Iron and copper // Iron</td><td></td></tr>
<tr><td>Zinc and copper // Zinc</td><td></td></tr>
<tr><td>Aluminium and copper // Aluminium</td><td></td></tr>
</table>
</td><td>3</td></tr>
</table>

Question	Rubric	Score
	Able to construct a less accurate table to record the voltmeter readings for the experiments with the following aspects 1. titles 2. Readings	2
	Able to construct a table with at least one title / readings.	1
	No response or wrong response	0
1(f)	Able to write correct operational definition. <u>Sample answer</u> The deflection of the voltmeter pointer in the direction away from the metal / electrode indicates that the metal / electrode releases electron . // The greater the potential difference / voltmeter reading indicates that the distance between the two metals is further in the electrochemical series.	3
	Able to write less accurate operational definition. <u>Sample answer</u> Voltmeter reading shows there is electron flowing.	2
	Able to give the idea of operational definition. <u>Sample answer</u> Voltmeter reading shows there is reaction.	1
	No response or wrong response.	0

Question	Rubric	Sorec
1(g)	Magnesium. Magnesium is the furthest from copper in the electrochemical series.	3
	Magnesium. Magnesium is the furthest from copper .	2
	Magnesium.	1
	No response or wrong response.	0
1(h)	From zinc to copper. Zinc has a greater tendency to donate electrons. // Zinc is higher than copper in the electrochemical series.	3
	From zinc to copper. Zinc is higher than copper.	2
	From zinc to copper.	1
	No response or wrong response.	0

Question	Rubric	**Score**
1(i)	 Magnesium Aluminium Zinc Iron Copper	3
	 Magnesium Copper	2
	 Copper	1
	No response or wrong response.	0
1(j)	Able to give correct value with unit and electrode. <u>Sample answer</u> 1.2 V . Aluminium.	3

Question	Rubric	Score
	Able to give correct value and electrode.	2
	Able to give **any one** of the following: (I) correct value with unit / without unit (II) electrode.	1
	No response or wrong response.	0
1(k)	(I) It enables the terminals of voltaic cells to be determined. (II) It enables the cell voltage for a pair of metals to be determined. (III) It enables the potential of a metal to displace another metal from its salt solution to be predicted. Able to suggest **all** of the above.	3
	Able to suggest **any two** of the above.	2
	Able to suggest **any one** of the above.	1
	No response or wrong response.	0

Question	Rubric	Score
2(a)	Able to state the problem statement correctly. Sample answer How does the oxidizing power of chlorine differ from that of bromine and iodine?	3
	Able to state the problem statement less accurately. Sample answer To study / investigate the oxidizing power of chlorine as compared to bromine and iodine.	2
	Able to give an idea of the aim of the experiment // problem statement. Sample answer To study the reaction of chlorine, bromine and iodine.	1
	No response or wrong response.	0
2(b)	Able to state **the three** variables correctly Sample answer **Manipulated variable** Halide solution // Potassium bromide solution, Potassium iodide solution. **Responding variable** Changes in colour of solution // occurrence of displacement reaction **Constant variable** Chlorine water	3
	Able to state **any two** variables correctly	2

Question	Rubric	Score
	Able to state **any one** variable correctly	1
	No response or wrong response	0
2(c)	Able to state the hypothesis correctly Sample answer The more electronegative the halogen is, the stronger will be its oxidizing power // Chlorine is the strongest oxidizing agent compared to bromine, followed by iodine.	3
	Able to state the hypothesis less accurately. Sample answer Chlorine is a strong oxidizing agent compared to bromine and iodine.	2
	Able to state the idea of hypothesis Sample answer Halogen / Chlorine, bromine, and iodine has different oxidizing power.	1
	No response or wrong response	0

Question	Rubric	Score
2(d)	Able to give complete list of substances and apparatus Sample answer **Substances** Chlorine water, potassium bromide solution, potassium iodide solution, 1,1,1-trichloroethane liquid **Apparatus** Test tube, Test tube rack, measuring cylinder	3
	Able to give at least **two** substances and at least **one** apparatus	2
	Able to give at least **one** substance and at least **one** apparatus	1
	No response or wrong response	0
2(e)	Able to list all the steps correctly Sample answer 1 Put / pour 2 cm^3 of potassium bromide solution into a test tube. 2. Add 2 cm^3 of chlorine water to the test tube and shake the mixture thoroughly. 3. Add 2 cm^3 of 1,1,1-trichloroethane, CH_3CCl_3 to the test tube. 4. Shake the mixture thoroughly and leave it on the test tube rack.. 5. After a few seconds, note the colour of the aqueous and the 1,1,1-trichloroethane, CH_3CCl_3 layers. 6. Repeat steps 1 to 5, using potassium iodide solution to replace potassium bromide solution. 7. Record all the orservations.	3

<table>
<tr><th>Question</th><th>Rubric</th><th>Score</th></tr>
<tr><td></td><td>Able to list down steps 1, 2, 6, 7</td><td>2</td></tr>
<tr><td></td><td>Able to give an idea of step 1 and 2</td><td>1</td></tr>
<tr><td></td><td>No response or wrong response.</td><td>0</td></tr>
<tr><td>2(f)</td><td>Able to tabulate the data with the following aspects

I Correct titles
II Complete list of halide solution

<u>Sample answer</u>

<table>
<tr><td rowspan="2">Halide solution</td><td colspan="2">Observation</td></tr>
<tr><td>Colour of aqueous layer</td><td>Colour of 1,1,1-trichloroethane layer</td></tr>
<tr><td>Potasium bromide</td><td></td><td></td></tr>
<tr><td>Potassium iodide</td><td></td><td></td></tr>
</table>
</td><td>2</td></tr>
<tr><td></td><td>Able to construct a table with

I at least one suitable title
II incomplete list of halide solution

<u>Sample answer</u>

<table>
<tr><td>Solution</td><td>Observation</td></tr>
<tr><td>Pottasium bromide</td><td></td></tr>
</table>
</td><td>1</td></tr>
<tr><td></td><td>No response or wrong response</td><td>0</td></tr>
</table>