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PART 2

CHEMISTRY

VIDEO PEMBELAJARAN LENGKAP DI

Tingkatan 4

Tingkatan 5

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Asid, bes, dan alkali + garam
Acid, base and alkali + salts

Asid: Asid ialah bahan kimia yang mengion di dalam air untuk menghasilkan ion hidrogen

Acid: Acid is a chemical that dissolves in water to form hydrogen ions

Asid kuat: Aid yang mengion lengkap di dalam air

Strong acids: Acids that ionize completely in water

Asid lemah: Asid yang megion separa dalam air

Weak acids: acids that ionize partially in water

Keterlarutan garam / *Solubility of Salts*

Garam nitrat ***Nitrate salts,*** NO_3^-	**Garam sulfat** ***Sulphate salts,*** SO_4^{2-}	**Garam klorida** ***Chloride salts,*** Cl^-	**Garam karbonat** ***Carbonate salts,*** CO_3^{2-}
Semua **LARUT** di dalam air/ *All nitrates are* ***SOLUBLE***	Semua **LARUT** di dalam air/ *All sulphates are* ***SOLUBLE*** **Kecuali/ *Except*:** $BaSO_4$, $CaSO_4$, $PbSO_4$ — **INSOLUBLE** TAK LARUT	Semua **LARUT** di dalam air/ *All chlorides are* ***SOLUBLE*** **Kecuali/ *Except*:** $AgCl$, $PbCl_2$, $HgCl$ — **INSOLUBLE** TAK LARUT	Semua **TIDAK LARUT** di dalam air/ *All carbonates are* ***INSOLUBLE*** **Kecuali/ *Except*:** Na_2CO_3, K_2CO_3, $(NH_4)_2CO_3$ — **SOLUBLE** LARUT

Warna garam / *The colours of salts*

$CuSO_4$	$FeSO_4$	ZnO
$CuCl_2$	$FeCl_2$	
$Cu(NO_3)_2$	$Fe(NO_3)_2$	
$CuCO_3$		PbO
CuO	$Fe_2(SO_4)_3$	
Cu	$FeCl_3$	
	$Fe(NO_3)_3$	

Cara penyediaan garam
Terdapat 2 langkah untuk penyediaan sesuatu garam

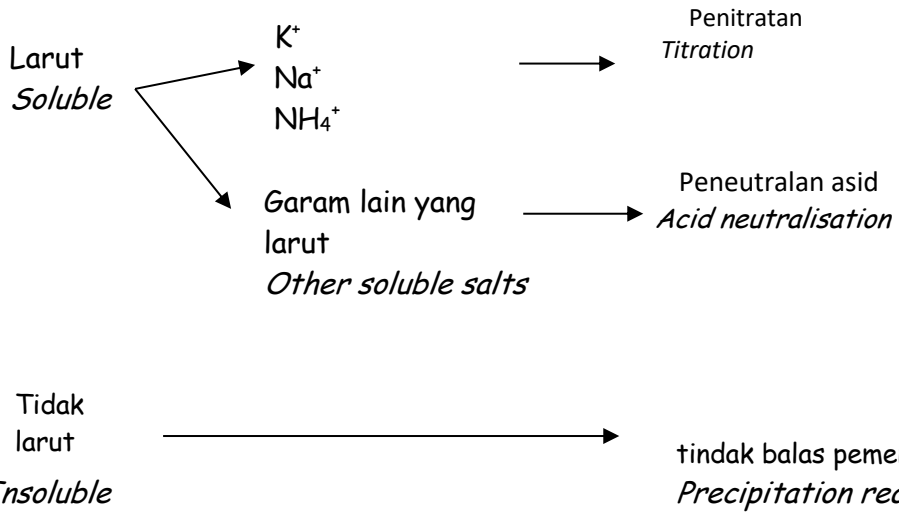
Langkah 1 : Menentukan keterlarutan garam
Langkah 2 : Tentukan keterlarutan asid dan bes yang digunakan

Salt preparation
There are 2 steps in writing out the preparation of a salt.
Step 1: Check solubility of the salt to be prepared
Step 2: Check solubility of the parent acid and parent base to be used

Terdapat 3 cara utama untuk menyediakan garam
There are 3 main methods available for salt preparation.
1) Penitratan asid-bes / *Titration*

2) Peneutralan asid (asid+logam, asid + oksida logam, asid+ karbonat)/ *Acid neutralisation* (acid +metal, acid + metal oxide, acid + metal carbonate)

3) tindak balas pemendakan/ *Precipitation reaction*



Untuk garam yang berikut, pilih cara penyediaan yang betul.
Kemudian tuliskan persamaan kimia dan persamaan ionic

For the following salts, choose the appropriate method of preparation and describe the preparation with balanced chemical equations and ionic equations.

a) Magnesium nitrat/ *Magnesium nitrate*

b) Plumbum (II) klorida / *Lead (II) chlorid*

c) Zink sulfat / *Zinc sulphate*

d) Kuprum (II) klorida / *Copper (II) chloride*

e) Kalium sulfat / *Potassium sulphate*

f) Argentum klorida / *Silver chloride*

Kation/ Cation	Sedikit NaOH *A few drops of NaOH*	NaOH berlebihan *Excess NaOH*	Sedikit NH_3 / *A few drops of NH_3* (aq)	NH_3 Berlebihan/ *Excess NH_3 (aq)*
Ca^{2+}	Mendakan putih/ *White ppt*	**MP tidak larut / *WP does not dissolve***	---------	---------
Mg^{2+}	Mendakan putih/ *White ppt*	**MP tidak larut / *WP does not dissolve***	Mendakan putih/ *White ppt*	**MP tidak larut / *WP does not dissolve***
$A1^{3+}$	Mendakan putih/ *White ppt*	MP Larut / *WP dissolves*	Mendakan putih/ *White ppt*	**MP tidak larut / *WP does not dissolve***
Zn^{2+}	Mendakan putih/ *White ppt*	MP Larut / *WP dissolves*	Mendakan putih/ *White ppt*	MP Larut / *WP dissolves*
Pb^{2+}	Mendakan putih/ *White ppt*	MP Larut / *WP dissolves*	Mendakan putih/ *White ppt*	**MP tidak larut / *WP does not dissolve***

Kenal pasti yang berikut / *Identify the following*

NH_4^+

NH_3

Cu^{2+}

Fe^{2+}

Fe^{3+}

H_2

O_2

Cl_2

SO_2

NO_2

HCl

NO_3^-

Cl^-

SO_4^{2-}

CO_3^{2-}

Contoh soalan 1

(a) Sulphate salts can be in the form of soluble salts and insoluble salts.
Garam sulfat boleh didapati dalam bentuk garam terlarutkan dan garam tak terlarutkan.

(i) State one example of soluble sulphate salt and one example of insoluble sulphate salt.
Nyatakan satu contoh garam sulfat terlarutkan dan garam sulfat tak terlarutkan

[2marks/ 2 *markah*]

(ii) Name the reactants for the preparation of the soluble sulphate salt in 9 (a) (i).
Namakan bahan-bahan tindak balas dalam penyediaan garam sulfat terlarutkan di 9 (a)(i).

[2 marks/2 *markah*]

(iii) With the aid of labelled diagram, explain the crystallization method to prepare soluble sulphate salt crystal from its salt solution.

Dengan bantuan gambar rajah berlabel, terangkan kaedah penghabluran untuk mendapatkan hablur garam sulfat terlarutkan daripada larutan garamnya.

[6 marks/*6 markah*]

(b) You are given a solution that contains a mixture of iron (III) nitrate and iron (III) chloride. Describe the confirmatory test to determine the presence of cation and anion in the solution. Your description must include all the materials used, observations and conclusion.

Anda diberi satu larutan yang mengandungi campuran ferum(III) nitrat dan ferum(III) klorida. Huraikan ujian pengesahan untuk menentukan kehadiran kation dan anion dalam larutan tersebut. Huraian anda mesti disertai dengan semua bahan, pemerhatian dan kesimpulan.

[10 marks/10 *markah*]

Contoh soalan 2

(a) Diagram 8.1 shows two methods of preparing salts in the laboratory.
Rajah 8.1 *menunjukkan dua kaedah penyediaan garam-garam di dalam makmal.*

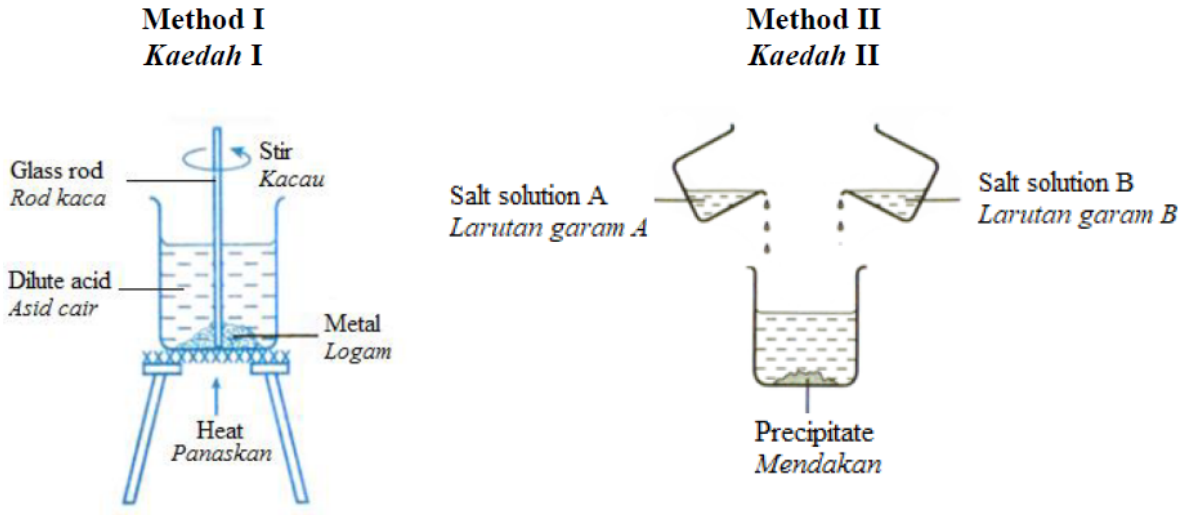


Diagram 8.1
Rajah 8.1

The following are three examples of salts that can be prepared using either Method I or Method II.
Berikut adalah tiga contoh garam yang boleh disediakan sama ada menggunakan Kaedah I *atau Kaedah* II.

Barium sulphate, $BaSO_4$ *Barium sulfat,* $BaSO_4$	Copper(II) nitrate, $Cu(NO_3)_2$ *Kuprum*(II) *nitrat,* $Cu(NO_3)_2$	Magnesium chloride, $MgCl_2$ *Magnesium klorida,* $MgCl_2$

(i) From the given examples, identify the salts that can be prepared by using the methods as shown in Diagram 8.1.
Daripada contoh-contoh yang diberikan, kenalpasti garam-garam yang boleh disediakan melalui kaedah-kaedah seperti di dalam Rajah 8.1.

[2 marks]
[2 *markah*]

(ii) State the reactants for the preparation of salt in Method II.
Nyatakan bahan tindak balas bagi penyediaan garam dalam Kaedah II.

[2 marks]

(b) Diagram 8.2 shows the graph of the height of precipitate against the volume of potassium iodide solution used to construct the ionic equation for the formation of lead(II) iodide through continuous variation method using 0.2 mol dm^{-3} potassium iodide solution and 5 cm^3 of 0.1 mol dm^{-3} salt **P** solution.
Rajah 8.2 *menunjukkan graf tinggi mendakan melawan isipadu larutan kalium iodida yang digunakan untuk membina persamaan ion bagi pembentukan plumbum*(II) *iodida melalui kaedah perubahan berterusan menggunakan larutan kalium iodida* 0.2 *mol* dm^{-3} *dan* 5 cm^3 *larutan garam* **P** 0.1 *mol* dm^{-3}.

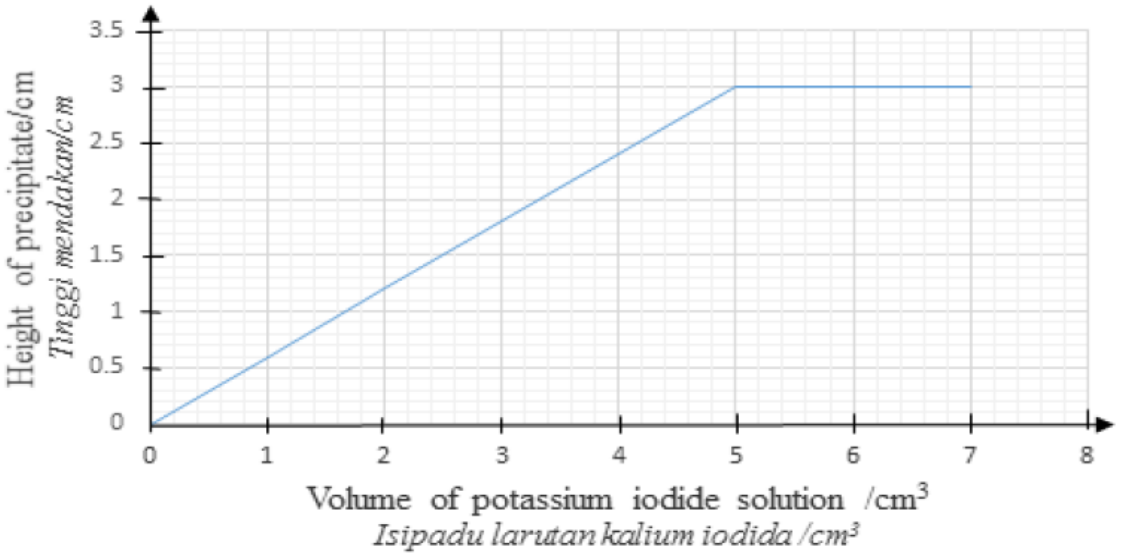


Diagram 8.2
Rajah 8.2

(i) Name the salt **P** solution.
Namakan larutan garam **P**.

[1 mark]

(ii) Based on Diagram 8.2 determine,
Berdasarkan Rajah 8.2 *tentukan,*

- the number of moles of Pb^{2+} ions and I^- ions that reacted completely in the reaction.
bilangan mol bagi ion Pb^{2+} *dan ion* I^- *yang bertindak balas dengan lengkap dalam tindak balas itu.*
- the simplest mole ratio of Pb^{2+} ions to I^- ions in the reaction.
nisbah mol yang teringkas bagi ion Pb^{2+} *kepada ion* I^- *dalam tindak balas itu.*
- ionic equation for the reaction.
persamaan ion bagi tindak balas itu

[5 marks]
[5 *markah*]

(c) Diagram 8.3 shows the reaction scheme of white solid W.
Rajah 8.3 *menunjukkan tindak balas bagi pepejal putih W.*

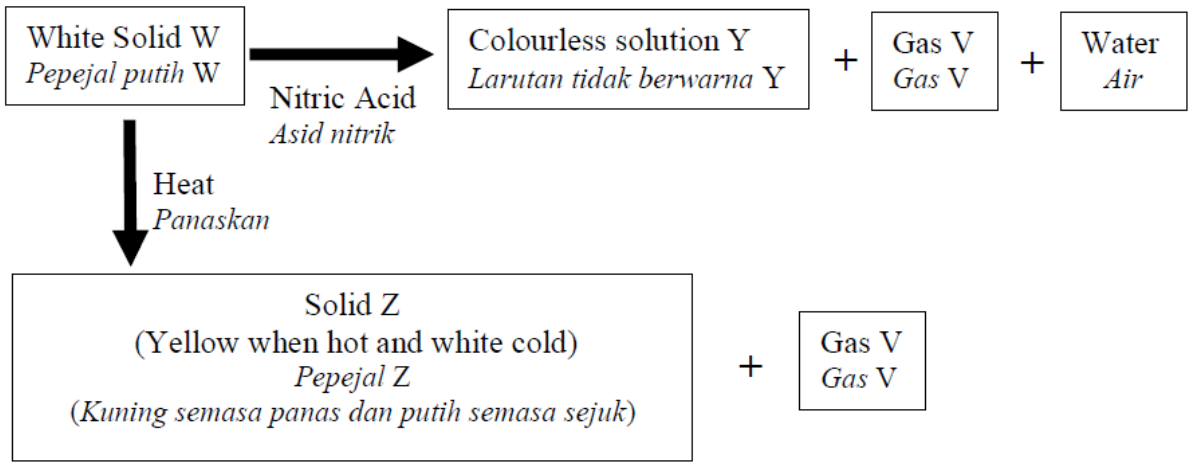


Diagram 8.3

Based on diagram 8.3
Berdasarkan Rajah 8.3

(i) Identify substances V, W, Y and Z
Kenalpasti bahan V, W, Y, *dan* Z

[4 marks]
[4 *markah*]

(ii) Describe a chemical test to verify the cation and anion in solution Y.
Huraikan ujian kimia untuk mengesahkan kehadiran kation dan anion di dalam larutan Y.

[6 marks]
[6 *markah*]

(c)

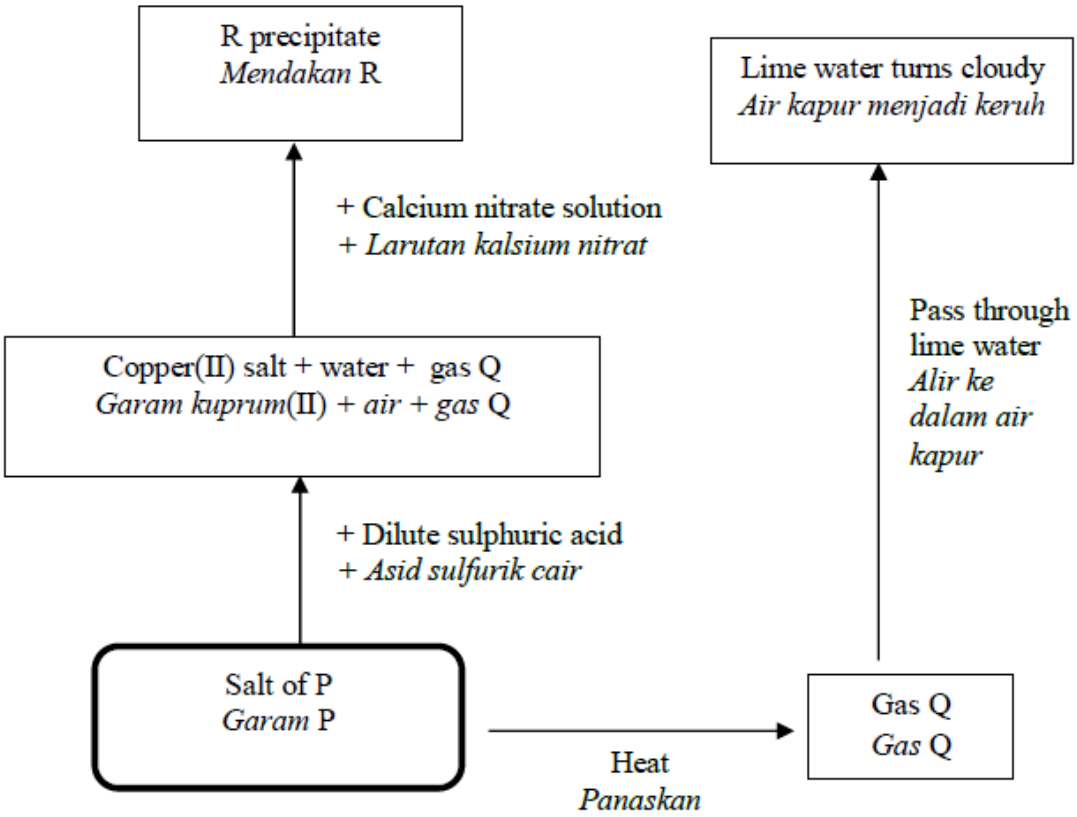


Diagram 7.2
Rajah 7.2

Based on Diagram 7.2:
Berdasarkan Rajah 7.2:

(i) Identify salt P, gas Q and R precipitate.
Kenal pasti garam P, *gas* Q *dan mendakan* R.

[3 marks]
[3 *markah*]

(ii) Write a chemical equation for the formation of R precipitate.
Tulis persamaan kimia bagi pembentukan mendakan R.

[2 marks]
[2 *markah*]

(iii) Copper(II) salt is a soluble salt. Describe briefly a chemical test to verify the cation and anion present in aqueous solution of the salt.
Garam kuprum(II) *adalah garam terlarutkan. Huraikan secara ringkas ujian kimia untuk mengesahkan kehadiran kation dan anion yang hadir dalam larutan akueus garam tersebut.*

[5 marks]
[5 *markah*]

Contoh soalan 3

Diagram 9.1 shows a jelly fish.
Rajah 9.1 *menunjukkan seekor obor-obor.*

Diagram 9.1
Rajah 9.1

(a) The sting of a jelly-fish is alkaline and can cause pain. Suggest one substance that can be applied to the skin to relieve the pain without causing further injury. Give three reasons for your suggestion.
Sengatan obor-obor adalah beralkali dan boleh menyebabkan kesakitan. Cadangkan satu bahan yang boleh disapu pada kulit untuk mengurangkan rasa sakit tanpa menyebabkan kecederaan yang seterusnya. Beri tiga sebab bagi cadangan anda.

[4 marks]

(b) Table 9.2 shows information about of acid P and acid Q
Jadual 9.2 *menunjukkan maklumat tentang asid* P *dan asid* Q.

Acid *Asid*	P	Q
Uses of acid *Kegunaan asid*		
pH	5	1

Table 9.2
Jadual 9.2

By naming an example for each acid, explain why the pH values are different.
Dengan menamakan satu contoh bagi setiap asid, terangkan mengapa nilai pH *adalah berbeza.*

[6 marks]

(c) Diagram 9.3 shows a dry zinc sulphate salt.
Rajah 9.3 menunjukkan garam zink sulfat kering.

Diagram 9.3
Rajah 9.3

Zinc sulphate salt can be prepared by adding solid X into acid Y solution. Suggest a suitable solid X and acid Y.
Describe how you can prepare a dry zinc sulphate salt by using solid X and acid Y.
Garam zink sulfat boleh disediakan dengan menambahkan pepejal X *ke dalam larutan asid* Y.
Cadangkan pepejal X *dan larutan asid* Y *yang digunakan.*
Huraikan bagaimana anda dapat menyediakan garam zink sulfat yang kering dengan menggunakan pepejal X *dan larutan asid* Y.

[10 marks]

Contoh soalan 4

Table 5 shows the information of two carbonate salts.
Jadual 5 *menunjukkan maklumat tentang dua garam karbonat.*

Carbonate salt ***Garam karbonat***	**Solubility in water** ***Keterlarutan dalam air***	**Action of heat** ***Tindakan oleh haba***
X carbonate *Karbonat* X	Soluble in water *Larut dalam air*	Not decomposed by heat *Tidak dapat diurai oleh haba*
Y carbonate *Karbonat* Y	Insoluble in water *Tidak larut dalam air*	Produce residue A that is yellow when hot and white when cold and gas B that can cloud the lime water *Menghasilkan baki* A *yang berwarna kuning ketika panas dan putih apabila sejuk dan gas* B *yang boleh mengeruhkan air kapur*

Table 5
Jadual 5

(a) What is meant by salt?
Apakah yang dimaksudkan dengan garam?

.....

.....

.....
[1 *mark*]

(b) (i) Suggest the name of salt X carbonate.
Cadangkan nama bagi garam karbonat X*.*

.....
[1 *mark*]

(ii) State two chemicals that can be used to prepare salt X.
Nyatakan dua bahan kimia yang boleh diguna untuk menyediakan garam X.

.....

.....
[1 *mark*]

(c) (i) State the name of residue A and gas B.
Nyatakan nama bagi baki A dan gas B.

Residue A / *Baki* A :

.....

Gas B / *Gas* B :

.....
[2 *marks*]

(ii) Write the chemical equation when the salt Y carbonate is heated.
Tuliskan persamaan kimia apabila garam karbonat Y *dipanaskan.*

.....

[2 *marks*]

(iii) Draw the apparatus set up to carry out the experiment in (c) (ii).
Lukis susunan radas untuk menjalankan eksperimen di (c) (ii).

[2 *marks*]

(iv) Predict the observation when salt Y nitrate is heated.
Ramalkan pemerhatian apabila garam Y *nitrat dipanaskan*.

.....

.....

.....

[2 *marks*]

Contoh soalan 5

Table 3 shows the pH values of four acidic solutions which have the same concentration.
Jadual 3 menunjukkan nilai pH bagi empat larutan berasid dengan kepekatan yang sama.

Solution *Larutan*	pH value *Nilai pH*
K	1.0
L	3.0
M	5.0
N	6.0

Table 3
Jadual 3

Which acidic solution has the highest degree of dissociation?
Larutan asid manakah mempunyai darjah penceraian yang paling tinggi?

A. K B. L C. M D. N

Contoh soalan 6

Which equations represent a neutralisation reaction?
Persamaan manakah mewakili tindak balas peneutralan?

I $MgO + 2HCl \longrightarrow MgCl_2 + H_2O$

II $CH_3COOH + KOH \longrightarrow CH_3COOK + H_2O$

III $Mg + 2AgNO_3 \longrightarrow Mg(NO_3)_2 + 2Ag$

IV $BaCl_2 + H_2SO_4 \longrightarrow BaSO_4 + 2HCl$

A I and II
I *dan* II

B II and III
II *dan* III

C I and IV
I *dan* IV

D III and IV
III *dan* IV

Contoh soalan 7

Diagram 3 shows some reactions of substance Y.
Rajah 3 menunjukkan beberapa tindak balas bagi bahan Y.

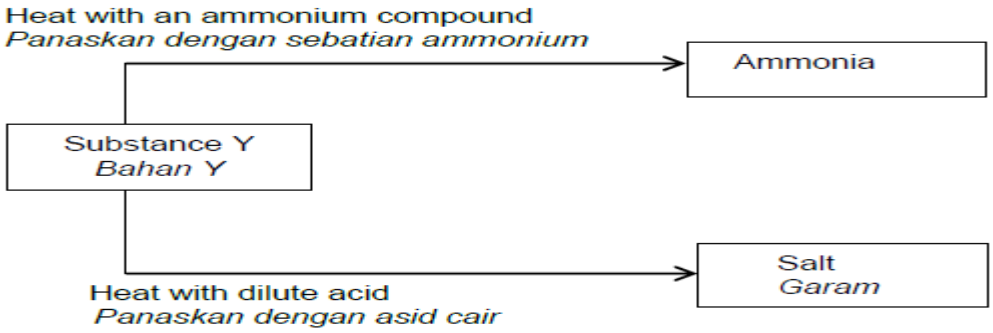


Diagram 3
Rajah 3

What is substance Y?
Apakah bahan Y?

A Alcohol
Alkohol

B Base
Bes

C Catalyst
Mangkin

D Metal
Logam

Redox , Elektrolisis dan sel kimia / *Redox , Electrolysis and chemical cell*

Release electrons / bebaskan electron
Oxidation/ pengoksidaan

e^- →

Receive electron/ menerima elektron
Reduction/ penurunan

$K \rightarrow K^+ + e^-$ $Na \rightarrow Na^+ + e^-$ $Ca \rightarrow Ca^{2+} + 2e^-$ $Mg \rightarrow Mg^{2+} + 2e^-$ $Al \rightarrow Al^{3+} + 3e^-$ $Zn \rightarrow Zn^{2+} + 2e^-$ $Fe \rightarrow Fe^{2+} + 2e^-$ $Sn \rightarrow Sn^{2+} + 2e^-$ $Pb \rightarrow Pb^{2+} + 2e^-$ $H_2 \rightarrow 2H^+ + 2e^-$ $Cu \rightarrow Cu^{2+} + 2e^-$ $Ag \rightarrow Ag^+ + e^-$ $2Cl^- \rightarrow Cl_2 + 2e^-$ $Fe^{2+} \rightarrow Fe^{3+} + e^-$	Contoh kertas 3 / *paper 3*	$2H^+ + 2e^- \rightarrow H_2$ $Cu^{2+} + 2e^- \rightarrow Cu$ $Ag^+ + e^- \rightarrow Ag$ Acidified potassium manganate (VII) Acidified potassium dichromate (VI) $Fe^{3+} + e^- \rightarrow Fe^{2+}$ $Br_2 + 2e^- \rightarrow 2Br^-$ $I_2 + 2e^- \rightarrow 2I^-$ $2H_2O + O_2 + 4e^- \rightarrow 4OH^-$

Contoh soalan 8

(a)

Neutralisation is not a redox reaction
Peneutralan bukan tindak balas redoks

Using a suitable chemical equation, prove the statement above.
Dengan menggunakan satu persamaan kimia yang sesuai, buktikan pernyataan di atas.
[4 marks/*4 markah*]

(b) Diagram 10 shows the apparatus set-up used to determine the positions of metals X, Y and Z in reactivity series.
Rajah 10 menunjukkan susunan radas yang digunakan untuk menentukan kedudukan logam-logam X, Y dan Z dalam siri kereaktifan.

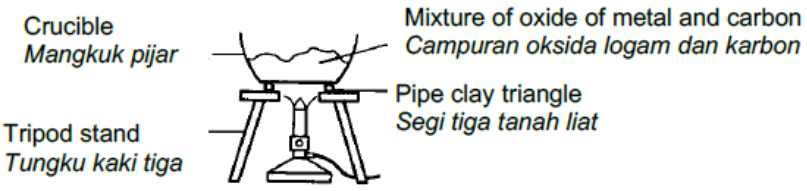


Table 10 shows the results of the experiment.
Jadual 10 menunjukkan keputusan eksperimen

Mixture *Campuran*	Observation *Pemerhatian*
Oxide of metal X + carbon *Oksida logam X + karbon*	Mixture burns brightly. Brown solid is produced. *Campuran menyala dengan terang. Pepejal perang terhasil.*
Oxide of metal Y + carbon *Oksida logam Y + karbon*	No change. *Tiada perubahan.*
Oxide of metal Z + carbon *Oksida logam Z + Karbon*	Mixture glows brightly. Grey solid is produced. *Campuran berbara dengan terang. Pepejal kelabu terhasil.*

Table 10
Jadual 10

(i) Suggest the name of metals X, Y and Z.
Cadangkan nama bagi logam X, Y dan Z.

(ii) Explain why there are differences in the observations.
Then, arrange the metals and carbon in ascending order of reactivity towards oxygen.
Terangkan mengapa terdapat perbezaan dalam pemerhatian.
Kemudian, susun logam-logam dan karbon dalam tertib menaik kereaktifan terhadap oksigen.

[6 marks/*6 markah*]

(c)

A more electropositive metal is able to prevent rusting but a less electropositive metal may speed up the rusting process.

Suggest **one** metal that is more electropositive than iron and **one** metal that is less electropositive than iron.
Using the named metals, describe an experiment to show how these two different metals affect the rusting process.

Your description should include the following aspects:

- Procedure
- Observation and inference

Logam yang lebih elektropositif boleh mencegah pengaratan tetapi logam yang kurang elektropositif boleh mempercepat proses pengaratan.

*Cadangkan **satu** logam yang lebih elektropositif daripada besi dan **satu** logam yang kurang elektropositif daripada besi.*
Dengan menggunakan logam yang dinamakan, huraikan satu eksperimen untuk menunjukkan bagaimana kedua-dua logam yang berlainan mempengaruhi proses pengaratan.

Huraian anda harus merangkumi aspek-aspek berikut:

- *Prosedur*
- *Pemerhatian dan inferens*

[10 marks/*10 markah*]

Contoh soalan 9

Diagram 8.1 shows the change of ion of iron as a redox reaction.
Rajah 8.1 *menunjukkan pertukaran ion bagi besi sebagai suatu tindak balas redoks.*

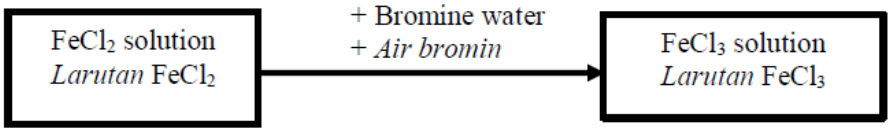


Diagram 8.1
Rajah 8.1

(a) Based on the reaction in Diagram 8.1:
Berdasarkan tindak balas dalam Rajah 8.1:

(i) State the change in oxidation number of iron and bromine.
Nyatakan perubahan nombor pengoksidaan besi.dan bromin

(ii) State the role of bromine water
Nyatakan peranan air bromin

(iii) State the colour change of the solution
Nyatakan perubahan warna larutan tersebut

[4 marks]

(b) One of the method used to prevent iron from corrosion is tin plating. Diagram 8.2 shows a food can that is electroplated with tin.
Salah satu kaedah digunakan untuk menghalang besi daripada terkakis adalah penyaduran timah. Rajah 8.2 *menunjukkan satu tin makanan yang disadurkan dengan timah.*

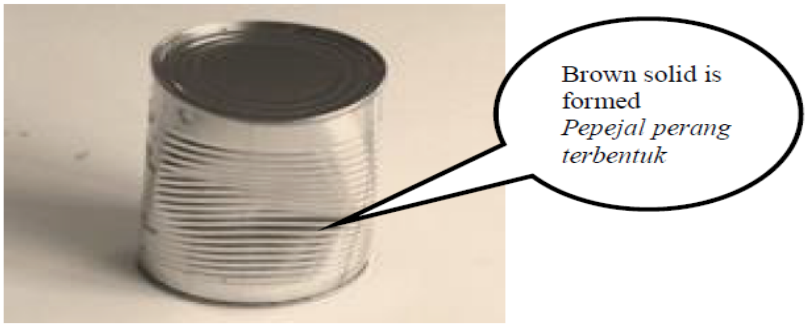
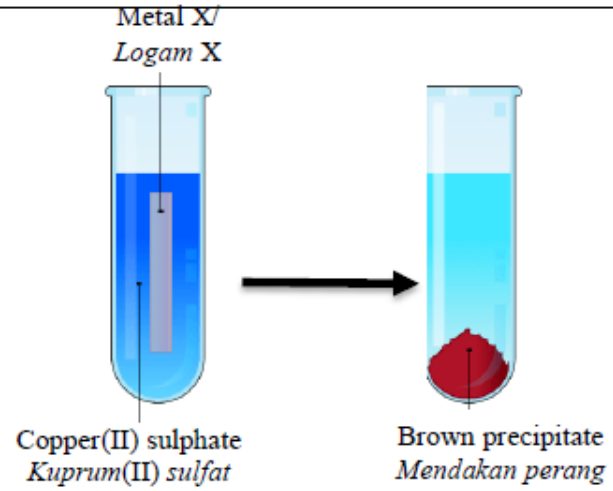
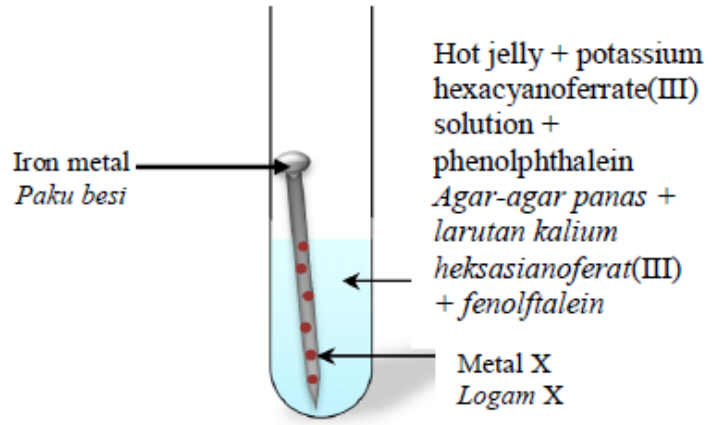


Diagram 8.2

Explain why food in a dented can should not be consumed.
Write the half equation for the reaction that occurs.
Terangkan mengapa makanan dalam tin yang kemek tidak boleh digunakan.
Tulis setengah persamaan bagi tindak balas yang terlibat.

[6 marks]
[6 *markah*]

(c) Diagram 8.3 shows the apparatus set-ups and observations for redox reaction involving metal X.
Rajah 8.3 menunjukkan susunan radas dan pemerhatian.bagi tindak balas redoks yang melibatkan logam X.

Set *Set*	*Observation* *Pemerhatian*	
I		Brown precipitate produced *Mendakan perang terbentuk*
II		Pink colour formed *Warna merah jambu terbentuk*

Based on the observations, suggest metal X and explain the observations in Set I and Set II include the half-equation.
Berdasarkan pemerhatian, cadangkan logam X *dan huraikan pemerhatian dalam Set* I *dan Set* II *beserta dengan setengah persamaan.*

[10 marks]

Contoh soalan 10

Carbon monoxide is a poisonous substance. Diagram 13 shows carbon monoxide detector that can be used at home.
Karbon monoksida adalah bahan beracun. Rajah 13 menunjukkan pengesan karbon monoksida yang boleh digunakan di rumah.

Diagram 13
Rajah 13

The orange spot turns black if there is a high concentration of carbon monoxide in the air. The chemical equation of redox reaction is shown below:
Tompok jingga bertukar hitam jika terdapat karbon monoksida berkepekatan tinggi di udara. Persamaan kimia tindak balas redoks adalah seperti berikut:

$$PdCl_2 + H_2O + CO \rightarrow Pd + 2HCl + CO_2$$

What is the change in oxidation number of palladium and carbon in this reaction?
Apakah perubahan nombor pengoksidaan palladium dan karbon dalam tindak balas ini?

	Palladium *Palladium*	Carbon *Karbon*
A	+2 to 0 +2 *kepada* 0	+2 to +4 +2 *kepada* +4
B	+4 to +2 +4 *kepada* +2	0 to +2 0 *kepada* +2
C	0 to +2 0 *kepada* +2	+4 to +2 +4 *kepada* +2
D	+2 to +4 +2 *kepada* +4	+2 to 0 +2 *kepada* 0

Contoh soalan 11

(a) Diagram 6 shows the apparatus set-up to study the displacement of halogen between bromine water and potassium iodide solution.
Rajah 6 menunjukkan susunan radas untuk mengkaji tindak balas penyesaran halogen di antara air bromin dan larutan kalium iodida.

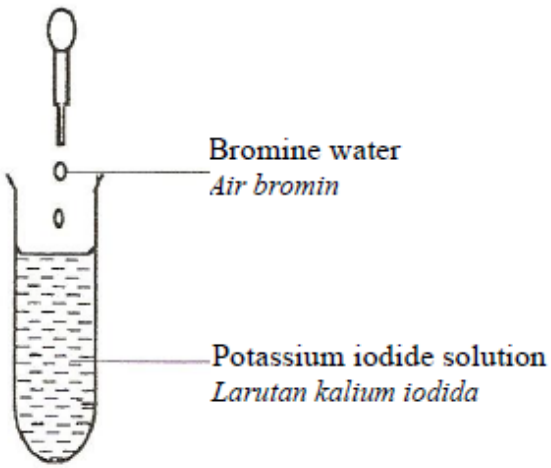


Diagram 6
Rajah 6

1,1,1-trichloroethane is added into the mixture and shaken thoroughly.
1,1,1-trikloroetana ditambah ke dalam campuran itu dan digoncang lagi dengan sempurna.

(i) State the function of bromine water.
Nyatakan fungsi air bromin.

.....

[1 mark]

(ii) State one observation after 1,1,1-trichloroethane is added to the mixture.
Nyatakan satu pemerhatian setelah 1,1,1-trichloroetana ditambah kepada campuran.

.....

[1 mark]

(iii) Write the ionic equation for the reaction.
Tuliskan persamaan ion bagi tindak balas ini.

.....

[2 marks]

(iv) State the change in the oxidation number of iodine.
Nyatakan perubahan nombor pengoksidaan bagi iodin.

.....

[1 mark]

(v) Name another reagent that can replace bromine water.
Namakan reagen lain yang boleh menggantikan air bromin.

.....

[1 mark]

(b) An experiment is carried out to study the reactivity of metals with oxygen.
Satu eksperimen telah dijalankan untuk mengkaji kereaktifan logam terhadap oksigen.

Table 6 shows the observations and the colour of the residue for each metal.
Jadual 6 menunjukkan pemerhatian dan warna baki pemanasan bagi setiap logam itu.

Metal *Logam*	**Observation** *Pemerhatian*	**Colour of Residue** *Warna Baki*
W	Glow brightly *Membara terang*	Yellow when hot white when cold *Kuning semasa panas putih semasa sejuk*
X	Glow faintly *Membara malap*	Black *Hitam*
Y	Burn brightly *Menyala terang*	White *Putih*

Table 6

(i) Draw the diagram of the apparatus set-up for the experiment.
Lukiskan diagram bagi susunan radas bagi eksperimen ini.

[2 marks]

(ii) Suggest metal W.
Cadangkan logam W.

.....

[1 mark]

(iii) Based on your answer in 6(b)(ii),
Write the chemical equation for the reaction between metal W and oxygen.
Berdasarkan jawapan anda dalam 6(b)(ii),
Tuliskan persamaan kimia bagi tindak balas antara metal W dan oksigen.

.....

[1 mark]

(iv) Based on the observations, arrange metals W, X and Y in descending order of the reactivity towards oxygen.
Berdasarkan kepada pemerhatian, susunkan logam-logam W, X and Y *mengikut tertib menurun dalam kereaktifan terhadap oksigen.*

.....

[1 mark]

Termokimia/ *Thermochemistry*

Haba pemendakan ialah perubahan tenaga apabila satu mol mendakan terbentuk daripada ion-ionnya

*The heat of precipitation is the energy change when **1 mole of precipitate** is formed from its ion*

Haba penyesaran ialah perubahan tenaga apabila satu mol logam disesarkan daripada larutan garamnya oleh logam yang lebih elektroposotif
***Heat of displacement** is the energy change when **1 mole of metal** is displaced from its salt solution by a more electropositive metal.*

Haba peneutralan ialah perubahan tenaga apabila satu mol air terbentuk daripada tindak balas antara satu mol ion hidrogen dan satu mol ion hidroksida
***Heat of neutralization** is the energy change when **1 mole of water** is formed from the neutralization between one mole of **hydrogen ions, H^+** from an acid and one mole of **hydroxide ions, OH^-** from an alkali.*

Haba pembakaran ialah perubahan tenaga apabila satu mol bahan dibakar dengan lengkap dalam oksigen berlebihan
***Heat of combustion** is the heat released when **1 mol of a substance is burnt completely** in an excess of oxygen*

Heat released = $mc\theta$ Heat of neutralization = $mc\theta$/moles

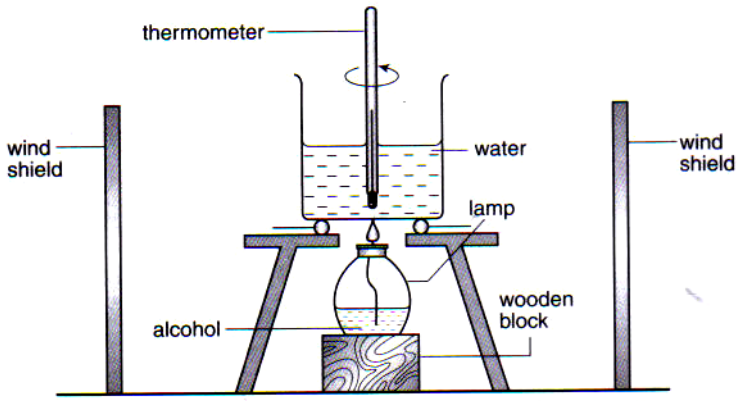


Figure 4.3 *Apparatus set-up to measure heat of combustion*

Precautions:

1. Use aluminium can
2. Use a wind shield
3. Stir the water continuously with the thermometer
4. Weigh the lamp as quickly as possible after putting out the flame
5. Heat the aluminium can directly without using a wire gauze
6. Use a wooden block so that the base of the can is as close as possible to the flame

Contoh soalan 12

The equation below shows a displacement reaction and its heat of reaction.
Persamaan berikut menunjukkan tindak balas penyesaran dan haba tindak balasnya.

$$Mg + Fe^{2+} \longrightarrow Mg^{2+} + Fe \quad ; \quad \Delta H = -189 \text{ kJ mol}^{-1}$$

Which of the following statements are true about the reaction represented by the above equation?
Penyataan manakah benar berkaitan tindak balas yang diwakili oleh persamaan di atas?

I The reaction is endothermic
Tindak balas adalah endotermik
II Magnesium is oxidized
Magnesium teroksida
III The temperature decreases during the reaction
Suhu menurun semasa tindak balas
IV The heat released during formation of 0.2 mole of iron is 37.8 kJ
Haba yang dibebaskan semasa 0.2 mol ferum terbentuk adalah 37.8 kJ.

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

Contoh soalan 13

The thermochemical equation represents the combustion of methanol, CH_3OH.
Persamaan termokimia mewakili pembakaran methanol, CH_3OH.

$$CH_3OH + \frac{3}{2}O_2 \rightarrow CO_2 + 2H_2O \qquad \Delta H = -728 \text{ kJ mol}^{-1}$$

What is the mass of methanol needed to raise the temperature of 250 cm^3 of water by 27.8°C?
[Molar mass of CH_3OH = 32; Specific heat capacity of water = 4.2 J g-1 $°C^{-1}$; Density of water = 1 g cm^{-3}]

Berapakah jisim metanol yang diperlukan untuk menaikkan suhu 250 cm^3 *air sebanyak* 27.8 °C*?*
[Jisim molar CH_3OH = 32*; Muatan haba tentu air* = 4.2 J g^{-1} $°C^{-1}$*;*
Ketumpatan air = 1 g cm^{-3}*]*

A 2.56 g

B 1.88 g

C 1.28 g

D 0.79 g

Contoh soalan 14

In an experiment , 2 g of magnesium powder is added to 50 cm^3 of 0.2 mol dm^{-3} zinc sulphate solution. The temperature of the mixture increases by 12 °C. What is the heat of displacement in the experiment?
[Specific heat capacity of a solution = 4.2 J g^{-1} $°C^{-1}$; Relative atomic mass of Mg = 24]
Dalam satu eksperimen, 2 g serbuk magnesium ditambahkan kepada of 0.2 mol dm^{-3} larutan zink sulfat. Suhu campuran meningkat sebanyak 12 °C. Berapakah haba penyesaran dalam eksperimen ini?
[Muatan haba tentu larutan = 4.2 J g^{-1} $°C^{-1}$, Jisim atom relatif Mg = 24]

A – 5.04 kJ mol^{-1}

B – 10.08 kJ mol^{-1}

C – 252 kJ mol^{-1}

D – 320 kJ mol^{-1}

Sebatian carbon/ *Carbon compounds*

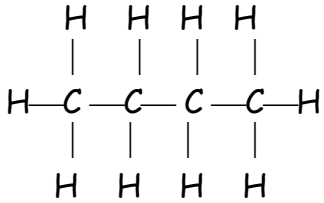
1. Apakah formula am alkane? *What is the general formula of alkanes?*

2. Tuliskan persamaan kimia untuk pembakaran etana dan propane. *Write the chemical equation for the combustion of ethane and propane.*

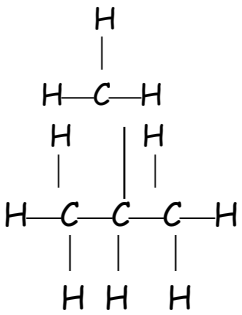
3. Apakah isomer? *What is the definition of isomers?*

4. Namakan molekul berikut dan kemalpasti sama ada mereka merupakan isomer *Name the two molecules below are determine if they are isomers:*

a)

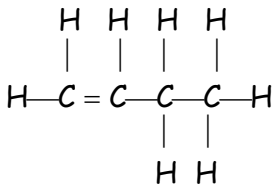


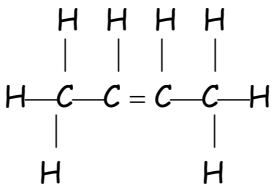
b)

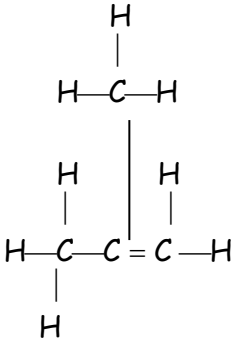


5. Tuliskan formula am akena. *Write the general formula for alkenes*

6. Namakan isomer butena. *Name these isomers for butene*







7. Bagaimanakah pentane dan pentena boleh dibezakan?
How can pentane be differentiated from pentene?

Ujian / *Test*	Pentane	Pentene
Pembakaran/ *Combustion*		
Air bromine/ *Bromine water*		
Kalium manganat(VII) berasid/ *Acidified potassium manganate (VII)*		

8. Apakah formula am alcohol? *What is the general formula of alcohol?*

9. Apakah formula am asid karboksilik?
What is the general formula for carboxylic acid?

10. Apakah formula am ester? *What is the general formula for ester?*

11. Tuliskan persamaan kimia pengesteran
Write chemical equations to form these esters:
a) propyl ethanoate

b) ethyl propanoate

12. Apakah sifat fizikal istimewa ester? *What special property does ester have?*

Contoh soalan 15

Table 7.1 shows an ester and its flavour.
Jadual 7.1 menunjukkan suatu ester dan perisanya.

Ester ***Ester***	**Flavour** ***Perisa***
Methyl propanoate *Metil propanoat*	Apple *Epal*

Table 7.1
Jadual 7.1

Sarah wants to produce an ester in of apple flavour in a school laboratory.
Sarah ingin menyediakan ester yang berperisa epal di dalam makmal sekolah

(a) (i) State the alcohol and the carboxylic acid to be used for preparing the ester. Write the chemical equation to prepare the ester.

Nyatakan alkohol dan asid karboksilik yang akan diguna untuk menyediakan ester itu.
Tulis persamaan kimia bagi penyediaan ester tersebut.

[4 marks/ 4 *markah*]

(ii) Calculate the mass of the alcohol will be used to get 1.32 g of the ester
[Relative atomic mass: H = 1, C = 12, O = 16]

Hitung jisim alkohol yang akan digunakan bagi mendapatkan 1.32 g *ester itu.*
[*Jisim atom relatif*: H = 1, C = 12, O = 16]

[2 marks/ 2 *markah*]

(b) The following information is about an organic compound P.
Maklumat berikut adalah mengenai suatu sebatian organic P.

- Carbon *Karbon* : 85.71 %
- Hydrogen *Hidrogen* : 14.29 %
- Relative molecular mass *Jisim molekul relatif* : 56
- Relative atomic mass of *Jisim atom relatif* : H, 1; C, 12

Based on the above information:
Berdasarkan maklumat di atas:

(i) Determine the empirical formula and molecular formula of the compound P
Tentukan formula empirik dan formula molekul bagi sebatian P

[5 marks/ 5 *markah*]

(ii) State the name and homologous series of compound P
Nyatakan nama dan siri homolog bagi sebatian P

[2 marks/ 2 *markah*]

(c) Table 7.2 shows the properties of two organic compounds.
Each compound has five carbon atoms per molecule.

Jadual 7.2 menunjukkan sifat-sifat bagi dua sebatian organik.
Setiap sebatian mempunyai lima atom karbon per molekul.

Compound *Sebatian*	Properties *Sifat*
R	• Insoluble in water *Tidak larut dalam air* • Decolourised brown colour of bromine water *Melunturkan warna perang air bromin*
S	• Soluble in water *Larut dalam air* • React with calcium carbonate to produce a type of gas that turns lime water cloudy *Bertindak balas dengan kalsium karbonat menghasilkan gas yang menukarkan air kapur menjadi keruh.*

Table 7.2
Jadual 7.2

Based on table 7.2,
Berdasarkan jadual 7.2,

(i) State the name and functional group of the compound R and S
Nyatakan nama dan kumpulan berfungsi bagi sebatian R dan S
[4 marks/ 4 *markah*]

(ii) Draw structural formulae for three isomers of compound R
Lukis formula struktur bagi tiga isomer sebatian R.
[3 marks/ 3 *markah*]

Contoh soalan 16

Diagram 10.1 shows the conversion of few carbon compounds with less than four carbon atoms.
Rajah 10.1 *menunjukkan penukaran beberapa sebatian karbon yang mempunyai atom karbon kurang daripada empat.*

Diagram 10.1
Rajah 10.1

(a) Based on Diagram 10.1:
Berdasarkan Rajah 10.1:

(i) Identify reaction I, reaction II and homologous series of compound P.
Kenalpasti tindak balas I, *tindak balas* II *dan siri homolog bagi sebatian* P.

(ii) By using suitable number of carbon atom, draw the structural formula of compound P, carboxylic acid Q and alkene W.
Dengan menggunakan bilangan atom karbon yang sesuai, lukiskan formula struktur bagi sebatian P, *asid karbosilik* Q *dan alkena* W.

[6 marks]
[6 *markah*]

(iii) By using compound P and alkene W that obtained in 10(a)(ii), describe how to conduct reaction II in the laboratory. In your description, include:

- Labeled diagram
- Procedure
- Chemical equation
- Chemical test to proof the product

Dengan menggunakan sebatian P *dan alkena* W *yang diperolehi di* 10(a)(ii), *huraikan bagaimana tindak balas* II *dijalankan dalam makmal. Dalam huraian anda, sertakan*:

- *Gambar rajah berlabel*
- *Prosedur*
- *Persamaan kimia*
- *Ujian kimia untuk mengesahkan hasil tindak balas*

[10 marks]
[10 *markah*]

Contoh soalan 17

Diagram 10.1 shows five structural formula of carbon compound.
Rajah 10.1 *menunjukkan lima formula struktur bagi sebatian karbon.*

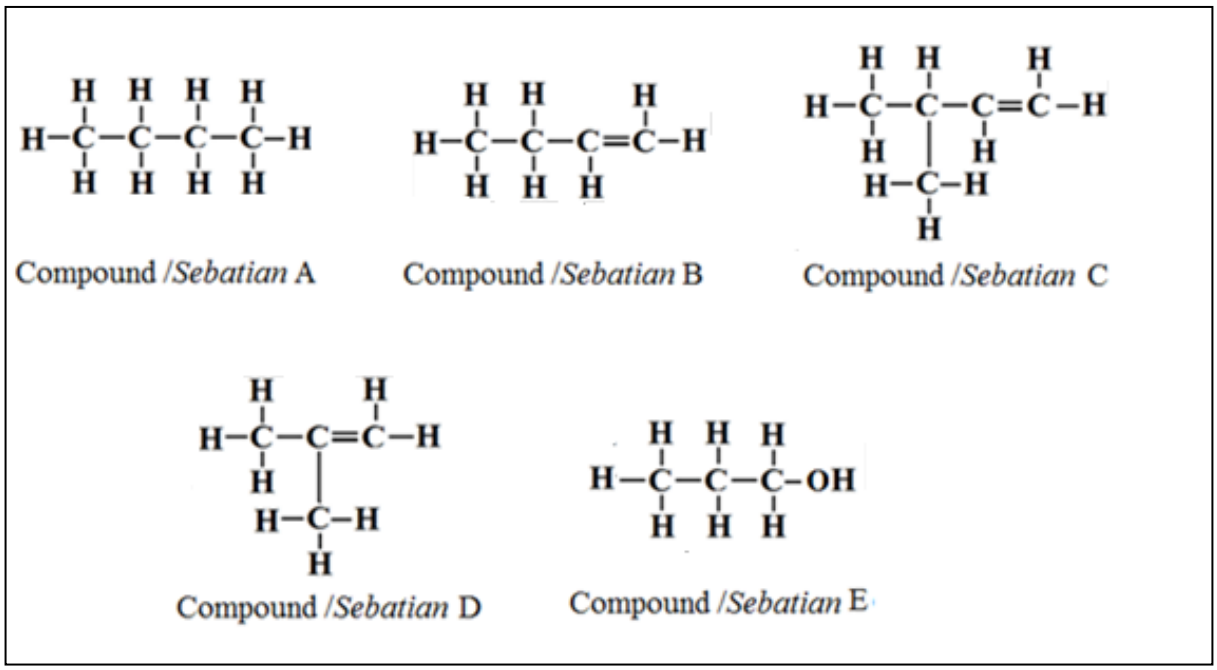


Diagram 10.1
Rajah 10.1

(a) Choose any one of the compound in Diagram 10.1, state the products formed when the compound burn completely in excess oxygen gas.
Write the chemical equation involve.
Pilih mana-mana satu sebatian dalam Rajah 10.1*, Nyatakan hasil-hasil yang terbentuk apabila sebatian itu terbakar dengan lengkap dalam gas oksigen berlebihan.*
Tuliskan persamaan kimia yang terlibat.

[3 *marks*]

(b) State the name of two compounds in Diagram 10.1 that are isomer. Explain your answer.
Nyatakan nama dua sebatian dalam Rajah 10.1 *adalah isomer. Terangkan jawapan anda*.

[3 *marks*]

(c) Between compound A and B, which compound produced more soot?
Explain your answer.
[RAM, C=12, H=1]
Antara sebatian A dan B, manakah sebatian yang menghasilkan lebih jelaga?
Terangkan jawapan anda.
[JAR, C=12, H=1]

[4 *marks*]

(d) Diagram 10.2 shows the reaction between compound E and carboxylic acid.
Rajah 10.2 *menunjukkan tindak balas antara sebatian* E *dengan asid karboksilik.*

Compound E	+	Carboxylic acid	→	ester
Sebatian E	+	*Asid karboksilik*	→	*ester*

Diagram 10.2
Rajah 10.2

State the name an example of a member of carboxylic acid and state the name of ester that formed when the named carboxylic acid react with compound E.
Describe an experiment to produce ester in laboratory by using compound E and carboxylic acid that you have named.
Write the chemical equation involved.

Nyatakan nama satu contoh ahli bagi asid karboksilik dan nyatakan nama ester yang terbentuk apabila asid karboksilik yang dinamakan bertindak balas dengan sebatian E.
Huraikan satu eksperimen untuk menghasilkan ester dalam makmal dengan menggunakan sebatian E dan asid karboksilik yang telah dinamakan.
Tulis persamaan kimia yang terlibat.

[10 *marks*]

Contoh soalan 18

12.5 g of hydrated copper(II) sulphate, $CuSO_4.xH_2O$ has 4.5 g of water of crystallisation. What is the value of x?
12.5 g kuprum(II) sulfat terhidrat, $CuSO_4.xH_2O$ mempunyai 4.5 g air penghabluran. Apakah nilai x?
[Relative atomic mass: Cu, 64; S, 32; O, 16; H, 1]
A. 4 B. 5 C. 8 D. 10

Contoh soalan 19

What is the mass of potassium sulphate that contains 1.806×10^{23} formula unit's of K_2SO_4?
Berapakah jisim kalium sulfat yang mengandungi 1.806×10^{23} *unit formula* K_2SO_4?
[Relative atomic mass: K = 39; S = 32; O = 16; Avogadro constant = 6.02×10^{23} mol^{-1}]
[*Jisim atom relatif* : K = 39; S = 32; 0 = 16; *Pemalar Avogadro* = 6.02×10^{23} mol^{-1}]

A.5.22 g B.7.95 g C.52.2 g D. 79.5 g

Contoh soalan 20

A lab assistant need to prepare 100 cm^3 solution of hydrochloric acid 0.1 mol dm^{-3} from a solution of hydrochloric acid 1.0 mol dm^{-3} that has been prepared before using dilution method. What is the volume of hydrochloric acid 1.0 mol dm^{-3} needed to be added to water?
Seorang pembantu makmal perlu menyediakan 100 cm^3 larutan asid hidroklorik 0.1 mol dm^{-3} daripada larutan asid hidroklorik 1.0 mol dm^{-3} yang sedia ada melalui kaedah pencairan. Berapakah isipadu asid hidroklorik 1.0 mol dm^{-3} yang diperlukan untuk ditambahkan ke dalam air?

A 1.0 cm^3
B 5.0 cm^3
C 10.0 cm^3
D 15.0 cm^3

Contoh soalan 21

Which substance consists of atoms?
Bahan manakah yang terdiri daripada atom?

A Calcium
Kalsium

B Nitrogen gas
Gas nitrogen

C Lead(II) bromide
Plumbum(II) bromide

D Naphthalene
Naftalena

Contoh soalan 22

Which of the following ions form a white precipitate insoluble in excess sodium hydroxide solution?

Antara ion-ion berikut, yang manakah membentuk mendakan putih yang tak larut dalam larutan natrium hidroksida berlebihan?

A Al^{3+}

B Zn^{2+}

C Pb^{2+}

D Mg^{2+}

Contoh soalan 23

Why is the combustion flame of hexene, C_6H_{12} more sooty than that of hexane, C_6H_{14} ?
Mengapakah nyalaan pembakaran heksena, C_6H_{12} *lebih berjelaga daripada heksana,* C_6H_{14}?

A The percentage of carbon by volume of hexene is higher compared to the percentage of carbon by volume of hexane
Peratus karbon perisipadu heksena lebih tinggi berbanding peratus karbon perisipadu heksana

B The percentage of carbon by mass of hexene is higher compared to the percentage of carbon by mass of hexane
Peratus karbon perjisim heksena lebih tinggi berbanding peratus karbon perjisim heksana

C The percentage of hydrogen by mass of hexene is higher compared to the percentage of hydrogen by mass of hexane
Peratus hidrogen perjisim heksena lebih tinggi berbanding peratus hidrogen perjisim heksana

D The percentage of hydrogen by volume of hexene is higher compared to the percentage of hydrogen by volume of hexane
Peratus hidrogen perisipadu heksena lebih tinggi berbanding peratus hidrogen perisipadu heksana

Contoh soalan 24

Diagram 32 shows the set up of apparatus for the titration of potassium hydroxide solution with sulphuric acid.

Rajah 32 menunjukkan susunan radas bagi pentitratan larutan kalium hidroksida dengan asid sulfurik.

0.1 mol dm^{-3} of sulphuric acid
Asid sulfurik 0.1 mol dm^{-3}

20 cm^3 of 0.1 mol dm^{-3} potassium hydroxide solution
20 cm^3 *larutan kalium hidroksida 0.1 mol* dm^{-3}

Rajah 32

What is the total volume of the mixture in the conical flask at the end point ?

Apakah jumlah isipadu campuran di dalam kelalang kon pada takat akhir ?

A.10 cm^3 B. 20 cm^3 C. 30 cm^3 D. 40 cm^3

Contoh soalan 25

36 Diagram 36 shows the structural formula of an ester.

Rajah 36 menunjukkan formula struktur bagi satu ester

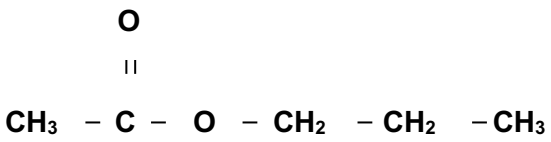


Diagram 36

Which of the following acid and alcohol will react to produce the ester ?

Yang manakah asid dan alcohol berikut yang boleh bertindak balas untuk menghasilkan ester?

	Acid ***Asid***	**Alcohol** ***Alcohol***
A	Ethanoic *Etanoik*	Propanol *Propanol*
B	Methanoic *Metanoik*	Ethanol *Etanol*
C	Pentanoic *Pentanoik*	Propanol *Propanol*
D	Propanoic *Propanoik*	Ethanol *Etanol*

Borang Maklum Balas Sesi Seminar SPM BACfreeschool

Sila lengkapkan borang penilaian bagi Seminar SPM yang telah anda hadiri. Penilaian anda dapat membantu kami memahami tahap keberkesanan program ini dan seterusnya membolehkan kami meningkatkan kualiti perkhidmatan kami di masa hadapan.

Terima kasih!

Please fill up this form for the session that you are attending. Your evaluation will help us improve our service and help us understand the effectiveness of this program.

Thank you!

1. Nombor Telefon
Phone Number

2. Apakah subjek bagi seminar yang sedang anda sertai sekarang?
What is the seminar's subject that you're attending now?

- ◯ Bahasa Malaysia
- ◯ English
- ◯ Sejarah
- ◯ Sains
- ◯ Science
- ◯ Matematik
- ◯ Mathematics
- ◯ Biologi
- ◯ Biology
- ◯ Kimia
- ◯ Chemistry
- ◯ Fizik
- ◯ Physics
- ◯ Matematik Tambahan
- ◯ Additional Maths
- ◯ Perniagaan
- ◯ Prinsip Perakaunan
- ◯ Ekonomi

3. Pernahkah anda menonton mana-mana video BACfreeschool (sebelum ini dikenali sebagai EduNation)?
Have you ever watched any BACFreeschool's (previously known as EduNation) videos?

- ◯ Ya
  Yes
- ◯ Tidak
  No

4. Nilai kefahaman guru terhadap isi kandungan yang diajar bagi subjek ini.
Rate the teacher's understanding of this particular subject.

Sangat Rendah *Very Low*	Rendah *Low*	Sederhana *Intermediate*	Tinggi *High*	Sangat Tinggi *Very High*
◯	◯	◯	◯	◯

5. Nilai cara penyampaian guru bagi subjek ini.
Rate the teacher's delivery of the subject.

Sangat Tidak Menarik *Very Uninteresting*	Tidak Menarik *Not Interesting*	Sederhana *Intermediate*	Menarik *Interesting*	Sangat Menarik *Very Interesting*
◯	◯	◯	◯	◯

6. Nilai tahap kepuasan terhadap nota tambahan yang telah diberikan.
Rate your satisfaction level with the notes given.

Sangat Tidak Berpuashati *Very Unsatisfied*	Tidak Berpuashati *Not Satisfied*	Sederhana *Intermediate*	Berpuashati *Satisfied*	Sangat Berpuashati *Very Satisfied*
◯	◯	◯	◯	◯

7. Nilai tahap kebergunaan isi kandungan seminar.
Rate the usefulness of the seminar's content to your SPM preparation.

Sangat Tidak Berguna *Not Very Useful*	Tidak Berguna *Not Useful*	Sederhana *Intermediate*	Useful *Berguna*	Sangat Useful *Very Useful*
◯	◯	◯	◯	◯

8. Bagi pendapat anda, 3 jam untuk satu sesi seminar adalah...
In your opinion, 3 hours per session is...

- ◯ terlalu pendek.
  too short.
- ◯ bersesuaian.
  just right.
- ◯ terlalu panjang.
  too long.

9. Adakah anda mempunyai sebarang maklum balas/komen bagi meningkatkan prestasi kami?
Do you have any additional comments, questions, or concerns you would like to share?