

KOLEKSI SOALAN SPM PERCUBAAN NEGERI
FORM 5 CHEMISTRY CHAPTER 3 : OXIDATION AND REDUCTION

QUESTION 1 - 2015 PERLIS

The following is an equation that represents a redox reaction.

Berikut adalah sains persamaan yang mewakili suatu tindak balas redoks.



- (a) State the meaning of redox reaction. *Nyatakan maksud tindak balas redoks.* [1 mark]
- (b) (i) Write the half equation for: / *Tuliskan setengah persamaan bagi:*
Oxidation / *Pengoksidaan:*
Reduction / *Penurunan:* [2 marks]
- (ii) State the change in oxidation number of oxidising agent.
Nyatakan perubahan nombor pengoksidaan bagi agen pengoksidaan. [1 mark]
- (c) Name the substance that undergoes oxidation in the reaction.
Namakan bahan yang mengalami pengoksidaan dalam tindak balas ini. [1 mark]
- (d) State one observation in the reaction.
Nyatakan satu pemerhatian dalam tindak balas ini. [1 mark]
- (e) State one other substance that can replace H₂S.
Nyatakan satu bahan lain yang boleh menggantikan H₂S. [1 mark]
- (f) State and describe a test to confirm the present of Fe²⁺ in the reaction.
Nyatakan dan terangkan satu ujian untuk mengesahkan kehadiran Fe²⁺ di dalam tindak balas ini. [1 mark]

Suggested Answer

1.a.	Oxidation and reduction happens at the same time
b.i.	Oxidation: $\text{H}_2\text{S} \rightarrow 2\text{H}^+ + \text{S} + 2\text{e}$ Reduction: $\text{Fe}^{3+} + \text{e} \rightarrow \text{Fe}^{2+}$
ii.	+3 or +2
c.	Hydrogen sulphide
d.	Yellow solid.
e.	Zinc / aluminium / magnesium / KI / KCl /
f.	Add NaOH / NH_3 solution / Potassium hexacyano ferrate(III) solution Green precipitate / dark blue precipitate

QUESTION 2 - 2015 KELANTAN

Diagram 4 shows an electrolysis process conducted in school laboratory.

Rajah 4 menunjukkan satu proses elektrolisis yang dilakukan di dalam makmal sekolah.

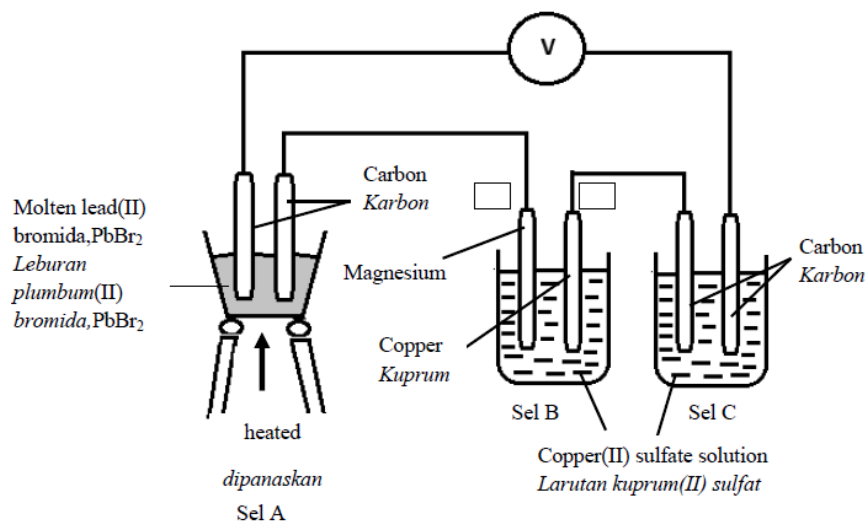


Diagram 4 / Rajah 4

(a) Electrolysis is one of the redox reaction. State the meaning of redox reaction?
Elektrolisis merupakan satu tindak balas redoks. Nyatakan maksud tindak balas redoks?

[1 mark]

(b) State the formula of ions present in molten lead (II) bromide.
Nyatakan formula ion-ion yang hadir dalam leburan plumbum (II) bromida.

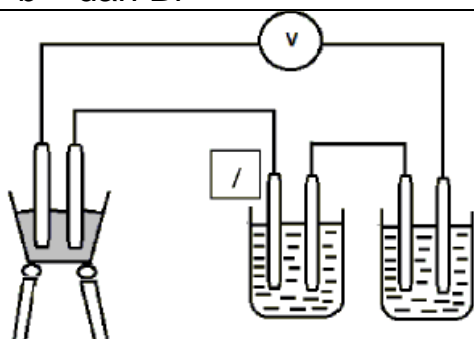
[1 mark]

(c) Mark / in the box provided to show the anode electrode in the cell B.
Tandakan /di dalam petak yang menunjukkan elektrod anod pada sel B.

[1 mark]

- (d) In cell B, write half equation at;
Di dalam sel B, tulis setengah persamaan pada;
 (i) Magnesium electrode / *Elektrod magnesium:*
 (ii) Copper electrode / *Elektrod kuprum:* [2 marks]
- (e) State the observation at both electrode in cell A
Nyatakan pemerhatian pada kedua-dua etektrod di dalam sel A
 Anod:
 Katod: [2 marks]
- (f) Explain the redox reaction in cell C in term of electron transfer.
Terangkan tindak balas redoks dalam sel C dan segi pemindahan elektron. [3 marks]

Suggested Answer

a.	Tindak balas yang melibatkan proses pengoksidaan dan proses penurunan yang berlaku secara serentak.
b.	Pb^{2+} dan Br^-
c.	
d.i.	$Mg \rightarrow Mg^{2+} + 2e^-$
ii.	$Cu^{2+} + 2e^- \rightarrow Cu$
e.	Anod : gas perang terbebas Katod : pepejal kelabu berkilat terenap
f.	Ion Cu^{2+} menerima elektron di katod Proses penurunan berlaku Ion OH^- melepaskan elektron di anod Proses pengoksidaan berlaku

QUESTION 3 - 2015 PERAK MOCK TEST

Diagram 4 shows the set-up of apparatus to investigate a chemical cell

Rajah 4 menunjukkan susunan radas untuk mengkaji suatu sel kimia

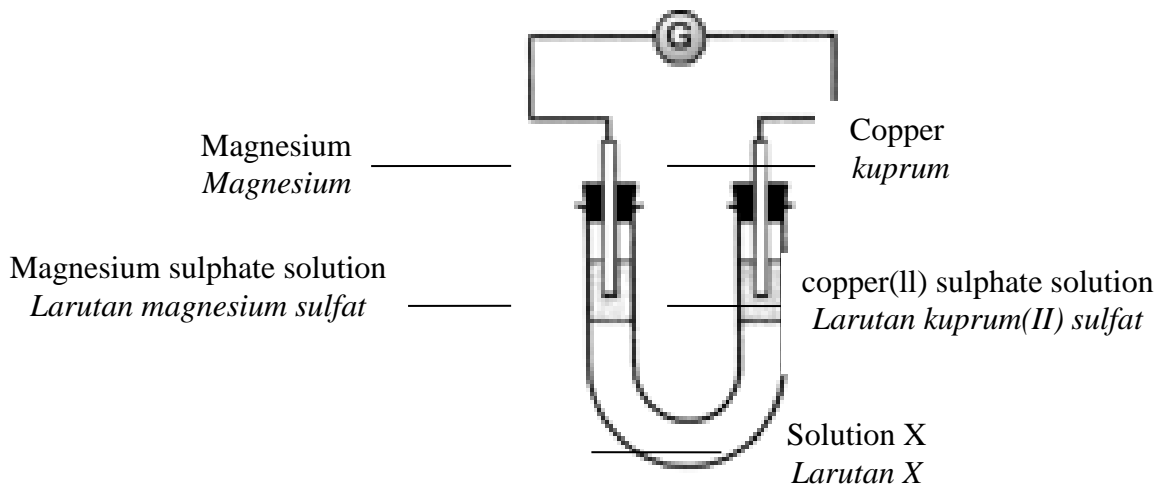


Diagram 4
Rajah 4

Based on Diagram 4, answer the following questions

Berdasarkan Rajah 4, jawab soalan-soalan berikut.

- (a) Name chemical substance suitable used as X.
Namakan bahan kimia yang sesuai digunakan sebagai X.

[1 mark]

- (b) (i) State the negative terminal and the positive terminal of the cell
Nyatakan terminal negatif dan terminal positif bagi sel

Negative terminal / *Terminal negatif*

Positive terminal / *Terminal positif* :

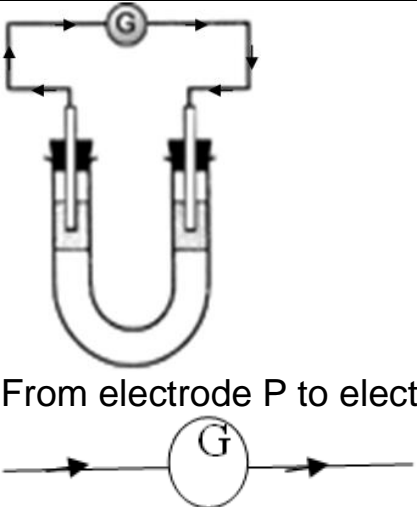
[2 marks]

- (ii) Explain your answer in b(i)
Terangkan jawapan anda di (b)(i)

[2 marks]

- (c) Write the half equation for the reaction at the
Tuliskan persamaan setengah bagi tindak balas yang berlaku di
- (i) Negative terminal
Terminal negatif [1 mark]
- Positive terminal
Terminal positif
- (ii) [1 mark]
- (d) Draw the direction of electron flow in Diagram 2
Lukiskan arah pengaliran elektron dalam Rajah 2 [1 mark]
- (e) State the changes of copper(II) sulphate solution and explain your answer based on electron transfer .
Nyatakan perubahan pada larutan kuprum(II) sulfat dan terangkan jawapan anda berdasarkan pemindahan elektron. [2 mark]
- (f) The experiment is repeated by replacing X with glacial ethanoic acid. Give one observation.
Eksperimen diulang dengan menggantikan X dengan asid etanoik glasial. Berikan satu pemerhatian. [1 mark]

Suggested Answer

a.	Sulphuric acid
b.	(i) Negative terminal: Magnesium Positive terminal: Copper (ii) Magnesium is more electropositive than copper
c.	(i) Negative terminal: $\text{Mg} \rightarrow \text{Mg}^{2+} + \text{e}$ (ii) Positive terminal: $\text{Cu}^{2+} + \text{e} \rightarrow \text{Cu}$
d.	 <p>From electrode P to electrode Q</p> <p>[show on the diagram]</p>
4. e.	pointer of galvanometer not deflected / galvanometer shows no deflection

QUESTION 5 - SBP 2014

(a) Diagram 4.1 shows the extraction of iron from hematite in a blast furnace. Hematite is heated with limestone and substance X.

Rajah 4.1 menunjukkan pengekstrakan ferum dari hematit dalam relau bagas. Hematit dipanaskan dengan batu kapur dan bahan X.

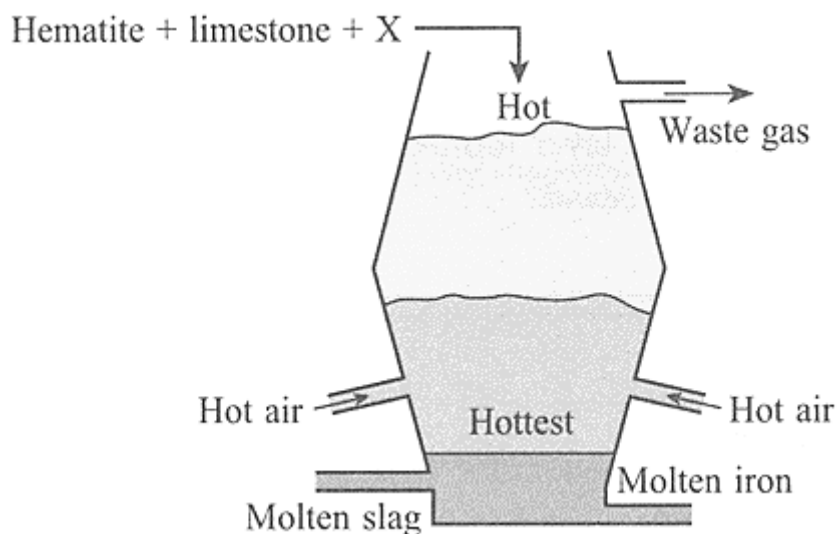


Diagram 4.1

Rajah 4.1

- (i) The main component of hematite is iron oxide, Fe_2O_3 .
What is the oxidation number of iron in Fe_2O_3 ?
*Komponen utama hematit adalah besi oksida Fe_2O_3 .
Apakah nombor pengoksidaan bagi ferum dalam Fe_2O_3 ?*

[1mark]

- (ii) Name substance X.
Namakan bahan X.

[2marks]

- (iii) What is the function of substance X?
Apakah fungsi bahan X?

[1mark]

- (iv) Write the chemical equation for the reaction.
Tuliskan persamaan kimia bagi tindak balas.

[2 marks]

- (b) Diagram 4.2 shows the changes when the chlorine water is added into the test tube that contains sodium bromide solution and 1,1,1-trichloroethane.
Rajah 4.2 menunjukkan perubahan yang berlaku apabila air klorin ditambah ke dalam tabung uji yang mengandungi larutan natrium bromide dan 1,1,1-trikloroetana.

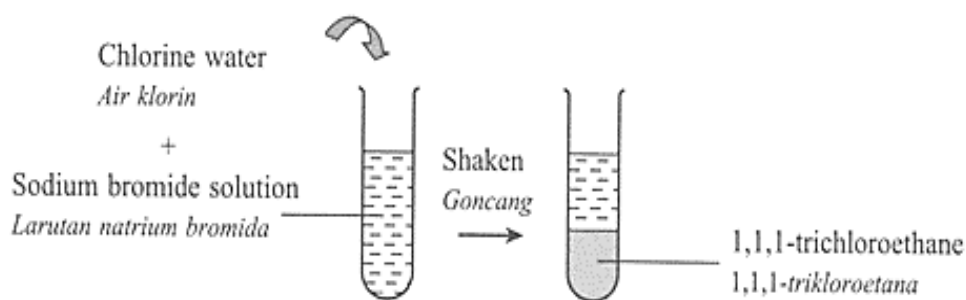


Diagram 4.2
Rajah 4.2

- (i) What is the colour of the 1,1,1-trichloroethane layer formed?
Apakah warna lapisan 1,1,1-trikloroetana yang terbentuk?

[1mark]

- (ii) Name the substance that gives the colour in b(i).
Namakan bahan yang menyebabkan warna di b(i).

[1mark]

(iii) State the change in oxidation number of chlorine.

Nyatakan perubahan nombor pengoksidaan klorin.

[1 mark]

(iv) Name the process undergone by chlorine.

Namakan proses yang dilalui oleh klorin.

[1 mark]

(v) Suggest one reagent that can replace chlorine water.

Cadangkan satu bahan uji yang boleh menggantikan air klorin.

[1 mark]

Suggested Answer

(a) (i)	Oxidation number of iron = +3
(ii)	Carbon
(iii)	Reducing agent
(iv)	$2\text{Fe}_2\text{O}_3 + 3\text{C} \rightarrow 4\text{Fe} + 3\text{CO}_2 //$ $\text{Fe}_2\text{O}_3 + 3\text{CO} \rightarrow 2\text{Fe} + 3\text{CO}_2$
	1- correct formula of reactants and products 2- balanced chemical equation
(b)(i)	Brown colour
(ii)	Bromine
(iii)	0 to -1
(iv)	Reduction
(v)	Acidified potassium manganate(VII) solution// Acidified potassium dichromate(VI) solution

QUESTION 6 - SBP 2010

Diagram 5 shows an experiment of displacement of halogen from its halide solution.
Rajah 5 menunjukkan suatu eksperimen penyesaran halogen daripada larutan halidanya.

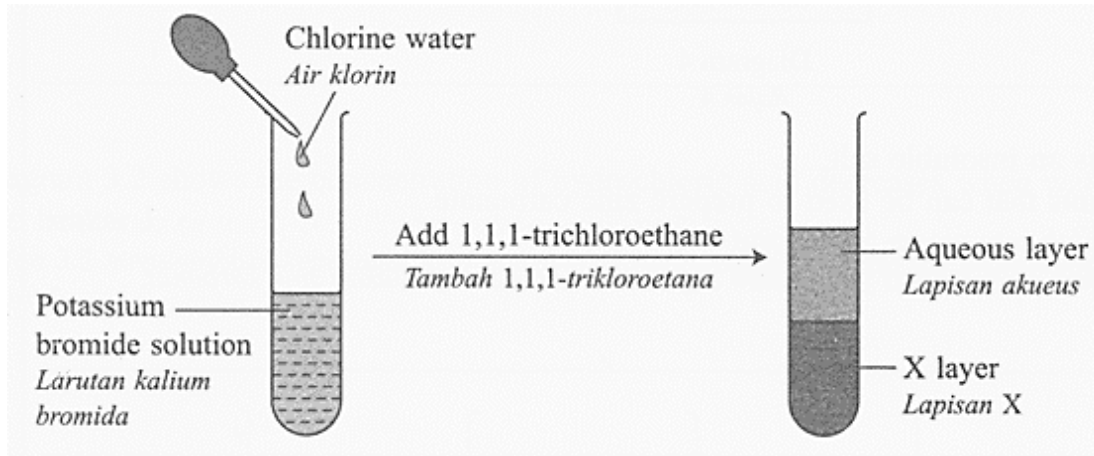


Diagram 5
Rajah 5

(a)(i) State an observation for the reaction in the test tube before 1,1,1-trichloroethane is added.

Nyatakan satu pemerhatian bagi tindak balas di dalam tabung uji sebelum 1,1,1-trikloroetana ditambahkan.

[1mark]

(ii) State the name of the substance that is oxidized.

Nyatakan nama bahan yang dioksidakan.

[2mark]

(b) After 1,1,1-trichloroethane is added into the test tube, state the colour of X layer.

Selepas 1,1,1-trikloroetana ditambahkan ke dalam tabung uji, nyatakan warna lapisan X.

[1mark]

(c) Name the oxidizing agent for this reaction and give reason in terms of electron transfer.

Namakan agen pengoksidaan dalam tindak balas ini dan berikan sebab dari segi pemindahan elektron.

[2marks]

(d) State the change of oxidation number for chlorine water.

Nyatakan perubahan nombor pengoksidaan air klorin.

[1mark]

(e) State another reagent that can replace chlorine water.

Nyatakan satu bahan reagen lain yang boleh menggantikan air klorin.

[1mark]

(f) By using suitable chemical substances and apparatus, draw a labelled diagram, to show the transfer of electrons at a distance.

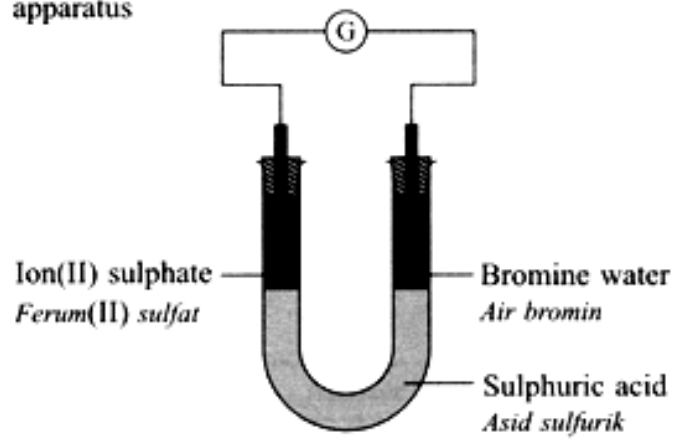
Dengan menggunakan bahan kimia dan alat radas yang sesuai, lukiskan gambar rajah berlabel untuk menunjukkan pemindahan elektron pada suatu jarak.

[2marks]

Suggested answer

(a)(i)	Colourless solution of potassium bromide changes to brown.
(ii)	Potassium bromide/ Bromide ion
(iii)	$2Br \rightarrow Br_2 + 2e$
(b)	Brown
(c)	1. Chlorine water 2. Chlorine accepts/receives electrons
(d)	0 to -1
(e)	Acidified potassium manganate(VII) solution/ Any oxidizing agent.
(f)	1. Functional apparatus 2. Label

apparatus



QUESTION 7 - 2015 PERAK MOCK TEST 2



Diagram 7
Gambar rajah 7

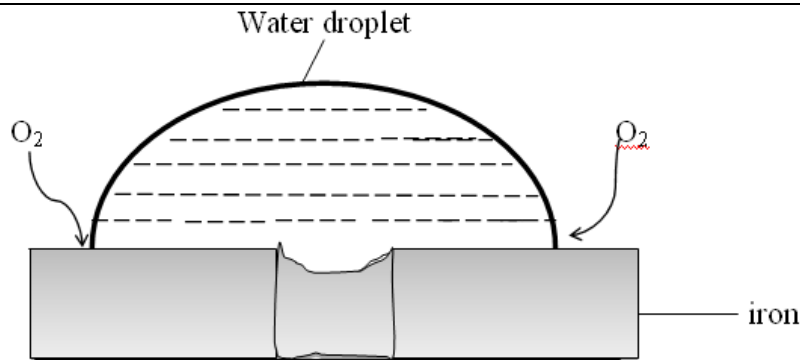
Diagram 7 shows rusted substances which can be seen in our daily lives.
Gambar rajah 7 menunjukkan bahan-bahan berkarat yang boleh dilihat dalam kehidupan harian.

- (a) State the conditions for the rusting to occur.
Nyatakan keadaan-keadaan yang diperlukan untuk pengkaratan berlaku. [2 marks]
- (b) Iron undergoes oxidation during the rusting process.
Ferum mengalami pengoksidaan semasa proses pengkaratan.
- (i) Write the half equation showing the formation of iron(II) ion.
Tuliskan persamaan setengah bagi pembentukan ferum(II). [2marks]
- (ii) State the changes in the oxidation number of iron in (b)(i).
Nyatakan perubahan nombor pengoksidaan ferum dalam (b)(i). [3 marks]
- (c) Draw a labelled diagram showing the mechanism of rusting of iron.
Explain the process involved in the rusting of iron.
Lukiskan rajah berlabel yang menunjukkan mekanisma pengkaratan besi. Terangkan proses-proses yang terlibat. [7 marks]
- (d) Rusting of iron occurs faster in the presence of acid or salt. Explain.
Pengkaratan besi berlaku dengan lebih cepat dalam kehadiran asid atau garam. Terangkan. [3 marks]
- (e) Corrosion of iron can be prevented using a sacrificial metal. Using a suitable example, explain how corrosion of iron can be prevented by using this method.
Kakisan besi boleh dicegah melalui penggunaan logam korban. Dengan menggunakan contoh yang sesuai, terangkan bagaimana kakisan dapat

dicegah melalui kaedah ini.

[5 marks]

Suggested Answer

a.	Oxygen and water
b.	$\text{Fe} \rightarrow \text{Fe}^{2+} + 2\text{e}^-$ 0 to +2
c.	 <p>Functional diagram Correct labelling of iron, water droplet, oxygen The iron oxidized / lose electrons to form Fe^{2+} ions. $\text{Fe} \rightarrow \text{Fe}^{2+} + 2\text{e}^-$ Water molecules and oxygen accept electrons and be reduces to hydroxide ions, OH^- Fe^{2+} ions and OH^- ions combine to produce iron (II) hydroxide $\text{Fe}^{2+} + 2\text{OH}^- \rightarrow \text{Fe}(\text{OH})_2$ Iron(II) hydroxide will be further oxidized into iron(III) hydroxide and finally from hydrated iron(III) oxide, Fe_2O_3, which is rust</p>
d.	The presence of salt increases the elctrical conductivity of water and acts as a good electrolyte Acidic gases dissolve in water increases the rate of rusting
e.	Iron in contact with more electropositive metal Magnesium / zinc can act as sacrificial metal More electropositive than iron More electropositive metal corrodes Example: Underground pipe connected with magnesium bags

QUESTION 8 - 2015 KEDAH MODUL 2

(a) Table 9.1 show the chemical equation of two reactions.

Jadual 9.1 menunjukkan persamaan kimia bagi dua tindak balas.

Reaction <i>Tindak balas</i>	Chemical equation <i>Persamaan kimia</i>
X	$\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$
Y	$\text{Zn} + \text{Cu}(\text{NO}_3)_2 \rightarrow \text{Zn}(\text{NO}_3)_2 + \text{Cu}$

Table 9.1 / *Jadual 9.1*

Determine whether each of the reactions is a redox reaction or not a redox reaction.

Explain your answer in term of oxidation number.
marks]

[5

Tentukan sama ada setiap tindak balas tersebut merupakan tindak balas redoks atau bukan tindak balas redoks. Terangkan jawapan anda dari segi nombor pengoksidaan.

[5 markah]

(b) Table 9.2 shows the formulae for two chlorides of iron compounds.

Jadual 9.2 menunjukkan formula dua sebatian klorida bagi ferum.

Compound <i>Sebatian</i>	Formula
R	FeCl_2
S	FeCl_3

Table 9.2 / *Jadual 9.2*

(i) Determine the oxidation number of iron in both compounds and name the compounds based on IUPAC nomenclature.

[4 marks]

Tentukan nombor pengoksidaan bagi ferum dalam kedua-dua sebatian dan namakan sebatian-sebatian tersebut berdasarkan penamaan IUPAC.

[4 markah]

(ii) Compound R can be converted to compound S in the presence of an oxidizing agent. Suggest the oxidizing agent and state one observation for the reaction. [2 marks]

Sebatian R boleh ditukarkan kepada sebatian S dengan kehadiran satu agen pengoksidaan. Cadangkan agen pengoksidaan tersebut dan nyatakan satu pemerhatian bagi tindak balas yang berlaku. [2 markah]

- (c) Table 9 shows a list of apparatus and materials.
Jadual 9 menunjukkan senarai radas dan bahan.

Apparatus and materials: Radas dan bahan:
- Carbon electrodes <i>Elektrod-elektrod karbon</i>
- Connecting wires <i>Wayar penyambung</i>
- Galvanometer <i>Galvanometer</i>
- U-tube <i>Tiub-U</i>
- Bromin water <i>Air bromin</i>
- Dilute sulphuric acid <i>Asid sulfurik cair</i>
- A reducing agent <i>Suatu agen penurunan</i>

Table 9 / Jadual 9

Draw one labelled diagram to show the apparatus set-up to investigate electron transfer at a distance by using the apparatus and materials given in Table 9. Name the reducing agent.

Describe the redox reaction in terms of the electron transfer at a distance. [9 marks]

Lukiskan satu rajah berlabel bagi menunjukkan susunan radas untuk menyiasat pemindahan elektron pada satu jarak dengan menggunakan radas dan bahan yang terdapat dalam Jadual 9.

Namakan agen penurunan tersebut.

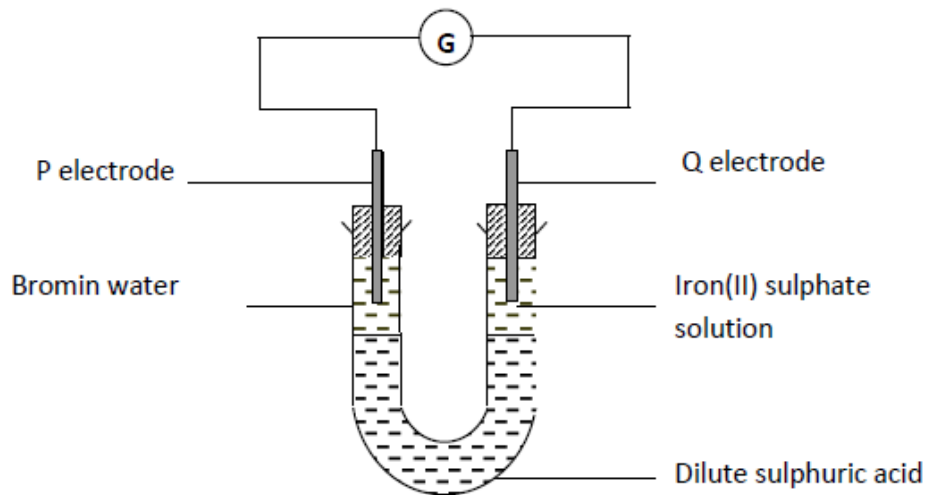
Huraikan tindak balas redoks dari segi pemindahan elektron pada satu jarak. [9 markah]

Suggested Answer

a.	Reaction X – not a redox reaction Reaction Y – redox reaction <u>Reaction X:</u> No change in oxidation number of reactants. <u>Reaction Y:</u> Oxidation number of zinc changes / increases from 0 to +2 Oxidation number of copper changes / decreases from +2 to 0 The oxidation and reduction occur simultaneously
b.	(i) Compound R: +2, iron(II) chloride Compound S: +3, iron(III) chloride (ii) Acidified potassium manganate (VII) [Any suitable agent] green solution turns brown // [any suitable observation for related oxidising agent used]
c.	Reducing agent: iron(II) sulphate Functional diagram Labelled diagram: Electron flows from electrode Q (electrode dipped into iron(II) sulphate) to electrode P (electrode dipped in bromine water) through external circuit / connecting wires Observation - Galvanometer needle deflects Half equation at electrode P $\text{Br}_2 + 2\text{e}^- \rightarrow 2\text{Br}^-$ Half equation at electrode Q $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{e}^-$ redox equation: $\text{Br}_2 + 2\text{Fe}^{2+} \rightarrow 2\text{Br}^- + 2\text{Fe}^{3+}$ Dilute sulphuric acid: complete the circuit // allow ions flow

LAMPIRAN

Functional and labelled diagram



QUESTION 9 - 2015 PULAU PINANG

(a) Define redox reaction.

Write a chemical equation showing an example of a redox reaction. Based on the given chemical equation, identify the oxidising agent and reducing agent.

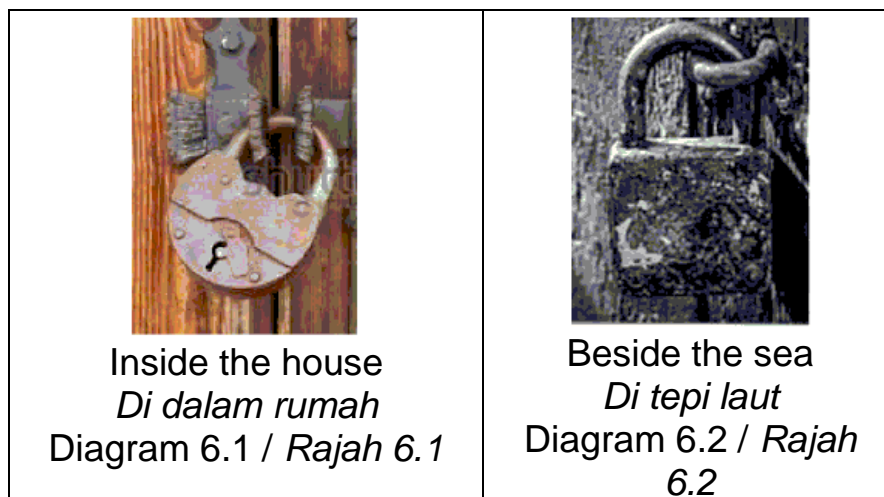
Takrifkan tindak balas redoks. Tuliskan satu persamaan kimia yang menunjukkan contoh tindak balas redoks. Berdasarkan persamaan kimia yang diberikan, kenalpasti agen pengoksidaan dan agen penurunan dalam tindak balas tersebut.

[5 marks]

(b) Diagram 6.1 shows an iron padlock found on the door inside a house.

Diagram 6.2 shows the same type of padlock on the door of a lighthouse at the seaside.

Rajah 6.1 menunjukkan sebuah mangga besi terjumpa pada pintu dalam sebuah rumah. Rajah 6.2 menunjukkan mangga jenis yang sama pada pintu sebuah rumah api di tepi laut.



(i) Explain why the iron padlock rusts easily at places near the sea? *Terangkan mengapakah mangga besi senang berkarat di tempat-tempat yang berdekatan dengan laut?*

[2 marks]

(ii) Suggest two methods that can be used to prevent the rusting of the padlock. *Cadangkan dua cara yang boleh digunakan untuk mencegah pengurangan mangga tersebut.*

[2 marks]

(c) The following statement is about redox reaction.
Pernyataan berikut adalah berkaitan dengan tindak balas redoks.

During a redox reaction, electrons are transferred from the reducing agent to the oxidizing agent.

Semasa tindak balas redoks, elektron dipindahkan daripada agen penurunan kepada agen pengoksidaan.

Below is a list of apparatus provided to carry out a redox reaction.

Berikut ialah satu senarai radas yang dibekalkan untuk menjalankan tindak balas redoks.

- U-tube / *Tiub U*
- Connecting wires / *Wayar penyambung*
- Galvanometer / *Galvanometer*
- Carbon electrodes / *Elektrod karbon*

Using the apparatus provided and suitable chemicals, explain the above statement.
Dengan menggunakan radas yang dibekalkan dan bahan kimia yang sesuai, terangkan pernyataan di atas.

Your explanation should also include the following aspects:

Penerangan anda juga perlu melibatkan aspek-aspek berikut:

- Observation / *Pemerhatian*
- Half equations / *Persamaan setengah*
- Labelled diagram / *Gambar rajah berlabel*

[11 marks]

Suggested Answer

a.	Redox reaction is a reaction that involves oxidation and reduction that occur at the same time. Example of redox reaction : $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$ Mg is reducing agent O_2 is oxidizing agent, [accept any possible answers]
b.	(i) 1. The sea breeze contains salts which increase the electrical conductivity of water. 2. This makes the water a better electrolyte and therefore speeds up the rusting / corrosion of the iron padlock.
	(ii) 1. Attach the iron padlock to a more electropositive metal which acts as the sacrificial metal. 2. Coat/ Galvanise the iron padlock with a thin layer of zinc. 3. Coat the iron padlock with a thin layer of tin // Tin planting/ 4. Electroplate the iron padlock with rust- resistant metals such as chromium/ nickel // Alloying. 5. Paint the iron padlock (any four)
c.	1. Chemicals used - Bromine water // any suitable oxidizing agent - Iron(II) sulphate solution // any suitable reducing agent 2. Functional diagram 3. Correct label 4. The needle of galvanometer deflects / shows reading 5. Brown bromine water turns colourless 6. Green iron(II) sulphate solution turns yellow / brown. 7. Iron(II) ion is oxidized to iron (III) ion. 8. $\text{Fe}^{2+} \rightarrow \text{Fe}^{3+} + \text{e}$ 9. Bromine molecules are reduced to bromide ions 10. $\text{Br}_2 + 2\text{e} \rightarrow 2\text{Br}^-$ 11. Electrons are transferred from the electrode dipped in iron (II) sulphate solution to the electrode dipped in bromine water

QUESTION 10 - SBP 2012

(a) The chemical equation below shows a redox reaction.

Persamaan kimia berikut menunjukkan tindak balas redoks.



Explain the redox reaction in terms of change in oxidation number.

Terangkan tindak balas redoks yang berlaku dari aspek perubahan nombor pengoksidaan.

[4marks]

(b) An experiment is carried out to determine the position of metal L, metal M and copper in the reactivity series. Diagram 9 shows the result of the experiment.

Satu eksperimen di jalankan untuk menentukan kedudukan logam L, logam M dan kuprum dalam siri kereaktifan. Rajah 9 menunjukkan keputusan bagi eksperimen tersebut.

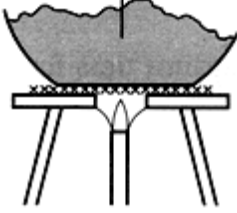
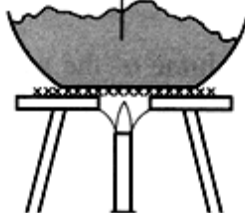
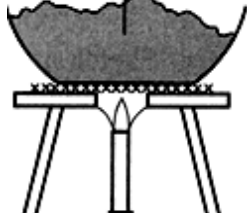
Experiment <i>Eksperimen</i>	I	II	III
Apparatus set-up <i>Susunan radas</i>	L + copper(II) oxide L + kuprum(II) oksida 	M + copper(II) oxide M + kuprum(II) oksida 	M + L oxide M + L oksida 
Observation <i>Pemerhatian</i>	Black powder turns brown <i>Serbuk hitam menjadi perang</i>	Black powder turns brown <i>Serbuk hitam menjadi perang</i>	No change <i>Tiada perubahan</i>

Diagram 9
Rajah 9

Based on the results in the experiment. Arrange the three metals in order of increasing reactivity towards oxygen. Explain your answer.

Berdasarkan keputusan dalam eksperimen itu, susun tiga logam tersebut mengikut urutan menaik kereaktifan terhadap oksigen. Terangkan jawapan anda.

[6marks]

(c) You are required to investigate the oxidation and reduction in the displacement of halogens from its halide solution. The chemicals provided are:

Anda dikendaki menyiasat pengoksidaan dan penuruan dalam tindak balas penyesanan halogen daripada larutan halidanya. Bahan-bahan kimia yang dibekalkan ialah:

- Potassium chloride solution
- Potassium bromide solution
- Potassium iodide solution
- Chlorine water
- Bromine water
- Iodine solution
- 1,1,1-trichloroethane

Describe a laboratory experiment to compare the ability of halogens as oxidizing agents. In your description, include:

Huraikan satu eksperimen makmal untuk membandingkan keupayaan halogen sebagai agen pengoksidaan. Dalam huraian anda, sertakan:

- Procedure
- Observation
- Ionic Equation

[10marks]

Suggested Answer

(a)	1. Magnesium atom undergoes oxidation. 2. Oxidation number increases from 0 to +2. 3. Copper(II) ion undergoes reduction 4. Oxidation number decreases from +2 to 0. 5. The reaction involving oxidation and reduction.
(b)	<u>Experiment I:</u> L can reduce copper(II) oxide// L can react with copper(II) oxide L is more reactive than copper <u>Experiment II:</u> M can reduce copper(II) oxide// M can react with copper (II) oxide M is more reactive than copper <u>Experiment III:</u> M cannot reduce L oxide// M cannot react with L oxide M is less reactive L// L is more reactive than M The arrangement in order of increasing reactivity towards oxygen is Cu, M and L.

(c) Procedure:

1. Pour 2cm³ of potassium bromide solution into a test tube.
2. Add 2cm³ of chlorine water into the test tube and shake the mixture.
3. Add 2cm³ of 1,1,1-trichloroethane into the test tube and shake the mixture.
4. Record the observation.
5. Repeat steps 1 to 4 using another halogens and halide solution.

Results:

	Chlorine water	Bromine water	Iodine water
Potassium Chloride		×	×
Potassium Bromine	√		×
Potassium Iodine	√	√	

Ionic equation:



Question 11 - 2014 KEDAH MODUL 2

(a) Table 10 shows the apparatus set-up and the observations to investigate the effect of two different metals, R and S on the rusting of iron.

Jadual 10 menunjukkan susunan radas dan pemerhatian untuk mengkaji kesan dua logam yang berbeza, R dan S ke atas pengarat besi.


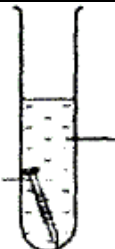
Apparatus set-up <i>Susunan radas</i>		Observation <i>Pemerhatian</i>
Iron nail coiled with metal R <i>Paku besi dililit dengan logam R</i>	 <p>Potassium hexacyanoferrate(III) solution + hot jelly <i>Larutan kalium heksasianoferat(III) + agar-agar panas</i></p>	No change <i>Tiada perubahan</i>
Iron nail coiled with metal S <i>Paku besi dililit dengan logam S</i>	 <p>Potassium hexacyanoferrate(III) solution + hot agar <i>Larutan kalium heksasianoferat(III) + agar-agar panas</i></p>	Dark blue precipitate is formed <i>Mendakan biru tua terbentuk</i>

Table 10 / Jadual 10

Based on Table 10, suggest a name for the metal R and S. Give one reason for your choice.

Berdasarkan Jadual 10, cadangkan nama bagi logam R dan S. Berikan satu sebab bagi pilihan anda.

[4 marks]

(b) Diagram 10 shows the apparatus and observations for a redox reaction between copper (II) sulphate solution and a metal strip.

Rajah 10 menunjukkan radas dan pemerhatian bagi satu tindak balas antara larutan kuprum(II) sulfat dengan satu jalur logam.

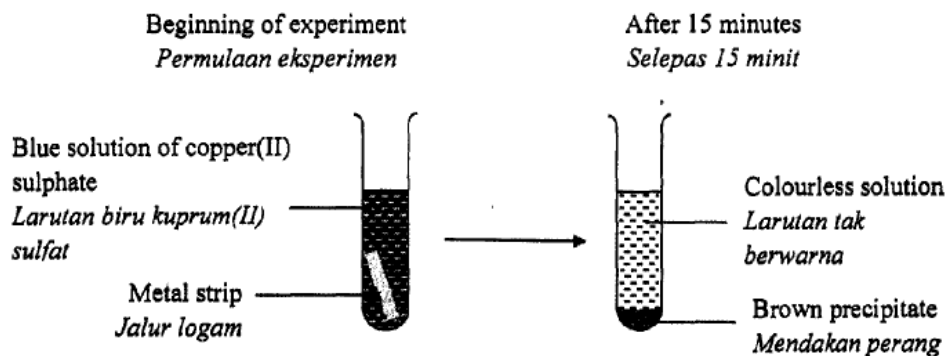


Diagram 10 / Rajah 10

Based on the observations shown in Diagram 10, suggest one suitable metal to be used in this experiment. Explain the redox reaction above in terms of changes in oxidation number.

Berdasarkan pada pemerhatian yang ditunjukkan pada Rajah 10, cadangkan satu logam yang sesuai untuk digunakan dalam eksperimen ini. Terangkan tindak balas di atas dari segi perubahan nombor pengoksidaan.

[6 marks]

(c)

During a redox reaction, electrons are transferred from the reducing agent to oxidising agent.

Semasa tindak balas redoks, elektron-elektron dipindahkan daripada agen penurunan ke agen pengoksidaan

You are given the following apparatus:

U- tube, galvanometer, connecting wires, stopper, dropper, carbon electrodes and retort stand with clamps. Describe an experiment to prove the above statement by using the given apparatus, bromine water and one suitable chemical, In your description, include the following;

Anda diberi radas yang berikut:

Tiub-U, galvanometer, wayar penyambung, penutup, penitis, elektrod karbon dan kaki retort dengan pengapit. Huraikan satu eksperimen untuk membuktikan pernyataan di atas dengan menggunakan radas yang diberikan, air bromindan satu bahan kimia lain yang sesuai. Dalam penghuraian anda, libatkan perkara-perkara berikut:

- Labelled diagram to shows the set- up of apparatus
Rajah berlabel yang menunjukkan susunan radas
- Procedure of experiment
Langkah-langkah eksperimen

- The half-equations for the reactions that occur
Persamaan setengah bagi tindak balas yang berlaku

[10

marks]

Suggested Answer

<p>a. Metal R: magnesium // zinc Reason: Metal R is more electropositive than iron // Iron nail does not rust // prevent iron from rusting // inhibit rusting of iron nail</p> <p>Metal S: copper // tin // lead // silver // aurum Reason: Iron is more electropositive than metal S // Iron nail rusts // Speed up rusting (accept any suitable metal R and S)</p>
<p>b. Metal: magnesium // zinc // lead // tin Eg: Oxidation nombor of Mg increases from 0 → +2 // $Mg \rightarrow Mg^{2+} + 2e$ Magnesium undergoes oxidation Oxidation nombor of copper(II) ion decreases from +2 → 0 // $Cu^{2+} + 2e \rightarrow Cu$ Copper undergoes reduction Redox reaction occurs as oxidation of magnesium and reduction of copper (II) ions occur simultaneously.</p>
<p>c.</p> <div style="text-align: center;"> </div> <p>Diagram: - Label - Functional apparatus Suggested chemical: Potassium iodide solution</p> <p>Procedure:</p> <ol style="list-style-type: none"> Dilute sulphuric acid is poured into a U-tube. Using a dropper, potassium bromide solution is added at one arm and bromine water at another arm Carbon electrode is placed in each side of the U-tube. The electrodes are connected to a galvanometer by using connecting wires // The external circuit is completed. Any changes that can be observed are recorded. <p>Half equations:</p>

