Bank Soalan SPM Bab 1

Kertas 1

1. Bahan yang manakah merupakan agen pengoksidaan?
Which substance is an oxidising agent?

A Air bromin
Bromine water

B Larutan ferum(II) klorida
Iron(II) chloride solution

C Larutan kalium iodida
Potassium iodide solution

D Larutan natrium klorida
Sodium chloride solution

2. Persamaan berikut menunjukkan tindak balas antara ferum(III) oksida, Fe_2O_3 dengan karbon monoksida, CO.
The following equation shows the reaction between iron(III) oxide, Fe_2O_3 with carbon monoxide, CO.

$$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$$

Antara yang berikut, yang manakah merupakan perubahan nombor pengoksidaan yang betul bagi ferum?
Which of the following is the correct change for the oxidation number of iron?

A +3 → 0 **C** +3 → +2
B +2 → +3 **D** +2 → 0

3. Antara faktor berikut, yang manakah mempengaruhi keupayaan elektrod piawai?
Which of the following factors affect the standard electrode potential?

I Mangkin
Catalyst

II Tekanan
Pressure

III Suhu
Temperature

IV Saiz logam
Size of metal

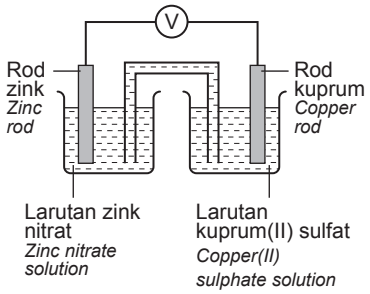
A I dan II
I and II

B II dan III
II and III

C III dan IV
III and IV

D I dan IV
I and IV

4. Rajah 1 menunjukkan susunan radas bagi sel kimia.
Diagram 1 shows the apparatus set-up of a voltaic cell.



Rajah 1 / Diagram 1

Antara pemerhatian berikut, yang manakah benar tentang sel kimia dalam Rajah 1?
Which of the following observations is true about the voltaic cell in Diagram 1?

A Rod kuprum menjadi lebih nipis.
Copper rod becomes thinner.

B Rod zink menjadi lebih tebal.
Zinc rod becomes thicker.

C Larutan zink nitrat menjadi biru.
Zinc nitrate solution becomes blue.

D Keamatan warna biru larutan kuprum(II) sulfat berkurang.
Blue intensity of copper(II) sulphate solution decreases.

5. Rajah 2 menunjukkan sejenis sel kimia.
Diagram 2 shows a type of chemical cell.

Rajah 2 / Diagram 2

Elektrik dihasilkan apabila tindak balas berikut berlaku dalam sel tersebut.
Electricity is generated when the following reaction occurs in the cell.

$$Zn + 2MnO_2 \rightarrow ZnO + Mn_2O_3$$

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Perubahan nombor pengoksidaan yang manakah adalah benar?
Which of the following change in oxidation number is true?

	Perubahan nombor pengoksidaan zink *Change in oxidation number of zinc*	Perubahan nombor pengoksidaan mangan *Change in oxidation number of manganese*
A	+2 → 0	+2 → +6
B	+2 → 0	+2 → +3
C	0 → +2	+4 → +3
D	0 → +2	+4 → +6

6. Antara yang berikut, faktor manakah yang tidak mempengaruhi elektrolisis larutan akueus?
Which of the following does not affect the electrolysis of aqueous solution?

A Kepekatan elektrolit
Concentration of electrolyte

B Isi padu elektrolit
Volume of electrolyte

C Jenis elektrod
Type of electrode

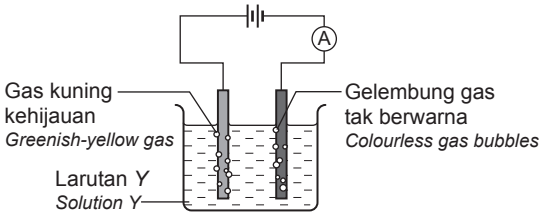
D Kedudukan ion dalam Siri Elektrokimia
Position of ion in the Electrochemical Series

7. Elektrolisis leburan plumbum(II) bromida dijalankan dengan menggunakan elektrod karbon. Setengah persamaan manakah yang menunjukkan tindak balas di anod?
Electrolysis of molten lead(II) bromide is carried out using carbon electrodes.
Which half-equation shows the reaction at the anode?

A $2Br^- \rightarrow Br_2 + 2e^-$ **C** $Pb^{2+} + 2e^- \rightarrow Pb$

B $Br_2 + 2e^- \rightarrow 2Br^-$ **D** $Pb \rightarrow Pb^{2+} + 2e^-$

8. Rajah 3 menunjukkan elektrolisis larutan *Y* 1.0 mol dm^{-3} dengan menggunakan elektrod karbon.
Diagram 3 shows the electrolysis of 1.0 mol dm^{-3} solution Y using carbon electrodes.



Rajah 3 / Diagram 3

Antara yang berikut, yang manakah larutan *Y*?
Which of the following is solution Y?

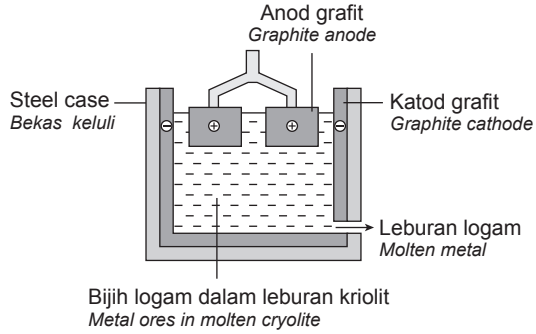
A Natrium nitrat
Sodium nitrate

B Natrium klorida
Sodium chloride

C Kuprum(II) nitrat
Copper(II) nitrate

D Kuprum(II) klorida
Copper(II) chloride

9. Rajah 4 menunjukkan pengekstrakan satu logam dari bijihnya secara elektrolisis.
Diagram 4 shows the extraction of a metal from its ore through electrolysis.



Rajah 4 / Diagram 4

Apakah fungsi kriolit?
What is the function of cryolite?

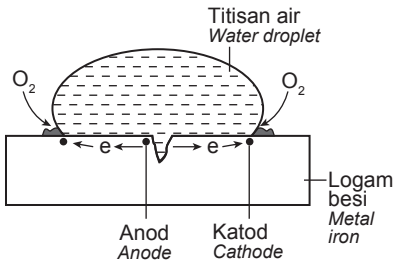
A Untuk mengelakkan elektrod-elektrod daripada teroksida
To prevent the electrodes from being oxidised

B Untuk bertindak sebagai mangkin
To act as a catalyst

C Untuk merendahkan takat lebur bijih logam
To lower the melting point of the metal ores

D Untuk meninggikan takat lebur bijih logam
To raise the melting point of the metal ores

10. Rajah 5 menunjukkan proses pengaratan besi.
Diagram 5 shows the rusting process of iron.



Rajah 5 / Diagram 5

Antara persamaan berikut, yang manakah berlaku di katod?
Which of the following equations occurs at the cathode?

A $Fe \rightarrow Fe^{2+} + 2e^-$

B $Fe^{2+} + 2e^- \rightarrow Fe$

C $O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$

D $4OH^- \rightarrow O_2 + 2H_2O + 4e^-$

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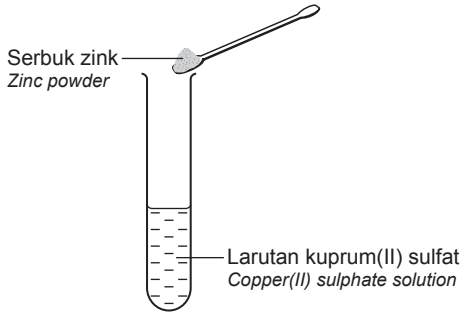
Kertas 2

1. Rajah 1 menunjukkan satu eksperimen untuk mengkaji tindak balas penyesaran.
Diagram 1 shows an experiment to investigate the displacement reaction.



Rajah 1 / *Diagram 1*

Berdasarkan eksperimen ini,
Based on this experiment,

(a) tulis setengah persamaan bagi tindak balas penurunan.
write the half-equation for the reduction reaction.

[1 markah / 1 *mark*]

(b) tulis perubahan nombor pengoksidaan bagi zink.
write the change in oxidation number for zinc.

[1 markah / 1 *mark*]

(c) cadangkan **satu** bahan lain yang boleh menggantikan serbuk zink dalam eksperimen ini.
*suggest **one** other material that can be used to replace zinc powder in this experiment.*

[1 markah / 1 *mark*]

(d) Jika eksperimen diulang dengan menggunakan serbuk argentum dan larutan kuprum(II) sulfat, ramalkan pemerhatian dan terangkan jawapan anda.
If the experiment is repeated using silver powder and copper(II) sulphate solution, predict the observation and explain your answer.

[2 markah / 2 *marks*]

2. Jadual 1 menunjukkan nilai keupayaan elektrod piawai setengah sel bagi beberapa logam. Simbol *W*, *X*, *Y* dan *Z* bukan merujuk unsur sebenar.
Table 1 shows the standard electrode potential values of half-cells for some metals. W, X, Y and Z symbols do not refer to the real elements.

$W^{2+} + 2e^- \rightleftharpoons W$	$E^0 = -2.38$ V
$X^{2+} + 2e^- \rightleftharpoons X$	$E^0 = +0.34$ V
$Y^{+} + e^- \rightleftharpoons Y$	$E^0 = +0.80$ V
$Z^{3+} + 3e^- \rightleftharpoons Z$	$E^0 = -1.66$ V

Jadual 1 / *Table 1*

(a) Nyatakan keupayaan elektrod hidrogen piawai.
State the potential of standard hydrogen electrode.

[1 markah / 1 *mark*]

(b) Berdasarkan Jadual 1, susun ion-ion dalam tertib menaik kekuatan agen pengoksidaan.
Based on Table 1, arrange the ions in the order of increasing strength of oxidising agents.

[1 markah / 1 *mark*]

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(c) (i) Tentukan anod bagi sel kimia yang terbina daripada pasangan logam *W*/*X*.
Determine the anode for the chemical cell formed from W/X metal pair.

[1 markah / 1 *mark*]

(ii) Hitungkan bacaan voltan, E^0_{sel} bagi pasangan logam ini.
Calculate the voltage reading, E^0_{cell} for this metal pair.

[2 markah / 2 *marks*]

(iii) Jika logam *W* digantikan dengan logam *Y*, ramalkan voltan sel, E^0_{sel}. Jelaskan jawapan anda.
If metal W is replaced with metal Y, predict the cell voltage, E^0_{cell}. Explain your answer.

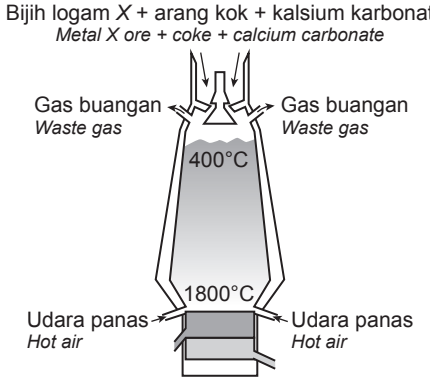
[2 markah / 2 *marks*]

(d) Anda dibekalkan dengan senarai bahan dan radas di bawah. Bina satu sel kimia dengan senarai bahan dan radas tersebut. Anda perlu melabelkan terminal positif bagi sel kimia tersebut serta arah pengaliran elektron.
You are provided with a list of materials and apparatus below. Build a chemical cell with the list of materials and apparatus given You have to label the positive terminal of the chemical cell as well as the direction of electron flow.

- Bikar / *Beaker*
- Pasu berliang / *Porous pot*
- 2 elektrod karbon / *2 carbon electrodes*
- Dawai penyambung / *Connecting wires*
- Voltmeter / *Voltmeter*
- Logam *X* / *Metal X*
- Logam *Z* / *Metal Z*
- Larutan *X* sulfat / *X sulphate solution*
- Larutan *Z* nitrat / *Z nitrate solution*

[3 markah / 3 *marks*]

3. Rajah 2.1 menunjukkan satu proses pengekstrakan logam daripada bijihnya.
Diagram 2.1 shows a process of metal extraction from its ore.



Rajah 2.1 / *Diagram 2.1*

(a) (i) Berdasarkan Rajah 2.1, cadangkan logam *X*. Tulis persamaan kimia bagi tindak balas antara bijih logam *X* dengan arang kok.
Based on Diagram 2.1, suggest a metal for X. Write the chemical equation for the reaction between Metal X ore with coke.

[3 markah / 3 *marks*]

(ii) Terangkan tindak balas redoks dalam Rajah 2.1 dari segi penambahan atau kehilangan oksigen.
Explain the redox reaction in Diagram 2.1 in terms of gain and loss of oxygen.

[4 markah / 4 *marks*]

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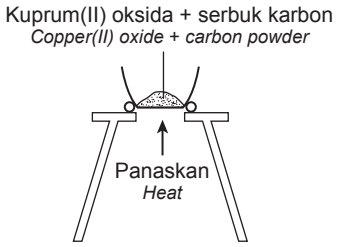
(b) Kuprum yang digunakan di dalam wayar mestilah dengan ketulenan 99.99%. Untuk memperoleh kuprum dengan ketulenan ini, kaedah elektrolisis digunakan. Terangkan proses penulenan logam kuprum menggunakan kaedah elektrolisis. Sertakan rajah berlabel dan setengah persamaan di anod dan katod.
The copper used in wires need to be 99.99% pure. To obtain copper with such purity, the electrolysis method is used. Explain the process of copper metal purification using the electrolysis method. Include a labelled diagram and the half-equations at the anode and cathode.

[9 markah / 9 *marks*]

(c) Rajah 2.2 menunjukkan susunan radas untuk mendapatkan logam kuprum daripada kuprum(II) oksida.
Diagram 2.2 shows the apparatus set-up to obtain copper metal from copper(II) oxide.



Rajah 2.2 / *Diagram 2.2*

Andy bercadang untuk menggunakan kaedah dalam Rajah 2.2 untuk mendapatkan logam aluminium daripada aluminium oksida.
Adakah Andy akan berjaya memperoleh logam aluminium daripada kaedah ini? Berikan sebab anda.
Andy planned to use the method in Diagram 2.2 to obtain aluminium metal from aluminium oxide.
Will Andy succeed in obtaining aluminium metal using this method? Give your reasons.

[4 markah / 4 *marks*]

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