

CONFIDENTIAL

4541/3
Chemistry
Paper 3
September
2011



1½ hours

MAKTAB RENDAH SAINS MARA

**SIJIL PELAJARAN MALAYSIA
TRIAL EXAMINATION 2011**

CHEMISTRY

Paper 3

One hour and thirty minutes

4
5
4
1
3

DO NOT OPEN THIS QUESTION BOOKLET UNTIL BEING TOLD TO DO SO

1. Tuliskan *nama 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 dikehendaki membaca maklumat di halaman belakang buku soalan ini.

<i>For Examiner's Use</i>		
Question	Full Mark	Mark obtained
1	21	
2	12	
3	17	
Total	50	

This booklet consists 14 printed pages and 2 unprinted pages

**[Turn page over
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1 Diagram 1.1 shows the apparatus set-up for three sets of experiment to investigate the effect of copper and magnesium on the rusting of iron, Fe.

Rajah 1.1 menunjukkan susunan radas untuk tiga set eksperimen untuk mengkaji kesan logam kuprum dan magnesium ke atas pengurangan besi, Fe.




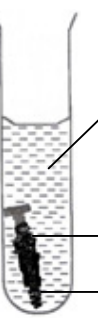

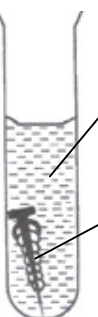
Set	Apparatus set-up Susunan radas	
	Day 1 Hari pertama	Day 5 Hari ke-5
I	 <p>Gel containing potassium hexacyanoferrate (III) solution <i>Gel mengandungi larutan kalium heksasianoferat(III)</i></p> <p>Iron nail <i>Paku besi</i></p>	 <p>Gel containing potassium hexacyanoferrate (III) solution <i>Gel mengandungi larutan kalium heksasianoferat(III)</i></p> <p>Iron nail <i>Paku besi</i></p> <p>A few blue spots <i>Sedikit tompok-tompok biru</i></p>
II	 <p>Gel containing potassium hexacyanoferrate (III) solution <i>Gel mengandungi larutan kalium heksasianoferat(III)</i></p> <p>Iron nail coiled with copper <i>Paku besi dililit dengan kuprum</i></p>	 <p>Gel containing potassium hexacyanoferrate (III) solution <i>Gel mengandungi larutan kalium heksasianoferat(III)</i></p> <p>Iron nail coiled with copper <i>Paku besi dililit dengan</i></p> <p>A lot of blue spots <i>Banyak tompok-tompok biru</i></p>
III	 <p>Gel containing potassium hexacyanoferrate (III) solution <i>Gel mengandungi larutan kalium heksasianoferat(III)</i></p> <p>Iron nail coiled with magnesium <i>Paku besi dililit dengan magnesium</i></p>	 <p>Gel containing potassium hexacyanoferrate (III) solution <i>Gel mengandungi larutan kalium heksasianoferat(III)</i></p> <p>Iron nail coiled with magnesium <i>Paku besi dililit dengan magnesium</i></p> <p>No blue spots <i>Tiada tompok-tompok biru</i></p>

Diagram 1.1

Rajah 1.1

- (a) State one observation that can be obtained from each set of the experiment in Table 1.2.

Nyatakan pemerhatian yang dapat diperolehi daripada setiap set eksperimen di dalam Jadual 1.2.

Set	Observation <i>Pemerhatian</i>
I	
II	
III	

Table 1.2
Jadual 1.2

[3 marks]
[3 markah]

1(a)

- (b)(i) State the inference for each set of the experiment in Table 1.3.

Nyatakan inferens bagi setiap set eksperimen di dalam Jadual 1.3.

Set	Inference <i>Inferens</i>
I	
II	
III	

Table 1.3
Jadual 1.3

[3 marks]
[3 markah]

1(b)(i)

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1(b)(ii)

- (b) (ii) Based on the experiment, arrange the three metals in ascending order of electropositivity.
Berdasarkan eksperimen, susun ketiga-tiga logam mengikut tertib keelektropositifan menaik.
- ,,
- [3 marks]
[3 markah]

1(c)

- (c) For the experiment, state:
Bagi eksperimen ini, nyatakan:
- (i) The manipulated variable
Pembolehubah dimanipulasi
-
- (ii) The responding variable
Pembolehubah bergerak balas
-
- (iii) The constant variable
Pembolehubah dimalarkan
-
- [3 marks]
[3 markah]

1(d)

- (d) State the hypothesis for the experiment.
Nyatakan hipotesis untuk eksperimen ini.
-
-
-
- [3 marks]
[3 markah]

- (e) Another experiment is conducted by coiling the iron nail with silver.
Predict the observation for this experiment compared to the experiments in Diagram 1.1.
*Suatu eksperimen lain dijalankan dengan melilitkan paku besi dengan logam argentum.
Ramalkan pemerhatian bagi eksperimen ini berbanding dengan eksperimen di dalam Rajah 1.1.*

.....
.....
.....

[3 marks]
[3 markah]

1(e)

- (f) State the operational definition for the rusting of iron in the experiment.
Nyatakan definisi secara operasi bagi pengamatan besi dalam tindak balas .

.....
.....
.....

[3 marks]
[3 markah]

1(f)

TOTAL	
1	
	21

- 2 Diagram 2.1 shows the apparatus set-up used to investigate the electrical conductivity of sodium chloride solution.

Rajah 2.1 menunjukkan susunan radas untuk mengkaji kekonduksian elektrik oleh larutan natrium klorida.

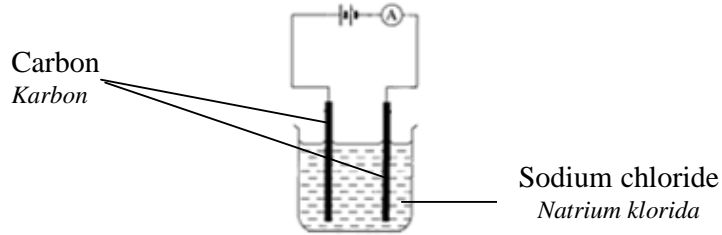


Diagram 2.1
Rajah 2.1

The experiment is repeated by replacing sodium chloride solution with ethanol, glucose solution and lead(II) nitrate solution.

Eksperimen diulangi dengan menggantikan larutan natrium klorida dengan etanol, larutan glukosa dan larutan plumbum(II) nitrat.

- (a) Diagram 2.2 shows the ammeter readings for all solutions. Record the ammeter readings in the spaces provided.
Rajah 2.2 menunjukkan bacaan ammeter untuk semua larutan.
Catat bacaan ammeter pada ruang yang disediakan.

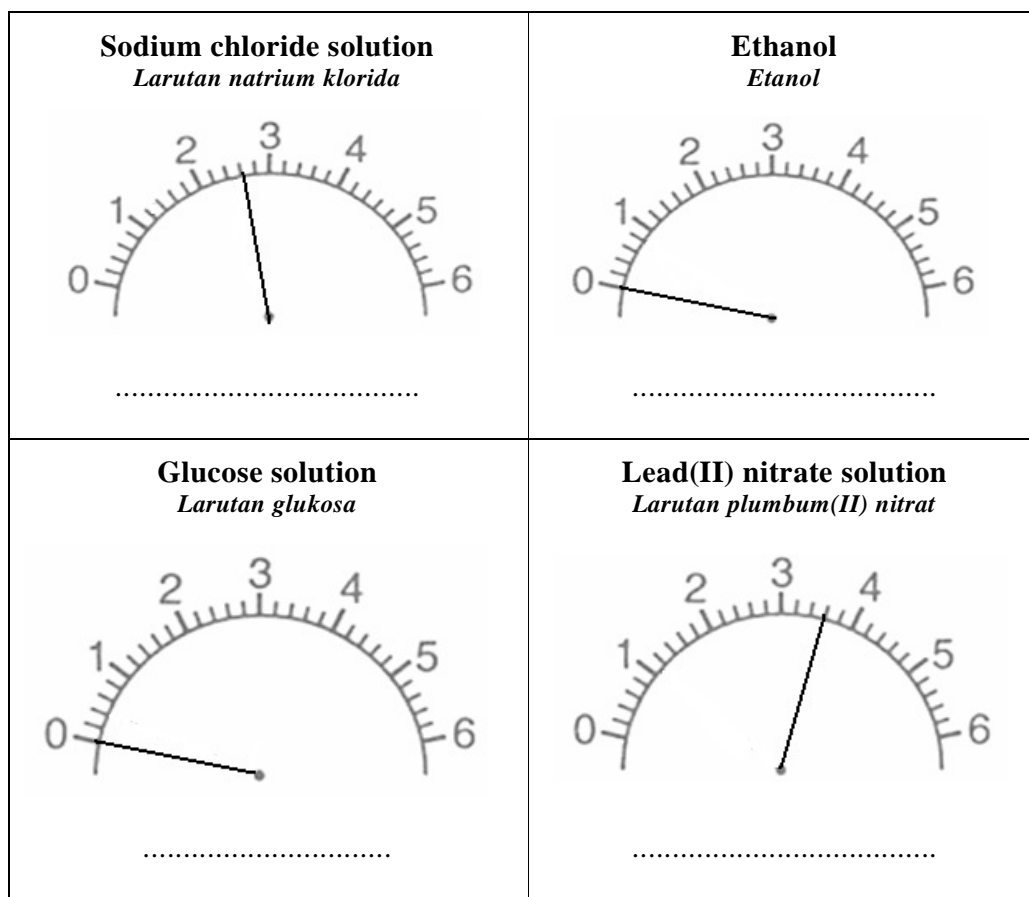


Diagram 2.2
Rajah 2.2

2(a)

[3 marks]
[3 markah]

- (b) Classify the substances used in the experiment into electrolytes and non-electrolytes.
Kelasikan bahan-bahan yang digunakan di dalam eksperimen kepada elektrolit dan bukan elektrolit.

2(b)

[3 marks]
[3 markah]

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- (c) (i) What will happen to the ammeter reading in the experiment shown in Diagram 2.1 after 10 minutes?
Apakah yang akan berlaku kepada bacaan ammeter bagi eksperimen yang ditunjukkan di dalam Rajah 2.1 selepas 10 minit?

2(c)(i)

.....

[3 marks]
[3 markah]

- (ii) Explain the answer in 2(c)(i).
Terangkan jawapan di 2(c)(i).

2(c)(ii)

.....

[3marks]
[3 markah]

TOTAL
2
12

- 3 Diagram 3 shows a situation faced by Mr. Ahmad at a rest area.
Rajah 3 menunjukkan situasi yang dialami oleh En. Ahmad di satu kawasan rehat.

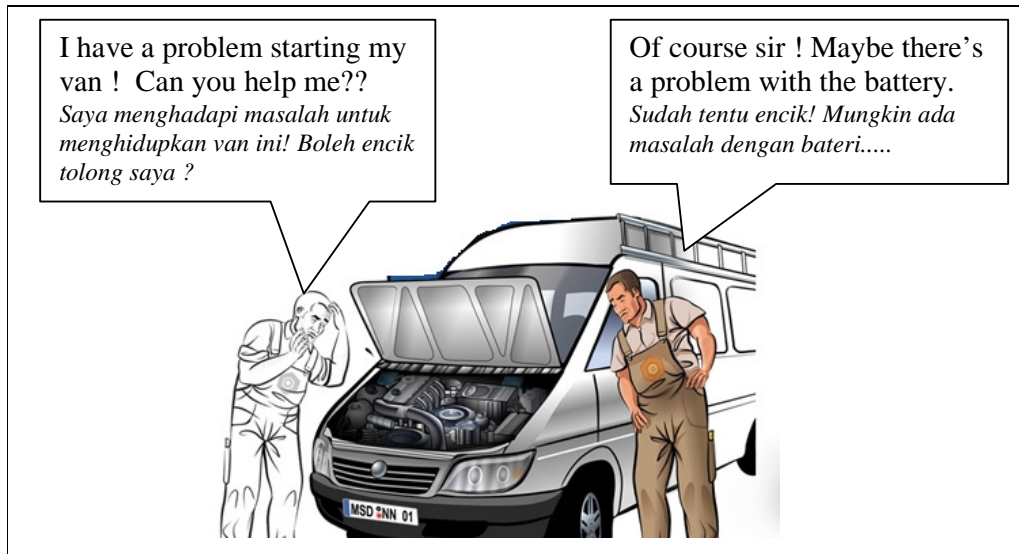


Diagram 3
Rajah 3

The above situation shows an application of a type of voltaic cell in daily lives.
 Plan a laboratory experiment to construct the Electrochemical Series using a voltaic cell. You are required to use the following metals; copper, iron, magnesium and zinc.
*Situasi di atas menunjukkan salah satu aplikasi sel voltan di dalam kehidupan seharian.
 Rancang satu eksperimen untuk membina Siri Elektrokimia menggunakan sel voltan.
 Anda hendaklah menggunakan logam-logam berikut; kuprum, besi, magnesium dan zink.*

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

- (a) Aim of experiment
Tujuan eksperimen
- (b) All the variables
Semua pembolehubah
- (c) Statement of the hypothesis
Pernyataan hipotesis
- (d) List of substances and apparatus
Senarai bahan dan radas
- (e) Procedure for the experiment
Prosedur eksperimen
- (f) Tabulation of data
Penjadualan data

[17 marks]
 [17 markah]

END OF QUESTION PAPER
KERTAS SOALAN TAMAT

SUGGESTED ANSWERS FOR MRSM CHEMISTRY TRIAL SPM 2011 PAPER 3

1. (a)

Set	Observation
I	Few blue spots on the iron nail
II	A lot of blue spots on the iron nail
III	No blue spot on the iron nail

(b) (i)

Set	Observation
I	A little bit of rusting on the iron nail
II	A lot of rusting on the iron nail
III	Iron nail does not rust

(ii) copper, iron, magnesium

(c) (i) manipulated variable: type of metal that coils the iron nail// metal in contact with iron nail

(ii) responding variable : the rusting of iron nail

(iii) Fixed variable: size of iron nail// jelly solution and potassium hexacyanoferrate(III) solution

(d) Hypothesis:

When iron nail is coiled with a more electropositive metal, iron nail does not rust//
when iron nail is coiled with a less electropositive metal, iron nail rusts faster

(e) The blue spots formed is more than set II

(f) Operational Definition:

When iron nail is coiled with a less electropositive metal and immersed in jelly and Potassium hexacyanoferrate(III) solution,

Blue spots are formed showing

The rusting of iron that is iron atoms donate electrons to form Fe^{2+} ions.

2. (a)

Solution	Voltmeter reading (V)
Sodium chloride	2.6
Ethanol	0
Lead(II) nitrate	3.6
Glucose	0

(b)

Electrolytes	Non-electrolytes
Sodium chloride solution	Glucose solution
Lead(II) nitrate solution	Ethanol

(c) (i) The voltmeter reading decreases

(ii) The concentration of ions decreases as H^+ ions and Cl^- ions are discharged at the cathode and anode respectively

3. (a) Aim of experiment:

To construct the electrochemical series using a voltaic cell

(b) All the variables:

Manipulated variable: metal paired with copper

Responding variable: voltmeter reading

Controlled variable: copper(II) sulphate solution // copper plate

(c) Statement of the hypothesis

The further the distance between metals in the electrochemical series, the higher is the voltmeter reading

(d) List of substances and apparatus:

Substances: copper(II) sulphate solution, copper plate, magnesium ribbon, zinc plate, iron nail, sand paper

Apparatus: voltmeter, connecting wires, beaker,

(e) Procedure of experiment:

1. Polish copper plate, zinc plate, magnesium ribbon and iron nail with sand paper.
2. Pour copper(II) sulphate solution into a beaker.
3. Dip copper plate and zinc plate into the solution and connect the two metal plates to a voltmeter.
4. The voltmeter reading and the negative terminal of the voltaic cell are recorded.

5. Steps 1 – 4 are repeated by replacing zinc plate with iron nail and magnesium ribbon.

(f) Tabulation of data

Metal pair	Voltmeter reading(V)	Negative terminal
Zn/Cu		
Fe/Cu		
Mg/Cu		