

SULIT  
4541/2  
Chemistry  
Kertas 2  
September  
2 1/2 jam



Nama

Tingkatan

PERSIDANGAN KEBANGSAAN PENGETUA-PENGETUA  
SEKOLAH MENENGAH MALAYSIA (PKPSM)  
CAWANGAN MELAKA

PEPERIKSAAN PERCUBAAN  
SIJIL PELAJARAN MALAYSIA 2007

CHEMISTRY

Kertas 2

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Kertas ini mengandungi tiga bahagian, Bahagian A, Bahagian B dan Bahagian C.*
2. *Jawab semua soalan dalam Bahagian A satu soalan daripada Bahagian B dan satu soalan daripada Bahagian C.*
3. *Jawapan kepada ketiga-tiga bahagian ini hendaklah diserahkan bersama.*
4. *Jawapan bagi Bahagian A hendaklah ditulis dalam ruang yang disediakan dalam kertas soalan. Langkah penting dalam kira-mengira hendaklah ditunjukkan.*
5. *Jawapan bagi Bahagian B dan Bahagian C hendaklah ditulis pada kertas tulis yang disediakan. Anda diminta menjawab dengan lebih panjang untuk Bahagian B, dan Bahagian C tetapi jawapannya mestilah jelas dan logik. Dalam jawapan anda, persamaan, gambar rajah, graf dan cara lain, yang sesuai untuk menjelaskan jawapan anda boleh digunakan.*
6. *Rajah tidak dilukis mengikut skala.*
7. *Dalam huraian anda, nama bahan kimia (bukan simbol atau formulanya) hendaklah digunakan.*
8. *Markah maksimum yang diperuntukkan ditunjukkan dalam kurungan pada hujung tiap-tiap soalan atau bahagian soalan.*
9. *Penggunaan kalkulator saintifik yang tidak boleh diprogramkan adalah dibenarkan.*

Untuk kegunaan pemeriksa		
Bahagian	No.	Markah
A	1	
	2	
	3	
	4	
	5	
	6	
Jumlah		
B	7	
	8	
Jumlah		
C	9	
	10	
Jumlah		
Jumlah Besar		

Kertas soalan ini mengandungi 33 halaman bercetak

[ Lihat Sebelah

## BAHAGIAN A

[ 60 markah ]

Jawab **semua** soalan dalam bahagian ini.

Masa yang dicadangkan untuk menjawab **Bahagian A** ialah 90 minit

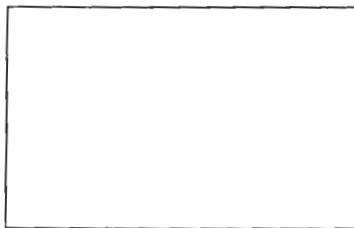
- 1 An experiment is carried out to determine the melting point of solid X. . Solid X is heated using water bath. The temperature of X is recorded at 30 seconds intervals as shown below

Time/second	0	30	60	90	120	150	180	210
Temperature/ $^{\circ}$ C	70	77	80	80	80	82	85	95

- (a) Draw the set up of the apparatus to carry out this experiment.

[ 3 marks ]

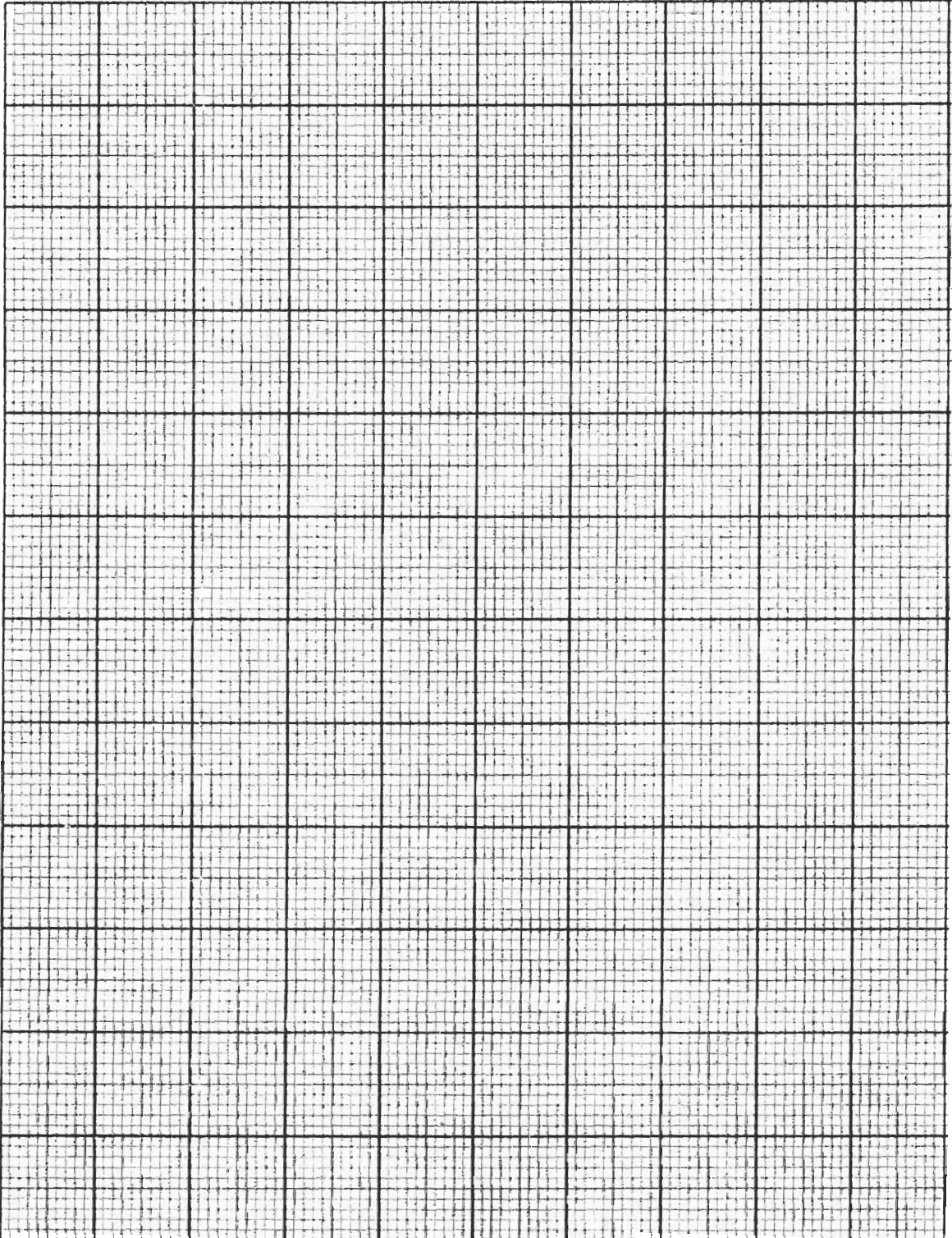
- (b) Draw the arrangement of particles in X at  $77^{\circ}$ C



[ 1 mark ]

- (c) On the graph paper , draw the graph of temperature against time for the heating of X

[ 3 marks ]



(d) Show on your graph, how the melting point of X is determined

[ 1 mark ]

(e) Explain why there is no change in temperature from 60 second to 120 second.

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

[ 2 marks ]

- 2 The table below shows the proton numbers of a few elements.

Elements	Proton Numbers
R	1
S	11
T	14
W	18
X	19

- (a) Write the electron arrangement of W

.....  
[ 1 mark]

- (b) Give a reason why W is not reactive

.....  
.....  
[ 1 mark]

- (c) Elements S and T are located in the same period

- (i) State the element with a bigger atomic size.

.....  
[ 1 mark]

- (ii) Explain your answer in (c)(i)

.....  
.....  
[ 2 marks]

- (d) (i) What can be observed when X reacts with oxygen?

.....  
[ 1 mark]

- (ii) Write a chemical equation to represent the reaction that takes place in d)(i).

.....  
[ 1 mark]

- (e) S reacts in the same way as X with water.

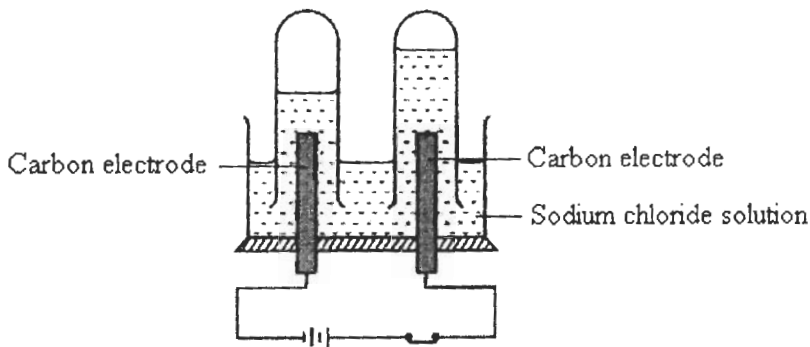
- (i) Which is more reactive towards water ?

.....  
[ 1 mark]

- (ii) Explain why.

.....  
.....  
[ 2 marks]

- 3 The diagram below shows the apparatus set up to study the effect of concentration of electrolyte on the products of electrolysis



**Experiment I :** Electrolysis of very dilute sodium chloride solution

**Experiment II :** Electrolysis of concentrated sodium chloride solution

(a) In **Experiment I**

- (i) What can be observed at the anode ?

.....  
[ 1 mark]

- (ii) Write an equation to represent the reaction that takes place at the anode.

.....  
[ 1 mark]

- (iii) What is the redox process that takes place at the anode ?

.....  
[ 1 mark]

(b) In **Experiment II**,

- (i) Which electrode will give a different product compared to **Experiment I** ?

.....  
[ 1 mark]

- (ii) Name the product formed at the electrode in (b) (i).

.....  
[ 1 mark]

- (iii) Write an equation for the reaction that takes place in (b) (i).

.....  
[ 1 mark]

(c) 2 cm<sup>3</sup> of potassium iodide solution is poured into the test tube which contain gas produced at the anode in **Experiment II**

(i) What can be observed ?

.....  
[ 1 mark]

(ii) Write an ionic equation for the reaction in (c).

.....  
[ 1 mark]

(iii) State the substance that is reduced in (c) (ii)

.....  
[ 1 mark]

(iv) Give a reason for your answer in (c) (iii)

.....  
[ 1 mark]



4 Figure A and Figure B below show two different methods of preparing soluble salt and insoluble salt.

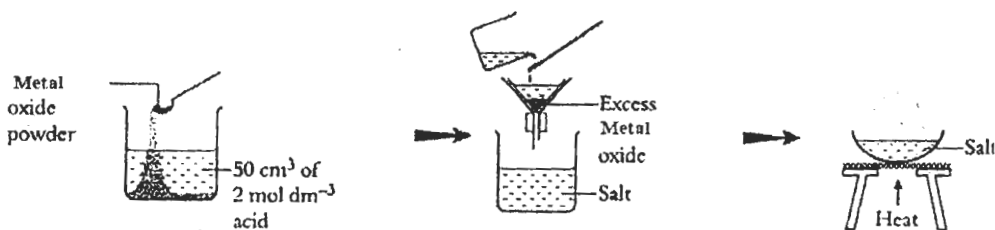


Figure A Preparing soluble salt

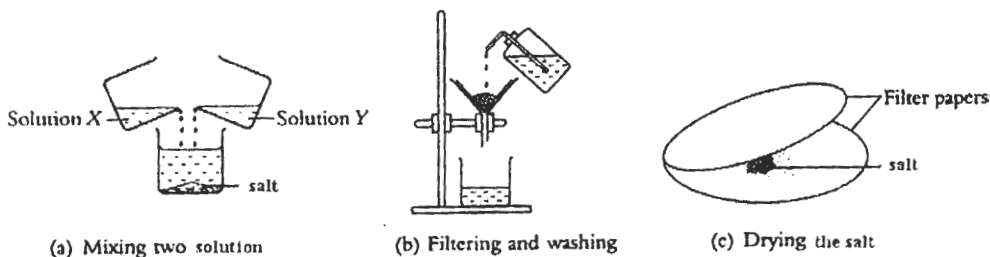


Figure B Preparing insoluble salt

You are given two salts : lead(II) iodide and copper (II) sulphate salts.

(a) Which salt is insoluble?

.....  
[ 1 mark]

(b) Name the reaction used to prepare the insoluble salt in (a).

.....  
[ 1 mark]

(c) (i) Suggest a name for X and Y to prepare the salt in (a) as shown in Figure B.

X : .....

Y : .....

[ 2 marks]

(ii) Write down the ionic equation for the reaction in (c) (i).

.....  
[ 2 mark]

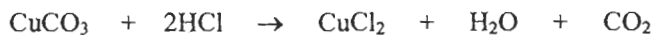
- (d) For the soluble salt,  
(i) State the acid used.

.....  
[ 1 mark]

- (ii) Write down the chemical equation to produce the soluble salt in (d)(i).

.....  
[ 1 mark]

- (e) The following reaction can be used to prepare copper (II) chloride.



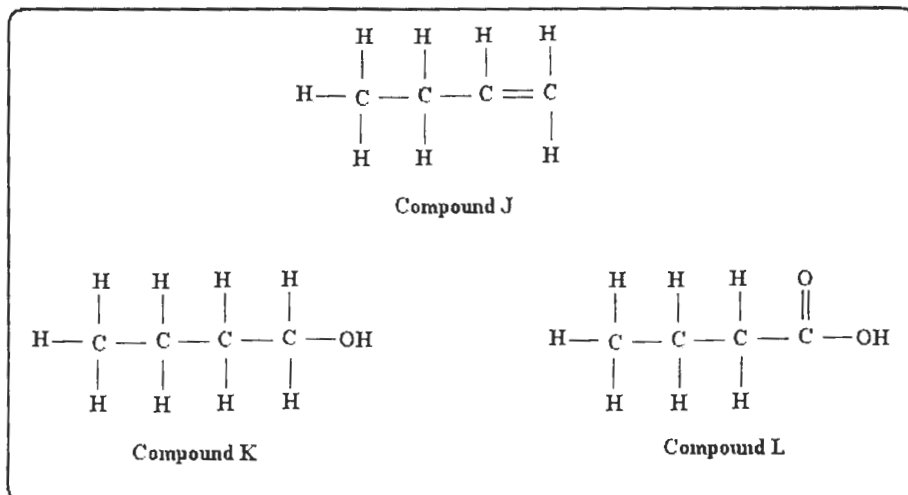
Access of copper (II) carbonate is added to react with 50 cm<sup>3</sup> of 2 mol dm<sup>-3</sup> hydrochloric acid to form the salt.

Calculate the mass of the salt formed.

[ Relative atomic mass for the salt formed = 135 ]

[ 2 marks]

- 5 Figure below shows the structural formulae of compounds J, K and L



- (a) State the homologous series for compounds J and K

Compound J : .....

Compound K : .....

[ 2 marks

- (b) In the figure given, circle the functional group of **compound L**.

[ 1 mark

- (c) (i) Name the compound K

.....  
[ 1 mark

- (ii) Another compound, M, is in the same homologous series as K. M has five carbon atom. Write the molecular formula for M.

.....  
[ 1 mark

- (d) Draw the structural formula for **another isomer** of compound J. Name the isomer.

[ 2 marks

- (e) When compound K is added into a test tube containing acidified potassium dichromate(VI) solution and heated for a few minutes, compound L is form.

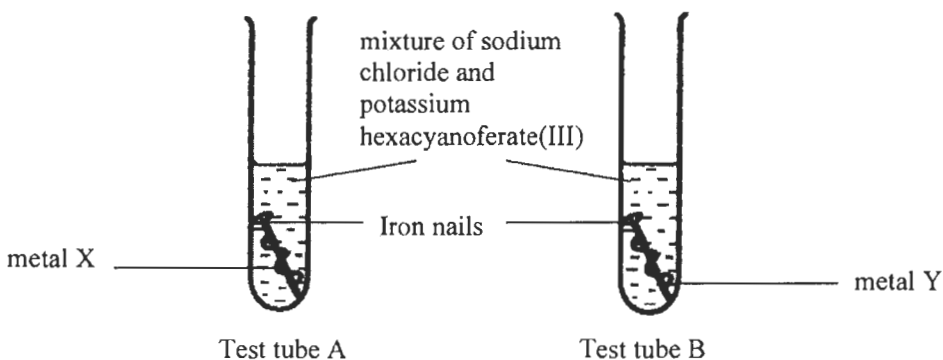
- (i) State **one** observation for this experiment

.....  
[ 1 mark

- (ii) Write a chemical equation for this reaction.

.....  
[ 2 marks

- 6 The figure below shows an experiment to study the effect of different metals on the rusting of iron. The pairs of metals are tied together and soaked in a mixture of sodium chloride and potassium hexacyanoferate(III) solution.



- (a) What is the function of

(i) the sodium chloride solution?

..... [ 1 mark]

(ii) the potassium hexacyanoferate(III) solution ?

..... [ 1 mark]

- (b) Metal X is below iron in the Electrochemical Series.  
State the observation in test tube A after two days.

..... [ 1 mark]

(i) Give an example of X.

..... [ 1 mark]

(ii) Write the half equation to show what happened to iron.

.....  
[ 1 mark]

(iii) Name the reducing agent in test tube A.

.....  
[ 1 mark]

(c) In test tube B, iron does not undergo any chemical change, but the mass of Y decreases.

(i) Give a reason for this observation.

.....  
[ 1 mark]

(ii) Give an example of Y.

.....  
[ 1 mark]

(d) Based on this experiment, suggest a way to prevent iron from rusting.

.....  
[ 1 mark]

**Section B**

[20 marks]

*Answer any one question*

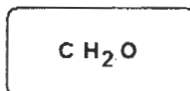
- 7 (a) The figure below shows the standard representation for an atom of element Na



State three types of information that can be deduced ?  
 Draw the electron arrangement for an atom of element Na

[6 marks]

- (b) The following figure shows the empirical formula of glucose :



- (i) What is the meaning of empirical formula ?  
 (ii) The relative molecular mass of glucose is 180, determine the molecular formula of glucose

[4 marks]

- (c) (i) A chloride of iron contains 2.80 g of iron and 5.32 g of chlorine.  
 Determine the empirical formula of the compound.  
 [ Relative atomic mass : Fe = 56 , Cl = 35.5 ]

[4 marks]

- (ii) Write a chemical equation to represent the reaction between iron and chlorine.  
 Calculate the volume of chlorine gas that react completely with 2.80 g iron.  
 [ 1 mole of gas occupied  $24 \text{ dm}^3$  at room temperature and pressure ]

[6 marks]

- 8 (a) The table below shows the data obtained when 2.0 g of calcium carbonate granules were added to 20.0 cm<sup>3</sup> of 0.1 mol dm<sup>-3</sup> hydrochloric acid in a conical flask.

Time/s	0	60	120	180	240	300	360	420
Volume of gas/cm <sup>3</sup>	0.0	5.0	9.5	13.0	16.5	18.5	19.0	19.0

- (i) Based on table, draw a graph of volume of gas against time  
[4 marks]
- (ii) From the graph, determine
- the average rate of reaction for the whole reaction
  - the rate of reaction at 210 seconds
- [4 marks]
- (iii) Explain why potatoes fried in boiling oil cooks faster than potatoes boiled in boiling water.  
[2 marks]
- (iv) By using the collision theory, explain how temperature affects the rate of reaction.  
[4 marks]

- (b) The table below shows three types of food additive and their functions

Type of food additive	Function
X	To slow down or prevent the growth of microorganisms so that food can be kept for a longer period.
Y	To prevent oxidation that causes rancid fats and fruits from turning brown
Z	To improve and restore the taste of food

State the type of food additive X, Y and Z. State **one** example each.

[6 marks]



**Section C**

[20 marks]

*Answer any one question*

- 9 (a) The table below shows the proton numbers of two elements, X and Y.

Element	Proton number
X	1
Y	11

Explain how both X and Y can react with a **named element** in Group 17 to form two different types of compounds. In your explanation, attach any useful diagram.

[ 11 marks ]

- (b) (i) State two properties of an ionic compound.

(ii) Describe an experiment, using electrical energy, how you prove that one of the compounds formed in (a) is an ionic compound. Explain how you arrive at the conclusion.

[ 9 marks ]

- 10 The following information is about the heat of reaction

One mole of ethanol produces 1317 kJ of heat energy when it is completely burnt.

- (a) What is the meaning of heat of combustion of ethanol ? [2 marks]

- (b) The heat of combustion on ethanol can be determined in the school laboratory.

(i) Draw a labelled diagram to show the set up of apparatus that can be used to determine the heat of combustion of ethanol. [3 marks]

(ii) Based on the diagram in (b) (i), describe briefly how to determine the heat of combustion of ethanol. Your answer should consist of the followings:

- Procedure of the experiment [7 marks]
- Tabulation of data [2 marks]
- Calculation [3 marks]
- Three precautions taken to obtain accurate results. [3 marks]