

4541/1
Chemistry
Kertas 1
September
2008
1 ¼ hrs

**SPM TRIAL EXAMINATION 2008
FOR
SECONDARY SCHOOLS IN ZONE A**

CHEMISTRY

KERTAS 1

Satu jam lima belas minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. This question paper consists of **50** questions.
Kertas soalan ini mengandungi 50 soalan.
2. Answer **all** questions.
Jawab semua soalan.
3. Each question is followed by four alternatives answers, **A, B, C,** or **D.** for each question, choose **one** answer only. Blacken your answer on the objective answer sheet provided.
Tiap-tiap soalan diikuti oleh empat pilihan jawapan iaitu A, B, C dan D. bagi setiap soalan, pilih satu jawapan sahaja. Hitamkan jawapan anda pada kertas jawapan objektif.
4. If you wish to change your answer, erase the blackened mark that you have made. Then blacken the new answer.
Jika anda hendak menukar jawapan, padamkan tanda yang telah dibuat. Kemudian hitamkan jawapan yang baru.
5. The diagrams in the questions provided are not drawn to scale unless stated.
Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.
6. You may use a non-programmable scientific calculator.
Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogram.

Kertas soalan ini mengandungi 20 halaman bercetak

Sarawak Zon A Trial SPM 2008
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<http://www.joshuatly.com/>

- 1 A chlorine atom and a chloride ion
- I are isotopes
 - II have the same number of protons
 - III have the same number of electrons
 - IV have the same number of neutrons
- A II only
 B II and IV only
 C I, II and III only
 D I, III and IV only

2

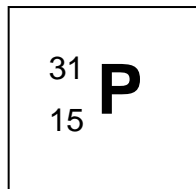


Diagram 1

Which of the following is **true** based on the symbol in Diagram 1?

	Proton Number	Nucleon Number	Number of electron
A	15	31	15
B	15	16	15
C	16	31	16
D	31	15	31

- 3 Table 1 shows the information for two types of particles

Particle	Proton Number	Electron arrangement
A	9	2.8
B	16	2.8.8

Table 1

Based on this information in the table 1, particle A and B are

- A atoms of inert gases
 B negative ions
 C atoms of metals
 D isotopes of the same element

- 4 Element Z has a proton number of 17. it can be deduced that
- A it is located in period 2.
 - B it has 17 valence electrons in the outermost shell.
 - C it has 3 electrons in the outermost shell.
 - D it has 3 occupied shells.
- 5 An element X form a carbonate salt of formula $X_2(CO_3)_3$. What is the possible formula for ion X?
- A X^+
 - B X^{2+}
 - C X^{3+}
 - D X^{4+}
- 6 Diagram 2 shows a reaction of sodium. What is/are the product(s) formed during the reaction ?

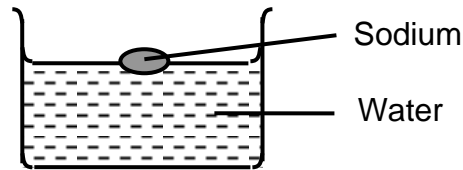


Diagram 2

- A Sodium oxide
 - B Sodium hydroxide
 - C Sodium oxide and hydrogen gas
 - D Sodium hydroxide and hydrogen gas
- 7 Which of the following is true about covalent compounds ?
- A Have low melting and boiling points
 - B Dissolve in both water and kerosene
 - C Formed by the transferring of electrons
 - D Can conduct electricity in all physical states

8 Diagram 3 shows the set up of apparatus for electrolysis.

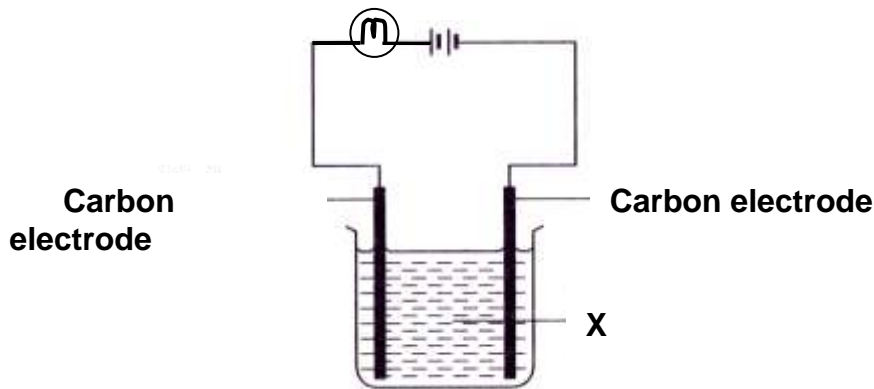


Diagram 3

The bulb is lighted up if X is

- A glucose
 - B tetrachloromethane
 - C methyl propanoate
 - D dilute ethanoic acid
- 9 Which of the following **does not** affect the type of products formed during electrolysis?
- A Type of electrodes used
 - B The voltage of the power supply
 - C Concentration of the ions in the electrolyte
 - D Position of ions in the electrochemical series
- 10 What is the function of cryolite during the extraction of aluminium metal from aluminium oxide?
- A To be used as electrolyte
 - B To increase the yields of reaction
 - C To prevent carbon electrodes from corrode
 - D To lower the melting point of aluminium oxide

11 Diagram 4 shows a simple chemical cell.

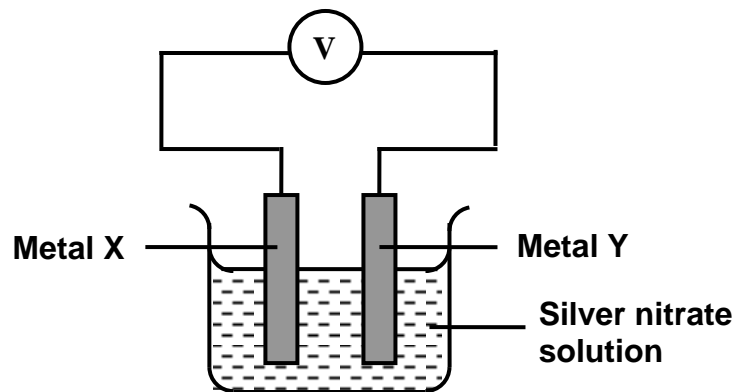


Diagram 4

Which of the following pairs of metal will produce the highest potential differences?

	Metal X	Metal Y
A	Zinc	Silver
B	Lead	Silver
C	Aluminium	Silver
D	Magnesium	Silver

- 12 The pH value of 1 mol dm^{-3} aqueous sodium hydroxide solution is higher than of 1 mol dm^{-3} aqueous ammonia. This is due to
- A the molar mass of sodium hydroxide is larger than ammonia
 - B sodium hydroxide is more soluble in water than ammonia.
 - C higher concentration of hydroxide ions in sodium hydroxide solution.
 - D The degree of dissociation in ammonia is higher than sodium hydroxide
- 13 Which of the statements about 1 mol dm^{-3} of ammonia solution is **incorrect**?
- A The ammonia solution contains molecules only
 - B The ammonia solution contains hydroxide ions.
 - C The ammonia solution shows pH value of 12.
 - D It conducts electricity.

- 14 Ammonium nitrate fertilizer is obtained through the reaction between ammonia solution with
- A sodium nitrate solution
 - B nitrogen dioxide gas
 - C dilute sulphuric acid
 - D dilute nitric acid

- 15 Diagram 5 shows the industrial preparation of sulphuric acid through the Contact Process

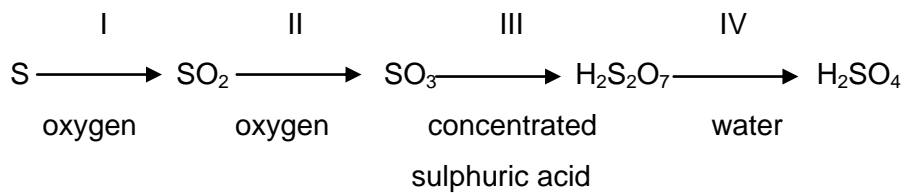
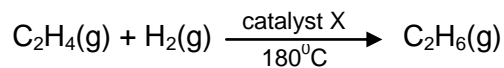


Diagram 5

Which stage involves the use of a catalyst called vanadium(V) oxide ?

- A I
 - B II
 - C III
 - D IV
- 16 Steel is an alloy of iron. Steel is
- I harder
 - II more resistant to rusting
 - III more presentable
 - IV more malleable
- A I and II
 - B II and IV
 - C III and IV
 - D I, II and III

- 17 Which of the following is/are **true** about a catalyst?
- I It speed up a chemical reaction by lowering its activation energy
 - II Only a small quantity of the catalyst is needed
 - III It increases the amount of the product formed.
 - IV It is completely used up in the reaction
- A I only
B I and II only
C I and IV only
D I, II, and III only
- 18 The equation below represents the reaction for the preparation of ethane.



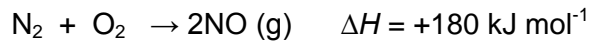
What is catalyst X?

- A Platinum
 - B Phosphoric acid
 - C Aluminium oxide
 - D Concentrated hydrochloric acid
- 19 Latex can be maintained in liquid form by mixing it with
- A formic acid
 - B acetone
 - C aqueous ammonia
 - D ethanol
- 20 An element undergoes reduction when
- A it loses oxygen
 - B it loses electrons
 - C it loses hydrogen
 - D its oxidation number increases

21 Which of the following is a redox reaction?

- A Esterification
- B Hydrolysis
- C Precipitation
- D Displacement

22 During lightning , nitrogen and oxygen can react according to the equation below,



Which of the following is **not** true regarding the reaction?

- A The reaction is endothermic
- B The rate of the reaction is very high
- C Energy is absorbed during the reaction
- D The heat absorbed during the breaking of bonds is more than the heat given out during the formation of bonds

23 Diagram 6 shows the set-up apparatus used to identify exothermic and endothermic reactions.

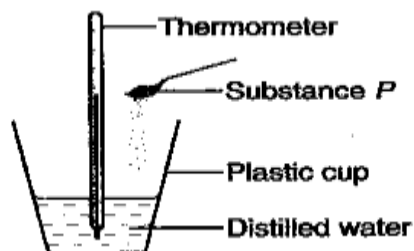


Diagram 6

When substance P is added to the water and the mixture is stirred , the temperature drops.

What is P?

- A Sodium chloride
- B Sodium sulphate
- C Sodium hydroxide
- D Sodium hydrogen carbonate

24 Which of the following substances can be used as a food colouring?

- I Pepper
 - II Acacia gum
 - III Azo compound
 - IV Triphenyl compound
- A** I and II only
B III and IV only
C I, II and III only
D I, II and IV only

25 The following shows the results of an experiment for three chemical cells.

Metal pairs	Negative terminal	Voltage reading / V
P/N	P	1.9
M/N	N	0.8
N/Q	Q	0.4

Which of the following can be deduced from the above results?

- I The cell voltage is 1.5 V when P and Q are used as electrodes
 - II The cell voltage is 1.1 V when P and M are used as electrodes.
 - III M is negative terminal when it is paired with N, P or Q in a cell
 - IV Electrons flow from terminal Q to M in the metal pair Q and M
- A** I only
B I and IV only
C I, II and III only
D I, II, III and IV

- 26 Diagram 7 shows an electron arrangement of ion Q^{2-} .

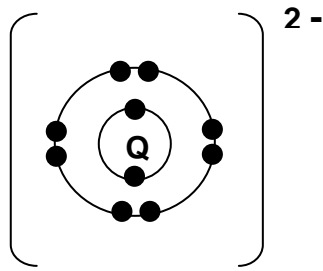


Diagram 7

How many protons and electrons are there in an **atom** of Q?

	Number of Protons	Number of Electrons
A	8	8
B	10	10
C	10	12
D	8	10

- 27 An oxide of element A has an empirical formula of A_xO_y and contains 56.36% of A by mass. What are the values of x and y?
[Relative atomic mass: A = 31, O = 16]

	x	y
A	1	3
B	3	1
C	2	3
D	3	2

- 28 Table 2 shows the proton number for elements W, X, Y and Z.

Element	W	X	Y	Z
Proton number	3	11	13	17

Table 2

Which of the following pair of elements exhibits the same chemical properties?

- A W and X
 - B W and Y
 - C W and Z
 - D X and Z
- 29 Bromine is located below chlorine in Group 17. Which of the following statements is true about bromine?
- A Bromine is more electronegative than chlorine
 - B Bromine has lower density than that of chlorine
 - C Bromine has higher melting point than that of chlorine
 - D Bromine is a better oxidising agent as compared to chlorine
- 30 Compound Z conducts electricity when dissolved in water. It does not conduct electricity in the solid state. Which of the following is most likely compound Z?
- A Ethanol
 - B Acetamide
 - C Rubidium chloride
 - D Disulphur dichloride

31 Diagram 8 shows the electron arrangement of a compound.

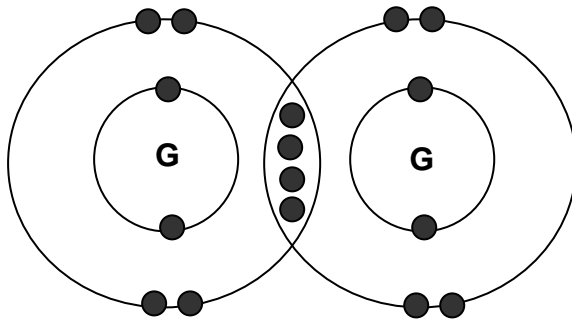
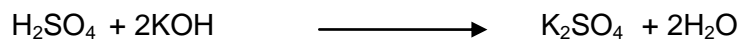


Diagram 8

How many electrons are there in an atom of G?

- A 6
- B 8
- C 10
- D 16

32 The equation below shows the reaction between sulphuric acid and potassium hydroxide solution.



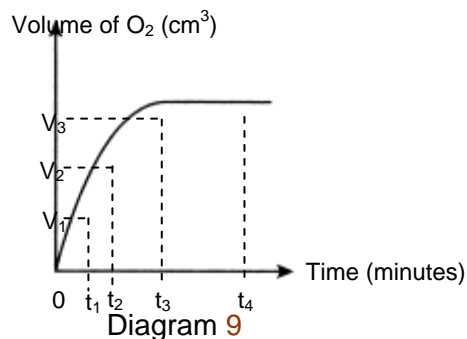
What is the number of moles of potassium sulphate salt produced if 0.8 mol of potassium hydroxide is used?

- A 0.40 mol
- B 0.05 mol
- C 0.22 mol
- D 0.25 mol

33 The following pairs of chemicals are suitable for the preparation of copper(II) sulphate **except**

- A Copper and dilute sulphuric acid.
- B Copper (II) oxide and dilute sulphuric acid
- C Copper (II) carbonate and dilute sulphuric acid
- D Copper (II) hydroxide and dilute sulphuric acid

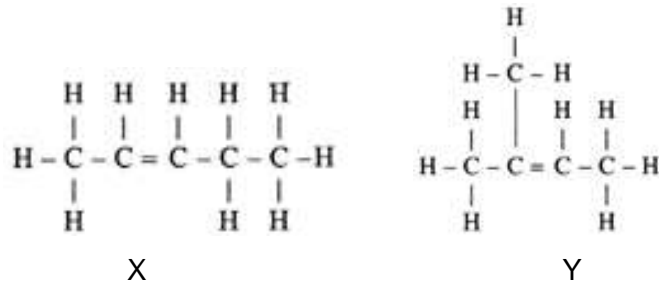
34. Diagram 9 shows the graph obtained when volume of oxygen gas produced from catalysed decomposition of hydrogen peroxide is plotted against time.



Which of the following statement is **true**?

- A Rate of reaction is zero at time t_4 .
- B Rate of reaction increases with time.
- C Rate of reaction is maximum at time t_4 .
- D Rate of reaction at time t_1 is $\frac{V_1}{t_1} \text{ cm}^3 \text{ min}^{-1}$.

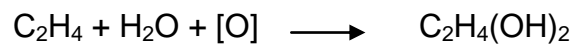
35 The structural formulae of two isomers are as follows.



Which of the following pairs has the correct name of the isomers?

	X	Y
A	Pent-2-ene	2-methylbut-3-ene
B	Pent-2-ene	2-methylbut-2-ene
C	Pent-3-ene	3-methylbut-2-ene
D	Pent-3-ene	3-methylbut-3-ene

36



What is the reagent that can cause the above change?

- A Alcohol
- B Phosphoric acid
- C Sodium hydroxide
- D Acidified potassium manganate (VII)

37 Transition elements usually show more than one stable oxidation numbers.

What are the oxidation numbers of chromium in $\text{Cr}_2\text{O}_7^{2-}$ and CrO_4^{2-} ions?

	$\text{Cr}_2\text{O}_7^{2-}$	CrO_4^{2-}
A	+3	+6
B	+6	+2
C	+6	+6
D	+12	+6

- 38 Fe^{3+} ions can be converted to Fe^{2+} ions by heating with zinc powder. Which of the following can replace zinc powder in this reaction?
- A Chlorine water
 - B Potassium iodide solution
 - C Potassium chloride solution
 - D Acidified potassium dichromate (VI) solution

- 39 Diagram 10 shows an energy level diagram.
- Energy

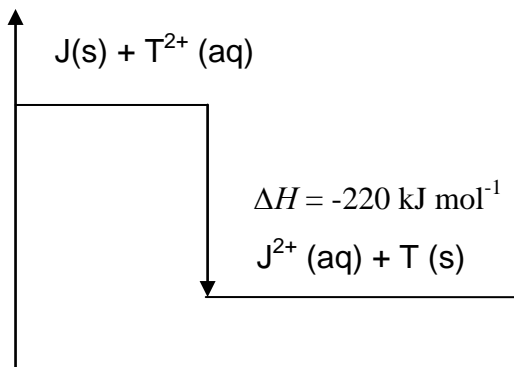


Diagram 10

What is the heat energy change if excess powder of J is added to 50 cm^3 of 0.2 mol dm^{-3} salt solution T?

- A 1.1 kJ
- B 1.5 kJ
- C 2.2 kJ
- D 2.5 kJ

- 40 Diagram 11 shows the set-up apparatus used to determine the heat of combustion of ethanol. The result obtained was different from the theoretical value.

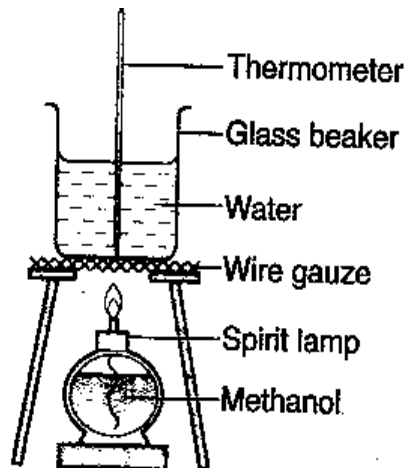


Diagram 11

What should be done to the set-up of the apparatus in order to get a more accurate result in this experiment ?

- I The wire gauze must be removed.
 - II The glass beaker should be replaced by a copper can.
 - III The flame from the spirit lamp must touch the bottom of the beaker.
 - IV The thermometer should not touch the base of the beaker.
- A** I , II and III only
B I , III and IV only
C I , III and IV only
D I , II , III and IV

- 41 The following chemical equation represents the reaction between hydrochloric acid and excess calcium carbonate

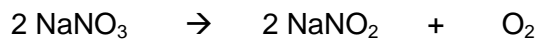


If 18 g of calcium carbonate reacts with 100 cm³ 1.0 mole dm⁻³ hydrochloric acid, what is the mass of the unreacted calcium carbonate?

[Relative atomic mass of : Ca = 40; C = 12; O = 16)

- A** 5 g
- B** 8 g
- C** 10 g
- D** 13 g

- 42 The following equation shows the decomposition reaction of sodium nitrate when heated strongly at room temperature and pressure.



Which of the following is **not** true when 1 mole of sodium nitrate is decomposed?

[Relative atomic mass: Na=23, N=14, O=16 and 1 mole of gas occupies 24 dm³ at room temperature and pressure]

- A 1 mole of sodium nitrite is formed
 - B 1 molecule of oxygen is given off
 - C 69 g of sodium nitrite is formed
 - D 12 dm³ of oxygen is given off
- 43 Calculate the volume of sodium hydroxide of concentration 0.5 mol dm⁻³ needed to neutralize 25.0 cm³ sulphuric acid of concentration 0.2 mol dm⁻³.
- A 10 cm³
 - B 20 cm³
 - C 25 cm³
 - D 50 cm³
- 44 When potassium thiocyanate solution is added to solution X, a blood red solution is formed. Then, solution X is added with silver nitrate solution in another test tube, a white precipitate is formed. Solution X contains
- A FeCl₂
 - B FeCl₃
 - C Fe(NO₃)₃
 - D FeSO₄

- 45 Graph X in Diagram 12 shows the volume of hydrogen gas produced against time for the reaction between 8 g of granulated zinc (in excess) and 50 cm³ of 1 mol dm⁻³ of sulphuric acid.

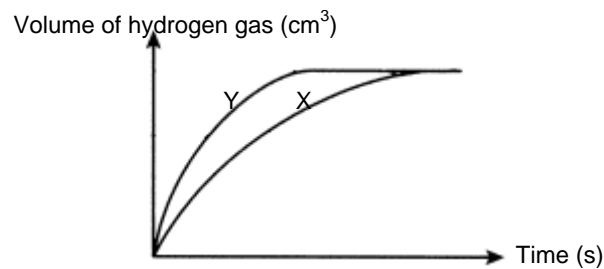
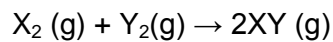


Diagram 12

Which of the following produces graph Y?

- A 8 g zinc powder + 50 cm³ of 2 mol dm⁻³ H₂SO₄
 B 8 g zinc powder + 50 cm³ of 1 mol dm⁻³ H₂SO₄
 C 8 g granulated zinc + 100 cm³ of 1 mol dm⁻³ H₂SO₄
 D 8 g granulated zinc + 50 cm³ of 2 mol dm⁻³ H₂SO₄
- 46 Gas X reacts with gas Y in the following chemical reaction:



Both gas X and Y are stored in a closed container at room temperature. Which of the following can increase the rate of formation of gas XY?

- I Compress the mixture of gas X and Y in container
 II Put the container in hot water
 III Increase the volume of gas X in the container
 IV Increase the volume of gas Y in the container
- A II only
 B II and III only
 C II, III and IV only
 D I, II, III and IV

- 47 Ethane burns completely in air to produce carbon dioxide and water. What is the volume of carbon dioxide gas that is produced at room temperature and pressure when 0.1 mol of ethane gas is burned completely?

[1 mole of gas occupies 24 dm³ at room temperature and pressure]

- A 0.2 dm³
 B 2.4 dm³
 C 4.8 dm³
 D 9.6 dm³
- 48 When ethanol vapour is passed through hot porous clay chips, a gas is produced. Which of the following is **not** the characteristic of the gas?
- A Changes the litmus solution colour to red
 B Decolourises bromine water
 C Decolourises acidified potassium manganate (VII) solution
 D Produces carbon dioxide and water when burned completely
- 49 Diagram 13 shows the process of iron rusting.

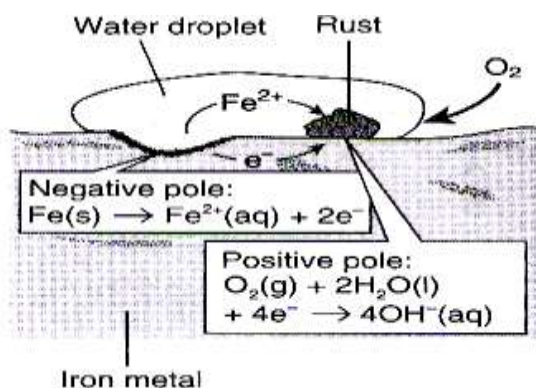


Diagram 13

Which of the following statements is **not** true about this process?

- A Water molecule is reduced to hydroxide ions
 B Oxygen molecule loses electrons to form hydroxide ions
 C Iron atom is oxidised to iron (II) ion
 D Hydroxide ions are formed when water molecules receive electrons

50 When 100 cm^3 of 0.5 mol dm^{-3} sodium hydroxide solution is added to 100 cm^3 of 0.5 mol dm^{-3} nitric acid, $q \text{ kJ}$ of heat energy is released.

Which of the following solutions, when added to 100 cm^3 of 0.5 mol dm^{-3} nitric acid, would also produce $q \text{ kJ}$ of heat ?

- I 50 cm^3 of 0.5 mol dm^{-3} potassium hydroxide solution.
 - II 100 cm^3 of 0.5 mol dm^{-3} potassium hydroxide solution.
 - III 50 cm^3 of 1.0 mol dm^{-3} sodium hydroxide solution.
 - IV 25 cm^3 of 1.0 mol dm^{-3} sodium hydroxide solution.
- A I and II only
 - B I and IV only
 - C II and III only
 - D III and IV only

END OF QUESTION PAPER

4541/2
Chemistry
Kertas 2
September
2008
2½ hrs

NO KAD PENGENALAN

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ANGKA GILIRAN

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Nama: _____

Kelas: 5 _____

**SPM TRIAL EXAMINATION 2008
FOR
SECONDARY SCHOOLS IN ZONE A**

CHEMISTRY

Kertas 2

Dua jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Tulis nombor kad pengenalan dan angka giliran anda pada ruangan yang disediakan.*
2. *Kertas soalan ini adalah dalam Bahasa Inggeris.*
3. *Calon dibenarkan menjawab keseluruhan atau sebahagian soalan sama ada dalam bahasa Inggeris atau bahasa Melayu.*
4. *Calon dikehendaki membaca maklumat di halaman belakang kertas soalan ini.*

Untuk Kegunaan Pemeriksa			
Bahagian	Soalan	Markah Penuh	Markah Diperolehi
A	1	9	
	2	11	
	3	10	
	4	10	
	5	9	
	6	11	
B	7	20	
	8	20	
C	9	20	
	10	20	
Jumlah			

Kertas soalan ini mengalami 18 halaman bercetak.

For
Examiner's
Use

Section A
[60 marks]

Answer **all** questions in this section.

1. (a) Table 1 shows five atoms of elements labelled **A**, **B**, **C**, **D** and **E**.

Atom	Proton number	Number of electrons	Nucleon number
A	11	11	23
B	17	17	35
C	17	17	37
D	18	18	40
E	20	20	40

Table 1

Answer the following questions based on the information given in Table 1 by using the letters as symbols of the elements. These letters are not the actual symbols of the element.

- (a) (i) Among the atoms **A**, **B**, **C**, **D** and **E**, which are isotopes?

1 (a)(i)

1

.....
[1 mark]

- (ii) Give a reason for your answer given in (a)(i).

1 (a)(ii)

1

.....
[1 mark]

- (iii) Do the isotopes show the same chemical properties? Explain your answer.

1 (a)(iii)

2

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

- (b) What is the number of valence electrons for element **C**?

1 (b)

1

.....
[1 mark]

- (c) Both elements **A** and **B** are in the same period in the Periodic Table.

- (i) Which period are they in?

1 (c)(i)

1

.....
[1 mark]

- (ii) Give your reason.

1 (c)(ii)

1

.....
[1 mark]

- (d) Explain why atom **D** is very unreactive towards any chemical.

1 (d)

1

.....
[1 mark]

- (e) Name the type of chemical bond for the compound formed between **C** and **E**.

1 (e)

1

..... [1 mark]

Total

4541/2

9

For
Examiner's
Use

2. (a) (i) Calculate the relative molecular mass of water.
[Relative atomic mass : H, 1; O, 16]

[1 mark]

2 (a)(i)

	1
--	---

- (ii) Determine the mass of one water molecule .
[Avogadro constant = $6.02 \times 10^{23} \text{ mol}^{-1}$]

[2 marks]

2 (a)(ii)

	2
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- (iii) A bottle contains 500 cm^3 of water. Calculate the number of moles of water.
[Density of water is 1 g cm^{-3}]

[1 mark]

2 (a)(iii)

	1
--	---

- (b) The following is the composition by mass of an organic compound **W**.

52.2% carbon 13.0% hydrogen 34.8 % oxygen
--

- (i) Determine the empirical formula of compound **W**.

[3 marks]

2 (b)(i)

	3
--	---

For
Examiner's
Use

- (b) (ii) 0.30 mole of compound **W** has a mass of 13.8 g. Determine the molar mass of compound **W**.

2 (b)(ii)

2

[2 marks]

- (iii) Determine the molecular formula of compound **W**.

2 (b)(iii)

2

[2 marks]

Total

11

3. Diagram 1 shows the set-up of apparatus to investigate electrolysis of $0.001 \text{ mol dm}^{-3}$ and 2 mol dm^{-3} hydrochloric acid using carbon electrodes.

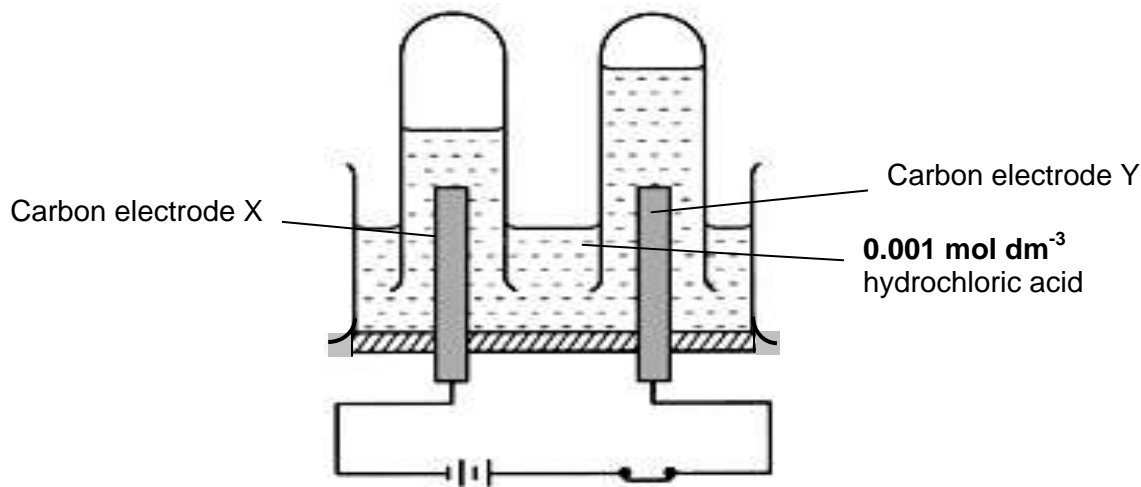


Diagram 1

Experiment I : Electrolysis of $0.001 \text{ mol dm}^{-3}$ hydrochloric acid

Experiment II : Electrolysis of 2 mol dm^{-3} hydrochloric acid

For **Experiment I**,

- (a) (i) write the formula for all the ions present in $0.001 \text{ mol dm}^{-3}$ hydrochloric acid.

.....
[1 mark]

- (ii) which ion is discharged at electrode Y? Explain why.

.....
[2 marks]

- (iii) name the gas collected at electrode Y.

.....
[1 mark]

- (iv) state how you would confirm the gas liberated at electrode Y.

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

3 (a)(i)

1

3 (a)(ii)

2

3 (a)(iii)

1

3 (a)(iv)

2

For
Examiner's
Use

3 (a)(v)

	1
--	---

(v) write the half-equation to represent the reaction at electrode Y.

.....
[1 mark]

For **Experiment II**,

3 (b)(i)

	1
--	---

(b) (i) what would you observe at electrode X?

.....
[1 mark]

3 (b)(ii)

	1
--	---

(ii) what is the redox process that occurs at electrode X?

.....
[1 mark]

3 (b)(iii)

	1
--	---

(iii) state the energy change that occurs in electrolysis.

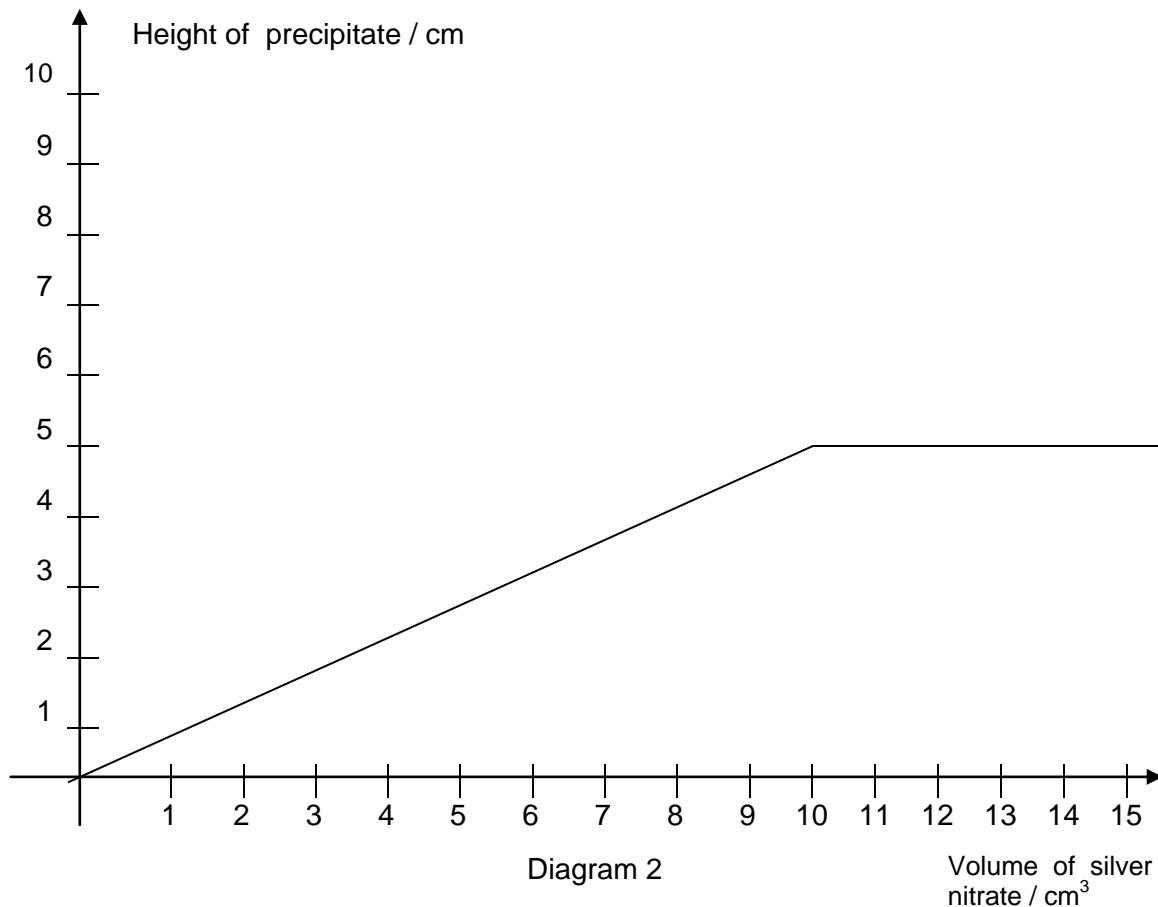
.....
[1 mark]

Total

	10
--	----

4. 10.0 cm^3 of 3.0 mol dm^{-3} aqueous solution of Y chloride, YCl , (Y is a metal) is poured into each of the 8 similar test tubes. Different volumes of 3.0 mol dm^{-3} silver nitrate, AgNO_3 solution are added into each test tube. The mixture is shaken and left to settle. A graph of the height of precipitate formed against volume of silver nitrate solution is shown in Diagram 2.

For
Examiner's
Use



- (a) (i) What is the colour of the precipitate formed?

4 (a)(i)

1

.....
[1 mark]

- (ii) Based on the information given, name the precipitate formed.

4 (a)(ii)

1

.....
[1 mark]

- (iii) Write an ionic equation for the formation of the precipitate in (a) (ii).

4 (a)(iii)

1

.....
[1 mark]

For
Examiner's
Use

- (b) What is the number of moles of Y chloride in 10.0 cm³ of 3.0 mol dm⁻³ of Y chloride solution ?

4 (b)

	2
--	---

[2 marks]

- (c) What is the volume of silver nitrate that will react completely with 10.0 cm³ of 3.0 mol dm⁻³ Y chloride solution?

4 (c)

	1
--	---

.....

.....

[1 mark]

- (d) How many mole of silver nitrate will react with one mole of Y chloride?

4 (d)

	2
--	---

[2 marks]

- (e) 10.0 cm³ of silver nitrate solution is added to 10.0 cm³ of the Y chloride solution in a test tube. The precipitate obtained is filtered.

State the observation obtained if the precipitate is exposed to sunlight for a few hours.

4 (e)

	1
--	---

.....

[1 mark]

- (f) Metal Y is lower than lead in the electrochemical series. State one observation that you could obtain when a piece of lead strip is placed in the filtrate.

4 (f)

	1
--	---

.....

[1 mark]

Total

	10
--	----

For
Examiner's
Use

5.

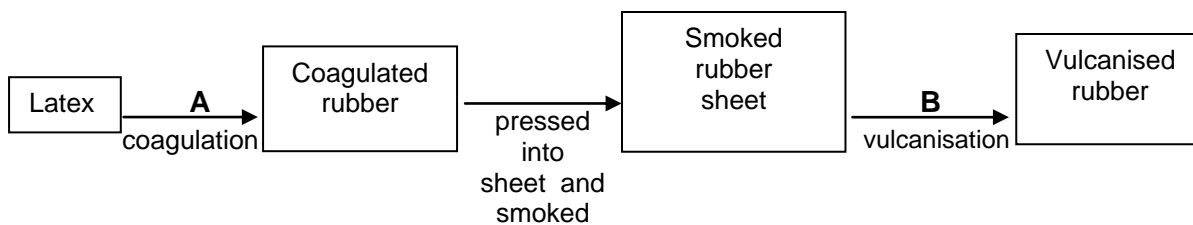


Diagram 3

- (a) Name the monomer of natural rubber.
.....
[1 mark]
- (b) State the reaction in which the monomers are joined together to form natural rubber.
.....
[1 mark]
- (c) Name the chemicals **A** and **B** in Diagram 3.
A :
B :
[2 marks]
- (d) Why do particles of rubber repel each other in latex ?
.....
[1 mark]
- (e) What happens to the polymers of rubber during vulcanisation ?
.....
[1 mark]
- (f) State **one** property of vulcanised rubber.
.....
[1 mark]
- (g) Why does latex coagulate after a few days ?
.....
[1 mark]
- (h) Name **one** chemical substance added to latex to prevent coagulation.
.....
[1 mark]

5 (a)

	1
--	---

5 (b)

	1
--	---

5 (c)

	2
--	---

5 (d)

	1
--	---

5 (e)

	1
--	---

5 (f)

	1
--	---

5 (g)

	1
--	---

5 (h)

	1
--	---

Total

	9
--	---

For
Examiner's
Use

6. Diagram 4 shows an experimental set-up to investigate the reaction between potassium iodide solution and chlorine water through the transfer of electrons at a distance.

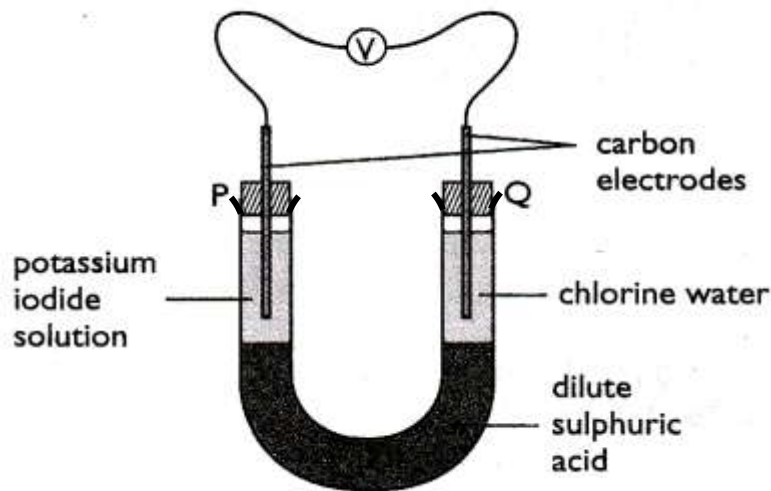


Diagram 4

- 6 (a)(i) 1 (a) (i) What is the energy change that occurs in this experiment ?
.....
[1 mark]
- 6 (a)(ii) 1 (ii) State the type of cell represented by the set-up of apparatus in Diagram 4.
.....
[1 mark]
- 6 (b)(i) 1 (b) (i) What is the change in colour of the solution around electrode P ?
.....
[1 mark]
- 6 (b)(ii) 2 (ii) Give a chemical test to confirm the product formed at electrode P.
.....
[2 marks]
- 6 (b)(iii) 1 (iii) Write the half-equation for the reaction that occurs at electrode P.
.....
[1 mark]
- 6 (c)(i) 1 (c) (i) Name the process that occurs at electrode Q.
.....
[1 mark]
- 6 (c)(ii) 1 (ii) Write the half-equation for the reaction that occurs at electrode Q.
.....
[1 mark]

(d) Write the overall ionic equation for the reaction that occurs in this experiment.

.....
[1 mark]

6 (d)

1

(e) Name the oxidising agent in this reaction.

.....
[1 mark]

6 (e)

1

(f) Suggest another reagent that can replace chlorine water.

.....
[1 mark]

6 (f)

1

Total

11

Section B

[20 marks]

Answer any **one** question from this section.

7. Table 2 shows the chemical symbols which represent three elements, P, Q, and R.

	Proton number	Nucleon number
P	3	7
Q	9	19
R	6	12

Table 2

- (a) (i) Write the electron arrangement of atoms Q and R. [2 marks]
- (ii) State the number of neutrons in an atom of element R and write the symbol for another isotope of element R. [2 marks]
- (b) The reaction between Q and R forms a compound. Based on the above statement, explain how this compound is formed. [8 marks]
- (c) State and explain how the reactivity of Group 1 and Group 17 elements change when going down the group. [8 marks]

8. Electroplating can be used to coat an iron key with a thin coat of nickel.

(a) Explain how you can carry out the process.

[7 marks]

(b) (i) State **one** purpose for electroplating the iron key.

[1 mark]

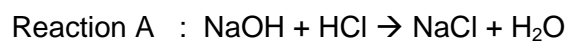
(ii) Besides electroplating, state another method which can have the same effect on the iron key as mentioned in (b)(i).

[1 mark]

(c) (i) What is meant by **redox** reaction ?

[2 marks]

(ii)



Which of the above reaction is a redox reaction ? Explain why.

[9 marks]

Section C

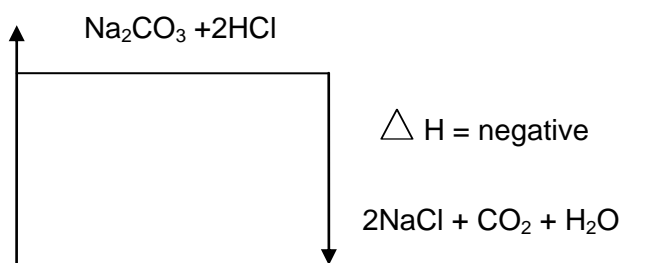
[20 marks]

Answer any **one** question from this section.

9. Diagram 5 shows the energy level for two different reactions.

Experiment 1

Energy

**Experiment 2**

Energy

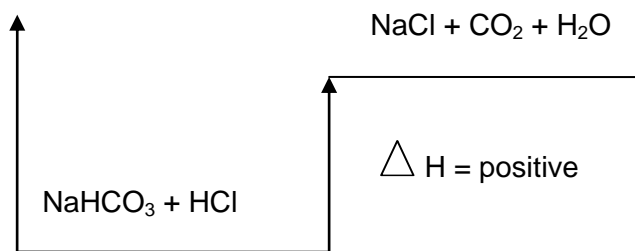


Diagram 5

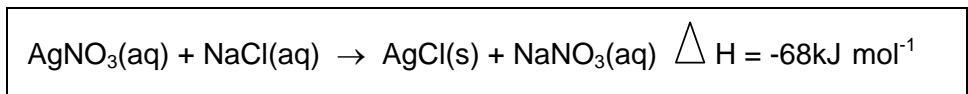
- (a) (i) Compare the energy level for the reactants and products for the two experiments above. State the types of reactions for each experiment.

[4 marks]

- (ii) Chemical reactions involve the breaking and formation of bonds. Explain the two types of reactions in (a) (i) in terms of breaking and formation of bonds.

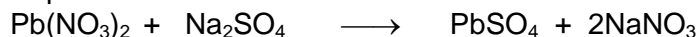
[6 marks]

(b) The thermochemical equation for the precipitation of silver chloride is as shown below:



- (i) What is the meant by *heat of precipitation* of silver chloride? [2 marks]
- (ii) When sodium chloride solution is replaced by hydrochloric acid of the same concentration and volume, the heat of precipitation remains unchanged. Explain this observation. [3 marks]
- (iii) In another experiment to determine the heat of precipitation of lead (II) sulphate, 50.0 cm³ of 2.0 mol dm⁻³ of lead(II) nitrate solution is reacted with 50.0 cm³ of 2.0 mol dm⁻³ of sodium sulphate solution. The increase in temperature of the mixture is 10 °C.

The equation for the reaction is :



Calculate the value of the heat of precipitation of lead(II) sulphate in this reaction.

[Specific heat capacity of water is 4.2 J g⁻¹°C⁻¹]

[5 marks]

10. (a) Using suitable examples, explain why an alloy is harder than the pure metal . [6 marks]
- (b) (i) State **two** reasons for using food additives in food processing. [2 marks]
- (ii) State **two** types of food additives. Give an example for each food additive and explain their function. [6 marks]
- (c) (i) What is soap ? [2 marks]
- (ii) State **two** differences between soap and detergent. [4 marks]

INFORMATION FOR CANDIDATES

1. This question paper consists of three sections : **Section A**, **Section B** and **Section C**.
2. Answer **all** questions in **Section A**. Write your answers for **Section A** in the spaces provided in this question paper.
3. Answer **one** question from **Section B** and **one** question from **Section C**. Write your answers for **Section B** and **Section C** on your own writing paper. You may use equations, diagrams, tables, graphs and other suitable methods to explain your answers.
4. The diagrams in the questions are not drawn to scale unless stated.
5. Marks allocated for each question or sub-part of a question are shown in brackets.
6. Show your working, it may help you to get marks.
7. If you wish to change your answer, cross out the answer that you have done. Then write down the new answer.
8. The Periodic Table of Elements is provided on the last page of this examination booklet.
9. You may use a non-programmable scientific calculator.
10. You are advised to spend 90 minutes to answer questions in **Section A** , 30 minutes for **Section B** and 30 minutes for **Section C**.
11. Hand in your answer sheets for Section B and C together with this question paper to the invigilator at the end of the examination.

4541/3
Chemistry
Kertas 3
September
2008
1½ hrs

NO KAD PENGENALAN

							-							
--	--	--	--	--	--	--	---	--	--	--	--	--	--	--

ANGKA GILIRAN

--	--	--	--	--	--	--	--	--	--

Nama: _____

Kelas: 5 _____

**SPM TRIAL EXAMINATION 2008
FOR
SECONDARY SCHOOLS IN ZONE A**

CHEMISTRY

KERTAS 3

Satu jam tiga puluh minit

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIBERITAHU

1. *Tulis nama dan kelas anda pada ruangan yang disediakan.*
2. *Calon dikehendaki membaca maklumat di muka surat 2.*

<i>Untuk Kegunaan Pemeriksa</i>		
Soalan	Markah Penuh	Markah Diperolehi
1	24	
2	9	
3	17	
JUMLAH	50	

Kertas soalan ini mengandungi 7 halaman bercetak.

INFORMATION FOR CANDIDATES

1. *This question paper consists of **three** questions. Answer **all** questions.
Kertas soalan ini mengandungi tiga soalan. Jawab semua soalan.*
2. *Write your answers for **Question 1** and **Question 2** in the spaces provided in the question paper.
Jawapan anda bagi soalan 1 dan Soalan 2 hendaklah ditulis pada ruang yang disediakan dalam kertas soalan ini.*
3. *Write your answer for **Question 3** on foolscap papers provided in detail.
Jawapan anda bagi soalan 3 hendaklah ditulis dalam helaian tambahan.*
4. *Show your working. It may help you to get marks.
Tunjukkan langkah pengiraan dengan jelas. Ini turut akan menyumbangkan markah.*
5. *If you wish to cancel any answer, neatly cross out the answer.
Jika anda hendak menukar jawapan, batalkan jawapan yang telah dibuat. Kemudian tulis jawapan yang baru.*
6. *The diagrams in the questions are not drawn to scale unless stated.
Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.*
7. *Marks allocated for each question or part question are shown in brackets.
Markah yang diperuntukkan bagi setiap soalan atau ceraihan soalan ditunjukkan dalam kurungan.*
8. *The time suggested to answer **Question 1** and **Question 2** is **45 minutes** and **Question 3** is **45 minutes**.
Masa yang dicadangkan untuk menjawab Soalan 1 dan Soalan 2 ialah 45 minit serta Soalan 3 ialah 45 minit.*
9. *You may use a non-programmable scientific calculator.
Anda dibenarkan menggunakan kalkulator saintifik yang tidak boleh diprogram.*

Marks awarded:

Mark	Description
3	Excellent : The best response
2	Satisfactory : An average response
1	Weak : An inaccurate response
0	No response <u>or</u> wrong response

For
Examiner's
Use

- 1 An experiment is carried out to determine the concentration of nitric acid. 25 cm^3 0.10 mol dm^{-3} potassium hydroxide solution is titrated with nitric acid from a burette. Phenolphthalein is used as an indicator. Figure 1 shows the initial and final readings of the three titrations carried out.

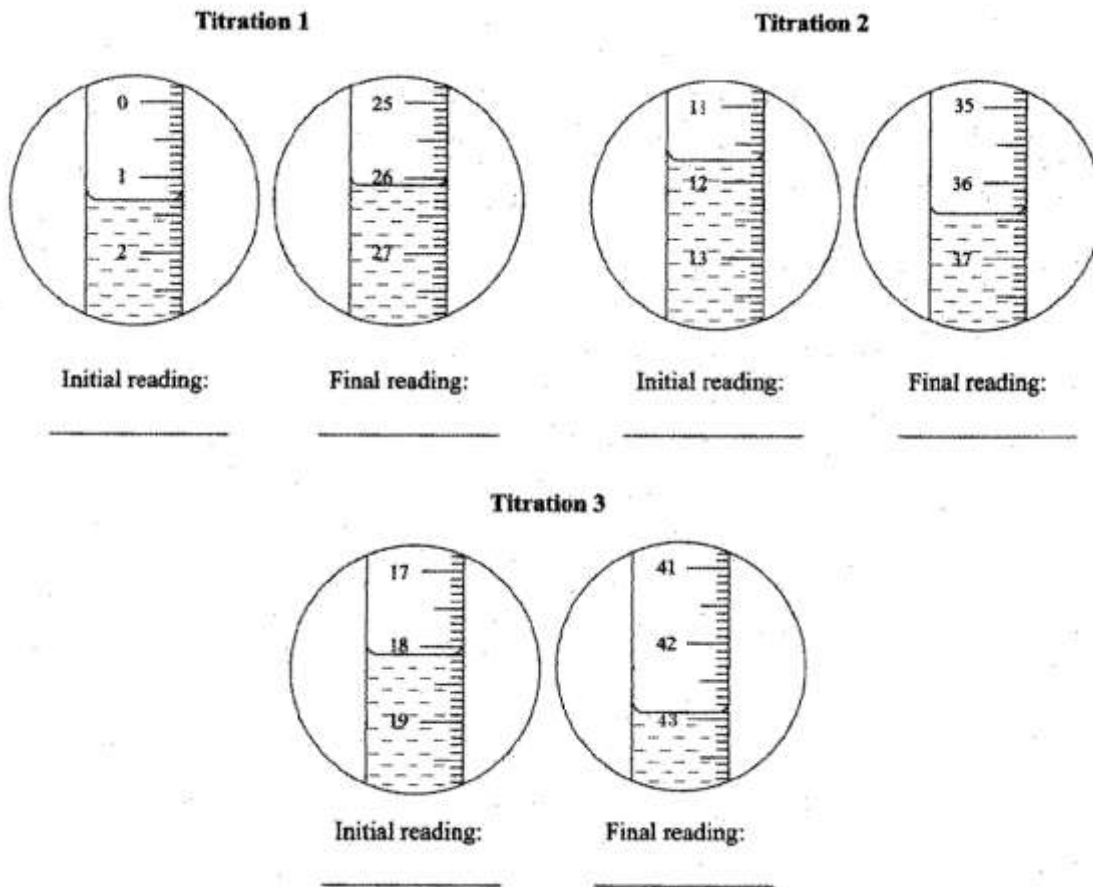


Figure 1

- (a) Record the readings for each titration in the spaces provided in Figure 1.

[3 marks]

1(a)

- (b) A change in the colour of phenolphthalein indicator is observed at the end point.

- (i) State the colour change.

[3 marks]

1(b)(i)

For
Examiner's
Use

(ii) State the inference that can be made from your answer in 1(b)(i).

[3 marks]

1(b)(ii)

(iii) State the operational definition for *end point* in this titration.

[3 marks]

1(b)(iii)

(c) Construct a table to show all the data in each of these titrations.

1(c)

[3 marks]

(d) Calculate the concentration of nitric acid that is used in this experiment.

1(d)

[3 marks]

For
Examiner's
Use

(e) If the titration of the 25 cm^3 of 0.10 mol dm^{-3} potassium hydroxide is repeated using 0.10 mol dm^{-3} sulphuric acid instead of nitric acid,

(i) predict the volume of the sulphuric acid needed to achieved the end point.

[3 marks]

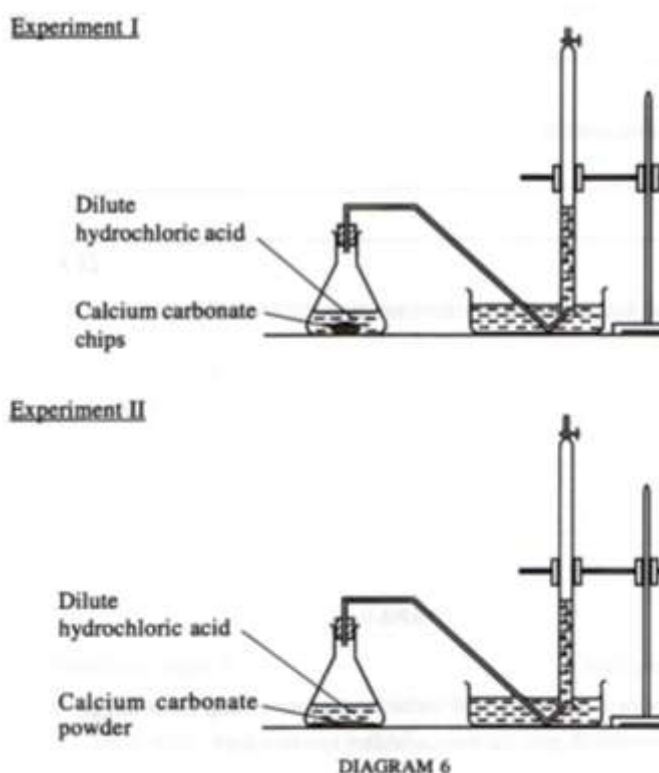
1(e)(i)

(ii) classify the following acids as either monoprotic or diprotic acid : sulphuric acid, hydrochloric acid and nitric acid.

[3 marks]

1(e)(ii)

2 A group of students carried out two experiments. In Experiment I, 50 cm^3 of 0.2 mol dm^{-3} hydrochloric acid reacted with 5 g of calcium carbonate chips. In Experiment II, 50 cm^3 of 0.2 mol dm^{-3} hydrochloric acid reacted with 5 g of calcium carbonate powder. The burette reading and the volume of gas released is recorded every 30 seconds.



For
Examiner's
Use

(a) State the hypothesis for the above experiment.

2(a)

[3 marks]

(b) State the variables in this experiment.

Manipulated variable :

Responding variable :

2(b)

Fixed variable :

[3 marks]

(c) Sketch a graph to show the change in volume of carbon dioxide produced against time on the same axes for Experiment I and Experiment II.

2(c)

[3 marks]

3 Alcohols have high fuel values because a lot of heat energy is released when burnt in excess oxygen.

You are required to plan a laboratory experiment to determine the heat of combustion for different alcohols.

Your planning should include the following:

- (i) Statement of the problem
- (ii) All the variables
- (iii) Hypothesis
- (iv) List of materials and apparatus
- (v) Procedure
- (vi) Tabulation of data

[17 marks]

END OF QUESTION PAPER

**SPM TRIAL EXAMINATION 2008
FOR
SECONDARY SCHOOLS IN ZONE A**

CHEMISTRY

PAPER 1

ANSWERS

FOR EXAMINER'S USE

1	B	11	D	21	D	31	B	41	D
2	A	12	C	22	B	32	A	42	B
3	B	13	A	23	D	33	A	43	B
4	D	14	D	24	B	34	A	44	B
5	C	15	B	25	B	35	B	45	B
6	D	16	D	26	A	36	D	46	D
7	A	17	B	27	C	37	C	47	C
8	D	18	A	28	A	38	B	48	A
9	B	19	C	29	C	39	C	49	B
10	D	20	A	30	C	40	D	50	C

4541/2
Chemistry
Paper 2
Marking Scheme
September
2008

**SPM TRIAL EXAMINATION 2008
FOR
SECONDARY SCHOOLS IN ZONE A**

CHEMISTRY

PAPER 2

MARKING SCHEME

FOR EXAMINER'S USE

Question No.	Explanation	Mark	Σ Mark
1. (a)(i)	B and C	1	
(a)(ii)	B and C have the same proton number // number of protons but different nucleon number // number of neutrons.	1	
(a)(iii)	Yes, because both the isotopes have the same number of valence electrons // 7 valence electrons.	2	4
(b)	1 // one	1	1
(c)(i)	Period 4	1	
(c)(ii)	Atoms of elements A and B have 3 shells filled with electrons // 3 occupied electron shells. Reject: 3 occupied shells / 3 electron shells.	1	2
(d)	Atom D has an electron arrangement of 2.8 // very stable octet electron arrangement.	1	1
(e)	Ionic / Electrovalent bond	1	1
			9

Question No.	Explanation	Mark	Σ Mark																				
2.																							
(a)(i)	Relative molecular mass of water, $H_2O = 2(1) + 1(16)$ $= 18$	1																					
(a)(ii)	Mass of 1 mole of water is 18 g 6.02×10^{23} water molecules have a mass of 18 g. Mass of one water molecule = $\frac{18}{6.02 \times 10^{23}}$ g $= 2.99 \times 10^{-23}$ g	1 1																					
(a)(iii)	Mass of water = $500 \text{ cm}^3 \times 1 \text{ g cm}^{-3} = 500 \text{ g}$ Number of moles of water = $\frac{500}{18} = 27.77 / 27.8 \text{ mol}$	1	4																				
(b)(i)	The mass of the elements in 100g of W is : <table border="1" data-bbox="358 1003 1144 1381"> <thead> <tr> <th>Element</th> <th>C</th> <th>H</th> <th>O</th> </tr> </thead> <tbody> <tr> <td>Mass / g</td> <td>52.2</td> <td>13.0</td> <td>34.8</td> </tr> <tr> <td>Number of moles</td> <td>$\frac{52.2}{12} = 4.35$</td> <td>$\frac{13}{1} = 13$</td> <td>$\frac{34.8}{16} = 2.175$</td> </tr> <tr> <td>Ratio of moles</td> <td>$\frac{4.35}{2.175} = 2$</td> <td>$\frac{13}{2.175} = 6$</td> <td>$\frac{2.175}{2.175} = 1$</td> </tr> <tr> <td>Simplest ratio of moles</td> <td>2</td> <td>6</td> <td>1</td> </tr> </tbody> </table>	Element	C	H	O	Mass / g	52.2	13.0	34.8	Number of moles	$\frac{52.2}{12} = 4.35$	$\frac{13}{1} = 13$	$\frac{34.8}{16} = 2.175$	Ratio of moles	$\frac{4.35}{2.175} = 2$	$\frac{13}{2.175} = 6$	$\frac{2.175}{2.175} = 1$	Simplest ratio of moles	2	6	1	1 1	
Element	C	H	O																				
Mass / g	52.2	13.0	34.8																				
Number of moles	$\frac{52.2}{12} = 4.35$	$\frac{13}{1} = 13$	$\frac{34.8}{16} = 2.175$																				
Ratio of moles	$\frac{4.35}{2.175} = 2$	$\frac{13}{2.175} = 6$	$\frac{2.175}{2.175} = 1$																				
Simplest ratio of moles	2	6	1																				
(b)(ii)	The empirical formula of compound W is C_2H_6O . 0.30 mole of W has a mass of 13.8 g 1 mole of W has a mass of $\frac{13.8}{0.30} = 46 \text{ g}$ The molar mass of W is 46 g mole^{-1} .	1 1 1																					

Question No.	Explanation	Mark	Σ Mark
(b)(iii)	Molecular formula = (Empirical formula) _n $46 = n [2(12) + 6(1) + 1(16)]$ $46 = 46n$ $n = 1$ \therefore The molecular formula for W is C ₂ H ₆ O.	1 1	7 11

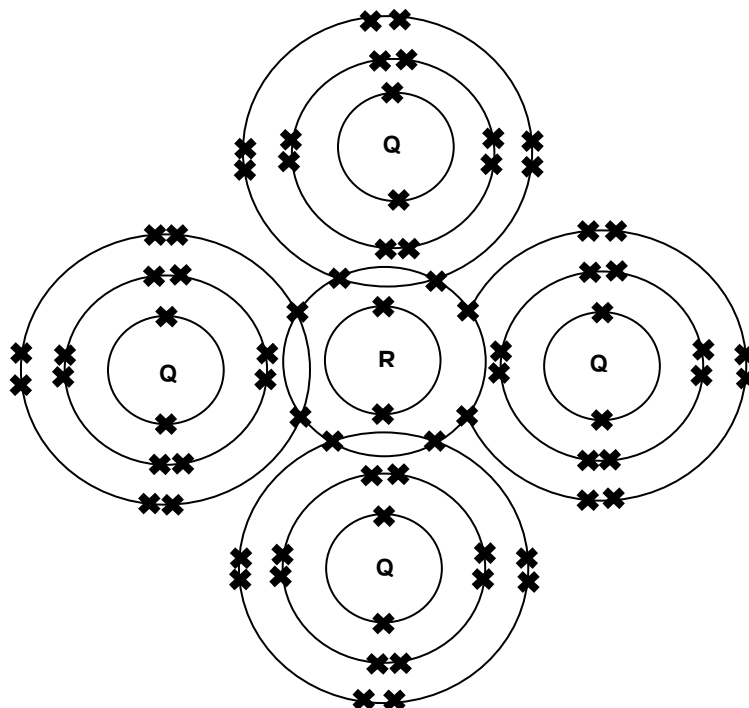
Question No.	Explanation	Mark	Σ Mark
3.			
(a)(i)	H ⁺ , OH ⁻ , Cl ⁻	1	
(a)(ii)	OH ⁻ ion is selectively discharged because OH ⁻ ion is placed lower than Cl ⁻ ion in the electrochemical series.	1 1	
(a)(iii)	Oxygen gas.	1	
(a)(iv)	Lower a glowing wooden splinter into the test tube filled with gas Y. The glowing wooden splinter rekindles / relights.	1 1	
	Procedure: [1 mark] Observation: [1 mark]		
(a)(v)	$4\text{OH}^- \rightarrow 2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}^-$	1	7
(b)(i)	Effervescence / bubbles of greenish-yellow gas is released at the cathode.	1	
(b)(ii)	Oxidation.	1	
(b)(iii)	From electrical energy to chemical energy.	1	3
			10

Question No.	Explanation	Mark	Σ Mark
4.			
(a)(i)	White.	1	
(a)(ii)	Silver chloride.	1	
(a)(iii)	$\text{Ag}^+ + \text{Cl}^- \rightarrow \text{AgCl}$	1	3
(b)	10 cm ³ of 3 mol dm ⁻³ of YCl contains 10 X 3 / (1000) = 0.03 mol of YCl	1 1	2
(c)	10 cm ³	1	1
(d)	The number of mole of silver nitrate = MV/1000 = 3 X 10/(1000)=0.03 mole of silver nitrate. 0.03 mole of silver nitrate will react with 0.03 mole of YCl 1 mole of silver nitrate will react with 1 mole of YCl.	1 1	2
(e)	White precipitate will change colour to grey.	1	
(f)	A brown solid is formed // Blue solution fades // becomes colourless // Lead strip dissolves // becomes thinner.	1	2
			10

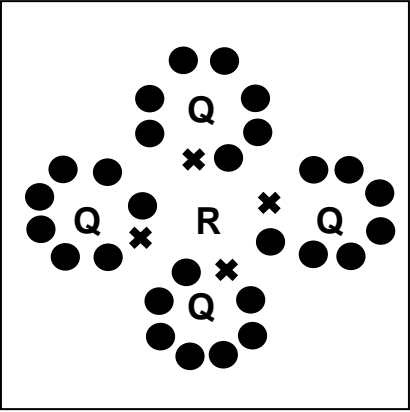
Question No.	Explanation	Mark	Σ Mark
5. (a)	Isoprene / 2-methylbuta-1,3-diene.	1	1
(b)	Polymerisation	1	1
(c)	A : Methanoic acid / Formic acid / acid B : Sulphur // Disulphur dichloride // sulphur monochloride in methyl benzene.	1 1	2
(d)	Particles of rubber are enclosed by negatively-charged protein membrane.	1	1
(e)	Sulphur atoms form cross-linkages between the polymers of rubber.	1	1
(f)	More resistant to oxidation // More elastic // More heat resistant // Less soluble in organic solvent // High melting and boiling point. (Any one answer)	1	1
(g)	Bacteria in latex produces acid that neutralises the negative charges on the particles of rubber.	1	1
(h)	Ammonia solution // Alkaline solution	1	1
			9

Question No.	Explanation	Mark	Σ Mark
6.			
(a)(i)	Chemical energy to electrical energy.	1	
(a)(ii)	Chemical cell.	1	2
(b)(i)	From colourless to pale yellow / brown	1	
(b)(ii)	Add a few drops of starch solution // 1 cm ³ of 1,1,1-trichloroethane / tetrachloromethane to the product in a test tube and shake the test tube. A dark blue precipitate / colouration is obtained. // The 1,1,1-trichloroethane / tetrachloromethane / bottom layer will turn purple	1	
(b)(iii)	$2I^- \rightarrow I_2 + 2e^-$	1	4
(c)(i)	Reduction	1	
(c)(ii)	$Cl_2 + 2e^- \rightarrow 2Cl^-$	1	2
(d)	$Cl_2 + 2I^- \rightarrow I_2 + 2Cl^-$	1	1
(e)	Chlorine water	1	1
(f)	Bromine water / Bromine / Any other named oxidising agents.	1	1
			11

Question No.	Explanation	Mark	Σ Mark
7.			
(a) (i)	1. The electron arrangement of atom Q : 2.7 // 2,7 2. The electron arrangement of atom R : 2.4 // 2,4	1 1	2
(a)(ii)	1. The number of neutrons in atom R is 6 2. Symbol for Isotope of R : ${}^{13}_6\text{R}$ // ${}^{14}_6\text{R}$	1 1	2
(b)	1. Element Q and R forms covalent bond. 2. Atom Q has an electron arrangement of 2.8.7 / 2,8,7 3. Atom R has an electron arrangement of 2.4 / 2,4. 4. To achieve the stable octet electron arrangement, atom R shares electrons with atom Q. 5. One atom R contributes 4 electrons. 6. Each atom Q contributes one electron. 7. Atom R shares four of its valence electrons each with 4 atoms of Q to form a covalent compound / molecule with the formula RQ_4 .	1 1 1 1 1 1 1	



Note : X represents electron

	<p>OR</p> <div style="text-align: center;">  </div> <p>(c) For Group 1 elements ,</p> <ol style="list-style-type: none"> 1. Going down the group, atomic size increases // the valence electron becomes further away from the nucleus. 2. Forces of attraction between the protons / nucleus and the valence electron becomes weaker. (Reject : electron shell.) 3. It is easier for the atom to donate / release the valence electrons. 4. Reactivity increases down the group // <p style="text-align: center;"> Reactivity Increases / More Reactive _____→ </p> <p style="text-align: center;">Lithium , Sodium , Potassium , Rubidium , Caesium , Francium // Li , Na , K , Rb , Cs , Fr</p> <p>For Group 17 elements ,</p> <ol style="list-style-type: none"> 5. Atomic size increases when descending the group // the valence electrons becomes further away from the nucleus. 6. Forces of attraction between the protons / nucleus and the valence electrons become weaker. 7. It is more difficult for the atom to accept / gain / receive electrons. 8. Reactivity decreases down the group // <p style="text-align: center;"> Reactivity decreases / Less Reactive _____→ </p> <p style="text-align: center;">Fluorine , Chlorine , Bromine, Iodine, Astatine // F₂ , Cl₂ , Br₂ , I₂ , As₂</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p>8</p> <p>8</p> <p>20</p>
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Question No.	Explanation	Mark	Σ Mark
8. (a)	1. The iron key is connected to the negative terminal of the cell // becomes the cathode.	1	7
	2. A piece of nickel metal is connected to the positive terminal of the cell // becomes the anode.	1	
	3. The iron key and nickel metal are immersed in nickel(II) nitrate solution.	1	
	4. When the circuit is complete, the nickel anode will ionize // $\text{Ni} \rightarrow \text{Ni}^{2+} + 2\text{e}^-$	1	
	5. Nickel(II) ions will move to the cathode.	1	
	6. At the cathode, nickel(II) ions will be discharged by accepting electrons and form nickel atoms $\text{Ni}^{2+} + 2\text{e}^- \rightarrow \text{Ni}$	1	
	7. Nickel atoms will be deposited on the iron key / cathode.	1	
(b)(i)	To prevent rusting of the iron key // improve the appearance of the iron key.	1	1
(b)(ii)	By painting the surface of the iron key with paint // By alloying the iron key with other metals such as chromium // **By coating the iron key with oil or grease. **accepted only for (b) (i) To prevent rusting of the iron key	1	1
(c)(i)	1. Redox reaction is a chemical reaction involving oxidation and reduction	1	2
	2. occurring simultaneously / at the same time	1	
(c)(ii)	For reaction A : $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$		3
	1. There is no change in the oxidation number	1	
	2. of all elements // sodium, oxygen, hydrogen and chlorine.	1	
	3. Thus, Reaction A is not a redox reaction.	1	

	<p>For reaction B : $\text{Mg} + \text{CuSO}_4 \rightarrow \text{MgSO}_4 + \text{Cu}$</p> <p style="text-align: center;">$\text{Mg} \rightarrow \text{Mg}^{2+} // \text{Mg} \rightarrow \text{MgSO}_4$</p> <p>1. Oxidation no. of Mg : 0 +2 // 0 +2</p> <p>2. Oxidation no. of Mg / Magnesium increases</p> <p>3. Mg / Magnesium undergoes oxidation // Mg / Magnesium is oxidised.</p> <p style="text-align: center;">$\text{Cu}^{2+} \rightarrow \text{Cu} // \text{CuSO}_4 \rightarrow \text{Cu}$</p> <p>4. Oxidation no of Cu : +2 0 // +2 0</p> <p>5. Oxidation no. of Cu / Copper decreases</p> <p>6. Cu / Copper undergoes reduction // Cu / Copper is reduced.</p> <p>7. Hence, reaction B is a redox reaction.</p> <p style="text-align: right;">(Maximum 6 marks)</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>	<p style="text-align: center;">6</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;">20</div>
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Question No.	Explanation	Mark	Σ Mark
(b)(i)	Heat of precipitation of silver chloride is the heat change when one mole of the silver chloride is formed / precipitated from the reaction between silver and chloride ions.	1 1	2
(b)(ii)	1. Both sodium chloride and hydrochloric acid dissociate completely in water to produce chloride ions. 2. Sodium chloride and hydrochloric acid of the same volume and concentration produces the same amount / number of moles of chloride ions // number of chloride ions. 3. The number of moles of silver chloride formed is the same.	1 1 1	3
(b)(iii)	1. Number of mole of lead (II) nitrate / $\text{Pb}(\text{NO}_3)_2 = \frac{50 \times 2}{1000}$ = 0.1 mol // Number of mole of sodium sulphate / $\text{Na}_2\text{SO}_4 = \frac{50 \times 2}{1000}$ = 0.1 mol 2. 1 mol of lead (II) nitrate, $\text{Pb}(\text{NO}_3)_2$ // 1 mol of sodium sulphate, Na_2SO_4 produces 1 mol of lead(II) sulphate, PbSO_4 0.1 mol lead (II) nitrate, $\text{Pb}(\text{NO}_3)_2$ // 0.1 mol of sodium sulphate, Na_2SO_4 produces 0.1 mol lead (II) sulphate, PbSO_4 3. Heat change = $100 \times 4.2 \times 10$ = 4200 J / 4.2 kJ 4. Heat of precipitation of $\text{PbSO}_4 = - \frac{4200}{0.1} / - \frac{4.2}{0.1}$ = - 42000 J mol ⁻¹ // - 42 kJ mol ⁻¹ (correct answer with correct unit and negative sign)	1 1 1 1 1 1	5
			20

	Colourings [1 mark]	Food look more attractive. [1 mark]	Tartrazine / caramel Azo compounds //Triphenyl compounds // Brilliant Blue [1 mark]	3	
	Antioxidants [1 mark]	Prevent / slow down oxidation of food // Prevent food from becoming rancid / brown / developing black spots. [1 mark]	Ascorbic acid / Vitamin C / Tocopherol / vitamin E / Sodium citrate / BHA / BHT [1 mark]	3	
	Stabilisers [1 mark]	Prevent emulsion from separating out // Stabilise emulsions // Prevent the separation of oil and water. [1 mark]	Lecithin / monoglycerides / diglycerides of fatty acids [1 mark]	3	
	Thickeners [1 mark]	To thicken food. [1 mark]	Acacia gum // Pectin / Agar-agar/ gelatine / modified starch //corn flour [1 mark]	3	6
(c)(i)	Soap is sodium or potassium salt of long-chain fatty / carboxylic acids.			1 1	2

(c)(ii)	Any two from the following:			
	Soap	Detergent		
	1. Not effective in hard / acidic / sea water.	1. Effective in hard / acidic / sea water.	2	
	2. Not very soluble in water.	2. Highly soluble in water.	2	
	3. Biodegradable / does not cause water pollution.	3. Some detergent is not biodegradable / causes water pollution.	2	
	4. Less versatile // cannot be adapted to different varieties of fibres / washing temperatures and water conditions.	4. Can be formulated to meet different varieties of fibres / washing temperatures and water conditions.	2	
	5. Not toxic to aquatic lives.	5. May be toxic to aquatic lives.	2	4
			20	

4541/3
Chemistry
Paper 3
Marking Scheme
September
2008

**SPM TRIAL EXAMINATION 2008
FOR
SECONDARY SCHOOLS IN ZONE A**

CHEMISTRY

PAPER 3

MARKING SCHEME

FOR EXAMINER'S USE

Question No.	Rubric [KK0503 – Measure and Using Number]	Maximum Score
1 (a)	[Able to record the initial and final burette readings correctly and accurately (with 2 decimal points), with correct units for all the 3 titrations.] Answers : Titration 1 Titration 2 Titration 3 Initial burette reading = 1.30 cm ³ 11.70 cm ³ 18.10 cm ³ Final burette reading = 26.10 cm ³ 36.40 cm ³ 42.90 cm ³	3
	[Able to record the initial and final burette readings correctly with correct unit but with 1 decimal point.] Or [Able to record the initial and final burette readings correctly and accurately (with 2 decimal points) but with no units.] Answers : Titration 1 Titration 2 Titration 3 Initial burette reading = 1.3 cm ³ 11.7 cm ³ 18.1 cm ³ Final burette reading = 26.1 cm ³ 36.4 cm ³ 42.9 cm ³ Or Titration 1 Titration 2 Titration 3 Initial burette reading = 1.30 11.70 18.10 Final burette reading = 26.10 36.40 42.90	2
	[Able to record the initial and final burette readings of any one of the titration with 2 decimal points and correct unit.] Answers : Titration 1 or Titration 2 or Titration 3 Initial burette reading = 1.30 cm ³ 11.70 cm ³ 18.10 cm ³ Final burette reading = 26.10 cm ³ 36.40 cm ³ 42.90 cm ³ OR Correct burette readings, but based on the upper meniscus.	1
	[No response or wrong response]	0

1 (b)(i)	Rubric [KK0501 –Making Observation]	
	[Able to state the observation correctly] Eg. From pink to colourless.	3
	[Able to state the final colour correctly] Eg. Change to colourless	2
	[Able to express idea on the observation] Eg. Pink colour	1
	[No response or wrong response]	0

1 (b)(ii)	Rubric [KK0504 –Making Inference]	
	[Able to explain the observation] Eg. All the hydroxide ions in the potassium hydroxide solution have reacted completely with the hydrogen ions from the nitric acid.	3
	[Able to explain the observation less accurately] Eg. The acid neutralises all the alkali.// A neutral solution is formed.	2
	[Able to express the idea to explain the observation] Eg. No more acid /alkali present in the conical flask.	1
	[No response or wrong response]	0

1 (b)(iii)	Rubric [KK0509-Define Operationally]	
	[Able to explain accurately the meaning of end point in the titration.] Answer : The stage of titration when the phenolphthlein changes colour from pink to colourless.	3
	[Able to explain less accurately the meaning of end point in the titration.] Answer : The stage of titration when the volume of acid added neutralises all the alkali completely. // Point in neutralization in which the acid-base indicator changes colour.	2
	[Able to explain vaguely the the meaning of end point in the titration.] Answer : The acid neutralises the base / alkali // The acid changes the colour of the indicator.	1
	[No response or wrong response]	0

1(c)	Rubric [KK0506 –Communication]																									
	[Able to construct a table which contain 4 of the following :] 1. Titration number 2. Initial Burette readings (with unit) 3. Final Burette readings (with unit) 4. Volume of acid required (with unit) *data ecf from 1(a)	3																								
	<table border="1"> <thead> <tr> <th>Titration</th> <th>1</th> <th>2</th> <th>3</th> </tr> </thead> <tbody> <tr> <td>Final burette reading (cm³)</td> <td>26.10</td> <td>36.40</td> <td>42.90</td> </tr> <tr> <td>Initial burette reading (cm³)</td> <td>1.30</td> <td>11.70</td> <td>18.10</td> </tr> <tr> <td>Volume of acid used (cm³)</td> <td>24.80</td> <td>24.70</td> <td>24.80</td> </tr> <tr> <td>Average volume of acid used (cm³)</td> <td colspan="3">24.77</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Titration	1	2	3	Final burette reading (cm ³)	26.10	36.40	42.90	Initial burette reading (cm ³)	1.30	11.70	18.10	Volume of acid used (cm ³)	24.80	24.70	24.80	Average volume of acid used (cm ³)	24.77							
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Average volume of acid used (cm ³)	24.77																									
Same as score 3 except without units or item 1	2																									
[Able to have the idea of constructing a table at least 2 x 2 // wrong units for volume]	1																									
[No response or wrong response]	0																									

1(d)	Rubric [KK0508 – Interpreting Data]	
	Correct balanced chemical equation Steps and answer correct with appropriate unit Suggested Answer : $\text{HNO}_3 + \text{KOH} \rightarrow \text{KNO}_3 + \text{H}_2\text{O}$ $M_A \qquad \qquad M_B = 0.10$ $V_A = 24.77 \quad V_B = 25.0$ (average) $\frac{M_A V_A}{M_B V_B} = \frac{1}{1} \qquad M_A = 0.1009 \text{ mol dm}^{-3}$ Ecf from 1(c)	3
	Steps and answer correct with correct chemical equation but with no or wrong unit	2
	Correct chemical equation // wrong answer with appropriate unit	1
	[No response or wrong response]	0

1(e)(i)	Rubric [KK0505 – Making Prediction]	
	[Able to predict the required volume of sulphuric acid accurately] Eg. 12.30 cm ³	3
	[Able to predict the volume of hydrochloric acid used correctly but with no unit / one decimal place.] Answers : 12.30 // 24.60 ÷ 2 // 12.3 cm ³ Or half the volume of the acid.	2
	[Able to state that the volume of sulphuric acid used is less than 24.60 cm ³ or less than the volume of nitric acid used]	1
	[No response or wrong response]	0

1(e)(ii)	Rubric [KK0502 – Classifying]							
	[Able to classify the acids given into monoprotic acid and diprotic acid correctly.]	3						
	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Monoprotic acid</th> <th>Diprotic acid</th> </tr> </thead> <tbody> <tr> <td>Nitric acid</td> <td>Sulphuric acid</td> </tr> <tr> <td>Hydrochloric acid</td> <td></td> </tr> </tbody> </table>	Monoprotic acid	Diprotic acid	Nitric acid	Sulphuric acid	Hydrochloric acid		
	Monoprotic acid	Diprotic acid						
	Nitric acid	Sulphuric acid						
Hydrochloric acid								
[Able to classify any two out of three acids given correctly.]	2							
[Able to classify any one out of three acids given correctly.]	1							
	[No response or wrong response]	0						

2 (a)	Rubric [KK0506 – Making Hypothesis]	
	[Able to state the hypothesis accurately] Suggested answer: The bigger the total surface area of the marble chips, the higher the rate of reaction/ volume of gas collected per unit time // The smaller the size of marble chips, the higher the rate of reaction/ volume of gas collected per unit time	3
	[Able to state the hypothesis less accurately] Suggested answer: The bigger the total surface area of the marble chips the faster the rate of reaction. The higher the rate of reaction, the bigger the total surface area. Or negative hypothesis.	2
	[Able to express idea about hypothesis] Eg. The surface area of the marble chips affects the rate of reaction.	1
	[No response or wrong response]	0
2 (b)	Rubric [KK0510 – Controlling Variables]	
	[Able to state all the three variables correctly] Eg. (i) Manipulated variable: The size / the total surface area of marble chips (ii) Responding variable : Rate of reaction // volume of gas collected per unit time (iii) Controlled variable : Concentration of hydrochloric acid, volume of hydrochloric acid, mass of marble chips, temperature. (any 2)	3
	[Able to state any two of the variables correctly]	2
	[Able to state any one of the variables correctly]	1
	[No response or wrong response]	0

2 (c)		3
	Correct graph but labelled wrongly /axis without units or label	2
	Wrong shape but with correct labelled axes. Correct graph with wrong axes.	1
	[No response or wrong response]	0

3 (i)	[Able to give the statement of problem correctly] Example: Does an alcohol with a higher number of carbon atoms per molecule has a higher heat of combustion? Or Does the heat of combustion of alcohol increases when the number of carbon atoms per molecule increases ?	3
	[Able to give the statement of problem less correctly] Example: Do different alcohols have different heat of combustion?	2
	[Able to give an idea about the statement of problem] Example: How to determine the heat of combustion of alcohol? Aim: To determine the heat of combustion for different alcohols .	1
	[No response or wrong response]	0

3 (ii)	[Able to state all variables correctly]	
	Example: Manipulated variable : Different types of alcohols / the number of carbon atoms per molecule of alcohol Example : methanol, ethanol, propanol, butanol Responding variable : Heat of combustion Controlled variable : Volume of water/ size of copper can /Thermometer	3
	[Able to state any two variables above correctly]	2
	[Able to state any one variable above correctly]	1
	[No response or wrong response]	0

3 (iii)	[Able to state the hypothesis correctly]	
	Example : The higher the number of carbon atoms per molecule of alcohols , the higher the heat of combustion.	3
	[Able to state the hypothesis less correctly]	
	Example : The larger the molar mass of an alcohol, the higher the heat of combustion. Or The higher the heat of combustion, the higher the number of carbon atoms per molecule of alcohols. Or negative hypothesis Or The number of carbon atoms per molecule of alcohol is propotional to the heat of combustion.	2
	[Able to give an idea about the hypothesis]	
	Example : Different alcohols have different heats of combustion.	1
	[No response or wrong response]	0

3 (iv)	<p>[Able to give the list of materials and apparatus completely]</p> <p>Example : List of materials :- Methanol, ethanol, propanol, butanol and water List of apparatus :- Copper can, tripod stand, thermometer, 100 cm³ measuring cylinder, spirit lamp, weighing balance, wooden block and wind shield</p>	3
	<p>[Able to give the list of materials and apparatus correctly but not completely]</p> <p>Example : List of materials :- Methanol, ethanol, propanol, butanol List of apparatus :- Copper can, thermometer, measuring cylinder, spirit lamp,</p> <p>Or Combined list of materials and apparatus given.</p>	2
	<p>[Able to give an idea about the list of materials and apparatus]</p> <p>Example : List of materials :- Two types of alcohols (methanol/ethanol/propanol/butanol) List of apparatus :- Copper can, thermometer</p>	1
	[No response or wrong response]	0

3 (v)	<p>[Able to state all procedures correctly]</p> <p>Example :</p> <ol style="list-style-type: none"> 1. Using a measuring cylinder, measure 200 cm³ of water and pour into a copper can. 2. Place the copper can on a tripod stand. 3. Measure the initial temperature of the water and record the reading in a table. 4. Pour 50 cm³ of methanol, CH₃OH into a spirit lamp and then weigh the lamp and its content. Record the mass. 5. Put the lamp on a wooden block and light up the wick of the lamp immediately. 6. Stir the water continuously until the temperature of the water increases by about 30°C. 7. Put off the flame and record the highest temperature reached by the water. 8. Weigh the lamp and its content immediately and record its reading. 9. Repeat steps 1 to 8 replacing methanol with ethanol, propanol and butanol. 	3
	<p>[Able to state part of the procedures correctly]</p> <p>Example :</p> <p>Steps 1, 3, 4, 5, 7, 8, 9</p>	2
	<p>[Able to state idea of the experiment]</p> <p>Example :</p> <p>Steps 1, 3, 9 and any other one step.</p>	1
	<p>[No response or wrong response]</p>	0

3 (vi)	<p>[Able to exhibit the tabulation of data correctly] Tabulation of data has the following elements :- 1. 5 columns and 7 rows. 2. Table contains all correct headings and units. Example :</p> <table border="1" data-bbox="360 294 1156 840"> <thead> <tr> <th>Alcohol</th> <th>Methanol</th> <th>Ethanol</th> <th>Propanol</th> <th>Butanol</th> </tr> </thead> <tbody> <tr> <td>Initial temperature of water/$^{\circ}\text{C}$</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Highest temperature of water/$^{\circ}\text{C}$</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Increase in temperature/$^{\circ}\text{C}$</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Mass of lamp before burning/g</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Mass of lamp after burning/g</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Mass of alcohol burnt/g</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Alcohol	Methanol	Ethanol	Propanol	Butanol	Initial temperature of water/ $^{\circ}\text{C}$					Highest temperature of water/ $^{\circ}\text{C}$					Increase in temperature/ $^{\circ}\text{C}$					Mass of lamp before burning/g					Mass of lamp after burning/g					Mass of alcohol burnt/g					3
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	<p>[Able to exhibit the tabulation of data less correctly] Tabulation of data has the following elements :- 1. 5 columns and 5 rows. 2. Table contains five correct headings without units. Example :</p> <table border="1" data-bbox="360 1029 1156 1480"> <thead> <tr> <th>Alcohol</th> <th>Methanol</th> <th>Ethanol</th> <th>Propanol</th> <th>Butanol</th> </tr> </thead> <tbody> <tr> <td>Initial temperature of water</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Highest temperature of water</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Mass of lamp before burning</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Mass of lamp after burning</td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	Alcohol	Methanol	Ethanol	Propanol	Butanol	Initial temperature of water					Highest temperature of water					Mass of lamp before burning					Mass of lamp after burning					2										
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	<p>[Able to an idea about the tabulation of data] Tabulation of data has the following elements :- 1. 3 columns and 2 rows. 2. Table contains one correct heading without unit. Example :</p> <table border="1" data-bbox="360 1669 847 1806"> <thead> <tr> <th>Alcohol</th> <th>Methanol</th> <th>Ethanol</th> </tr> </thead> <tbody> <tr> <td>Initial temperature of water</td> <td></td> <td></td> </tr> </tbody> </table>	Alcohol	Methanol	Ethanol	Initial temperature of water			1																													
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	[No response or wrong response]	0																																			

(possible marks 18, max marks 17)