SPM 2008 [4541/1] [4541/2] [4541/3]

Chemistry

Analisis Mata Pelajaran

Analysis of Chemistry
(2004 - 2007)

YEAR / TOPICS	PAPER 1				PAPER 2				PAPER 3			
	04	05	06	07	04	05	06	07	04	05	06	07
Form 4												
Introduction to chemistry												
The structure of the atom	7	6	4	6	1	1		1	1	1	1	
Chemical formulae and questions	4	6	6	6		½	1	1				
Periodic table of elements	2	3	3	3		1		1				
Chemical bonds	2	1	2	1			1	1				
Electrochemistry	3	3	5	3	1	½				1	1	1
Acids and bases	5	4	3	4			1			½		
Salts	1	-	2	-	1	1		1		½		
Manufactured substances in industry	4	3	4	3			1	1	1			
Form 5												
Rate of reaction	4	5	4	4			1	1		1		
Carbon compounds	6	7	6	7	1			1	1			1
Oxidation and reduction	6	7	4	6	1			1	1		1	
Thermo chemistry	4	4	5	5	1	2						1
Chemical for consumer	2	1	2	2	1	1	1	1				

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SOALAN ULANGKAJI SPM 2008
CHEMISTRY
Paper 1
Nov./Dis

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1. Answer all the questions

2. Think thoroughly before answering any of the questions. If you need to change your answer, erase the answer properly and thoroughly before remarking the question sheet.

This question paper contains 7 printed pages and 0 non printed pages

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Instruction : For Question 1 to 50, each question is followed by four options, A, B, C and D. Choose one correct answer for each question and blacken the corresponding space in your objective answer sheet.

1. Diagram 1 shows the set-up of the apparatus for electrolysis

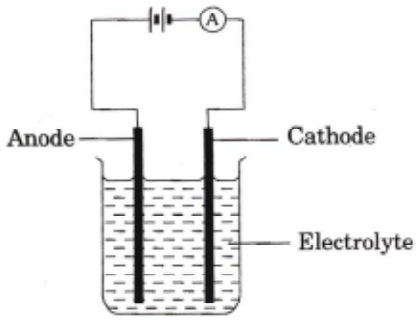


Diagram 1

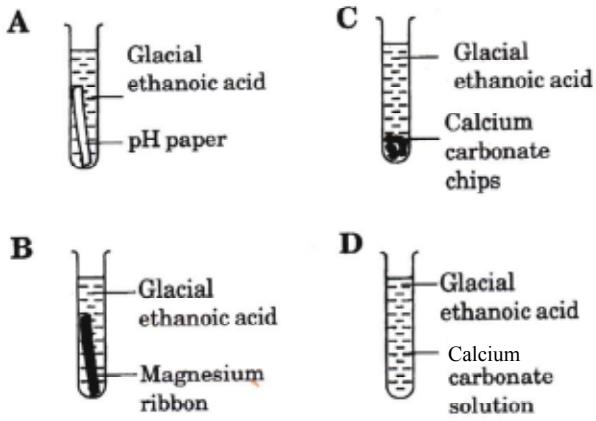
Which of the following compounds could be used as an electrolyte ?

A Ethanol
B Kerosene
C Naphthalene
D Ethanoic acid

2. Which of the following is true about acids.
   A Acids react with metal to produce salt and water
   B Acids react with bases to produce salt and hydrogen gas
   C Acids react with metal oxide to produce salt, water, and hydrogen gas
   D Acids react with carbonates of metals to produce salt, water, and carbon dioxide gas.

3. Which of the following substance is a non electrolyte?
   A Molten lead (ii) oxide
   B Aqueous silver nitrate
   C Molten nanphthalene
   D Ammonia in water

4. Glacial ethanoic acid is put into four test tubes A, B, C and D. In which test tube does a reaction occur?



5. Which of the following is a strong alkali ?
   A Magnesium hydroxide
   B Calcium hydroxide
   C Aqueous ammonia
   D Potassium hydroxide

6. Diagram2 shows the formation of ammonia through the Haber process

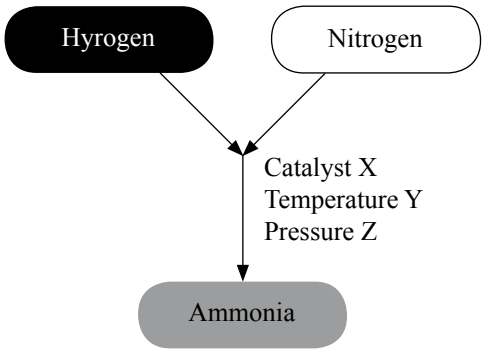


Diagram 2

Which of the following represent catalyst X, temperature Y and pressure Z?

Catalyst X	Temperature Y, ºC	Pressure Z/atm
A Vanadium(V) oxide	550	200
B Nickel	300	100
C Iron	200	450
D Iron	450	300

7. $SO_2 \xrightarrow{X} SO_3 \xrightarrow{Y} H_2S_2O \xrightarrow{Z} H_2SO_4$

The figure above represents the manufacture of sulphuric acid by the Contact Process. What do the letters X, Y and Z represent ?

	X	Y	Z
A	Oxygen	Concentrated sulfuric acid	Water
B	Oxygen	concentrated sulphuric acid	Catalyst
C	Oxygen	Water	Concentrated sulfuric acid
D	Catalyst	Oxygen	Concentrated sulfuric acid

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8. Which of the following substances can be used to compare the chemical properties of hexane and hexene?
   I Lime water
   II Liquid Bromine
   III Dilute sulphuric acid
   IV Acidified potassium manganate (VII)

   A I and III only
   B II and IV only
   C II, III and IV only
   D I, II, III and IV

9. Ethanol undergoes complete combustion when it burns in excess air to produce
   A Water and carbon dioxide gas
   B Water, carbon and carbon dioxide gas
   C Water, carbon monoxide gas and carbon dioxide gas
   D Water, carbon, carbon monoxide gas and carbon dioxide gas

10. Diagram 3 shows the change of the state of matter

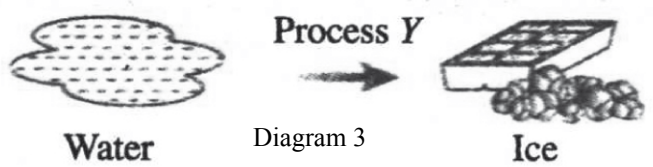


Diagram 3

Which of the following is process Y?
   A Sublimation
   B Boiling
   C Freezing
   D Condensation

11. Which of the following has the same number of molecules as 80 g of magnesium oxide?
   A 44 g carbon dioxide gas
   B 4 g hydrogen gas
   C 6 g helium gas
   D 58.5 g sodium chloride

12. Which of the following contains 6.02 x 10^{23} molecules? [Relative atomic mass : H,1; N, 14; O, 16, Avogadro constant: 6.02 x 10^{23}]
   I 1.5 g of hydrogen gas
   II 1.8 g of water
   III 32 g of oxygen gas
   IV 17 g of ammonia gas

   A I and II only
   B III and IV only
   C II, III and IV only
   D I, II, III and IV

13. What is the meaning of heat of reaction?
   A The change in the energy needed to break the chemical bond
   B The change in the energy contained in the products and in the reactants
   C The energy needed to start a reaction
   D The energy involved when the change of state of the matter happens

14. Which of these chemicals equation is not balanced?
   I $2Pb_3O_4 \rightarrow 6PbO + O_2$
   II $Mg + Fe_2O_3 \rightarrow MgO + 2Fe$
   III $H_2 + S \rightarrow H_2S$
   IV $H_2SO_4 + NaHCO_3 \rightarrow Na_2SO_4 + H_2O + CO_2$

   A IV only
   B I and III only
   C II and IV only
   D I, II, III and IV

15. 10.4g of a sample of chloride of metal M contains 6.85g of metal M. Determine the formula of the metal M chloride. (Relative atomic mass : m,137;cℓ,35.5

   Which of these following statement is true?
   A MCℓ
   B $MC\ell_2$
   C $M_2C\ell$
   D $M_2C\ell_3$

16. Which of the following correctly matches the type of glass and its composition ?

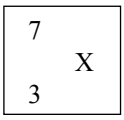
	Glass	Main composition
I	Lead glass	Lead(II) oxide
II	Borosilicate glass	Boron oxide
III	Fused glass	Sodium oxide
IV	Soda-lime glass	Aluminium oxide

   A I and II only
   B I, II and III only
   C II and IV only
   D II, III and IV only

17. Soap is produced in the saporification reaction by

   A heating carboxylic acid with ethanol
   B heating ethanol with acidic potassium dichromate(VI)
   C heating animal oil with sodium hydroxide solution
   D heating palm oil with hydrochloric acid

18. Diagram 4 shows the atomic symbol of element X.



Duagram 4

Which of the following is true about the sub-atomic particles of element X?

	Proton Number	Number of Neutron	Number of electron
A	7	7	10
B	7	7	7
C	3	4	3
D	3	4	2

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19. Chlorine and bromine are in the same Group in the Periodic Table because

A their physical properties are the same
B Both of them are gases at room temperature
C Both of them have 7 valence electrons
D Both of them dissolve in water at the same rate

20. Diagram 5 shows three different alkali metals burning at different rates in bromine gas.

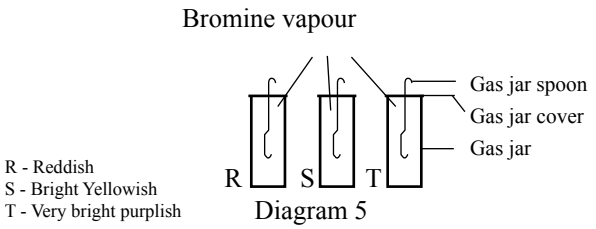

Diagram 5

By observing the brightness and colour of the flames, which metals are present in gas jars R, S and T respectively?

	R	S	T
A	Potassium	Lithium	Sodium
B	Sodium	Potassium	Lithium
C	Lithium	Sodium	Potassium
D	Sodium	Potassium	Lithium

21. The sub-atomic particles that are present in an atom are

I electron
II proton
III neutron
IV nucleon

A 1, II and IV only
B 1, II and III only
C I, III and IV only
D I, II, III and IV

22. Diagram 6 shows a simple voltaic cell. P and Q are electrodes of the an hour for the reaction to occur

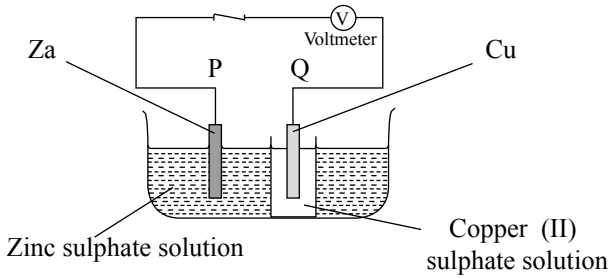

Diagram 6

Which of the following is/are true about the cell?

I Porous pot is used to capture electrons
II Electrode Q becomes thicker
III Electrons flow from Q to P
IV Oxidation process occurs at P

A I and IV only
B II and IV only
C II and III only
D I, II and IV only

23.

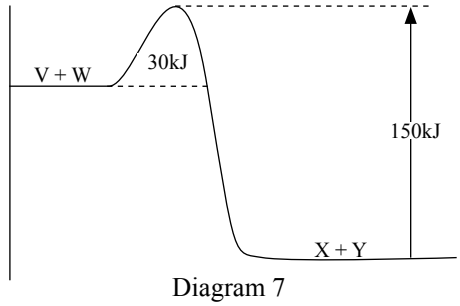

Diagram 7

Diagram 7 shows energy level of reaction which is represented by

V + W X + Y $\Delta H = P$ kJ mol^{-1}

Calculate ~~the value of~~ the heat of reaction

A + 120 kJ mol^{-1}
B + 150 kJ mol^{-1}
C - 120 kJ mol^{-1}
D -150 kJ mol^{-1}

24. When excess zinc powder is put into 50 cm^3 1.0 mol dm^{-3} copper (II) sulphate solution, the temperature of the mixture rises by T ºC. What is the displacement heat for one mole copper displaced ? [Relative formula mass: $CuS0_4$, 160; Specific heat capacity of solution, c: 4.2 J g^{-1} ºC^{-1}]

A $\frac{50 \times T \times 4.2}{1000}$ kJ mol^{-1}

B $\frac{50 \times T \times 4.2 \times 160}{0.5 \times 1000}$ kJ mol^{-1}

C $\frac{50 \times T \times 4.2 \times 1}{0.05 \times 1000}$ kJ mol^{-1}

D $\frac{50 \times T \times 4.2 \times 0.05}{1000}$ kJ mol^{-1}

25. Below is the half-equation of a reaction.

$Cu^{2+} + 2e \rightarrow Cu$

What is meant by reduction reaction based on the equation ?

A Electrons are received by copper
B Electrons are donated by copper
C Electrons are received by copper (II) ions
D Electrons are donated by copper (II) ions

26. Which of the following cannot be prepared by double decomposition method?

I Silver bromide
II Calcium carbonate
III Lead(II) nitrate
IV Lead(II) chloride

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26. Which of the following cannot be prepared by double decomposition method?
I Silver bromide
II Calcium carbonate
III Lead(II) nitrate
IV Lead(II) chloride

27. Sodium hydroxide solution is added in excess to a solution containing lead ion, magnesium ion, iron(II)ion and aluminium ion in four separate test tubes and shaken. Which of the following is the correct observation?

Catalyst X	Observation
A Aluminium	White precipitate. Does not dilute in excess NaOH
B Magnesium	White precipitate. Does not dilute in excess NaOH
C Lead	White precipitate. Does not dilute in excess NaOH
D Iron (II)	Brown precipitate. Does not dilute in excess NaOH

28. Diagram 8 shows the electron arrangement of a compound formed between atoms P and Q .

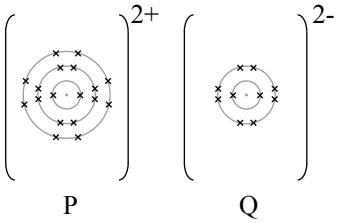


Diagram 8

Which of the following statements is true about the compound?

A There is a strong intermolecular force between particles P and Q
B The compound is formed by sharing the electrons
C The compound conducts electricity in molten state
D It is a covalent compound

29. Diagram 9 shows the set-up of the apparatus used to purify impure copper Stripe.

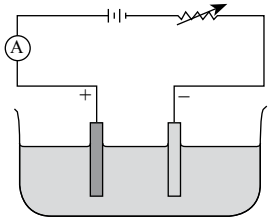
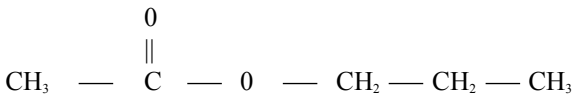


Diagram 9

Which of the following set is suitable to make the process work?

	Anode	Cathode	Electrolyte
A	Impure copper	Pure copper	Dilute hydrochloric acid
B	Impure copper	Pure copper	Copper (II) Chloride solution
C	Impure copper	Carbon	Dilute hydrochloric acid
D	Impure copper	Carbon	Copper (II) Chloride solution

30. The following represents the structural formula of a carbon compound



The compound is produced by the reaction between
A ethanol and propanoic acid
B ethanol and butanoic acid
C propanol and ethanoic acid
D butanol and ethanoic acid

31.

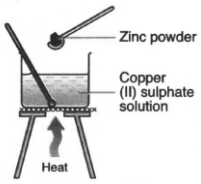


Diagram 10

Based on diagram 10, what is observation after 10 minutes?

A Gas bubbles are released
B Grey precipitate is formed
C Blue colour solution turns colourless
D The concentration of copper ion decreases

32. The tables shows the heat of combustion of three alcohols.

Alcohol	Heat of combustion/kJ mol^{-1}
CH_3OH	-710
C_2H_5OH	-1370
C_4H_9OH	-2670

Which of the following factors increases the heat of combustion of alcohols?

A Size of molecules decreases
B Number of carbon atoms per molecule increases
C Number of oxygen atoms per molecule increases
D Number of hydrogen atoms per molecule decreases

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33. Which of the following compounds is an isomer of heptane?
A 2-methyl pentane
B 2-methyl heptane
C 2,3-dimethyl pentane
D 3,3-dimethye hexane

34. Protein is a polymer that is made up of many units of……
A glycerols
B fatty acids
C amino acids
D monosaccharides

35. Diagram 11 shows information about two types of particle.

Particle	Proton Number	Electron configuration
X	9	2.8
Y	17	2.8.8

Diagram 11

Based on the information in the table, both particles X and Y are
A inert gases
B negative ions
C atoms of metals
D isotopes of the same element

36. Which of the following are uses of an alloy?
I To make ornaments
II To produce superconductors
III To build the bodies of aircrafts

A I and II only
B I and III only
C II and III only
D I, II and III

37. What is the number of molecules in 12 dm^{-3} of oxygen gas, O_2? [1 mole of gas occupies 24 dm^{-3} at room temperature and pressure; Avogadro constant 6.0 x 10^{23} particles]
A 1.5 x 10^{22} molecules
B 1.5 x 10^{23} molecules
C 3 x 10^{23} molecules
D 3x 10^{22} molecules

38. The equation shows the reaction between sulphuric acid and sodium hydroxide.

$$H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$$

What is the volume of 1.0 mol dm^{-3} sodium hydroxide solution which can neutralize 50 cm^3 of 0.5 mol dm^{-3} sulphuric acid ?
A 25 cm^3
B 30 cm^3
C 50 cm^3
D 75 cm^3

39. When sodium metal is left exposed to the air, the grey metal turns white. What inference can be made from this observation?
A Sodium does not rust
B Sodium undergoes oxidation by receiving electrons
C Sodium resistant to corrosion
D Sodium corrodes and gets tarnished

40. Diaram 12 shows the change of ethanol through step I, II and III.

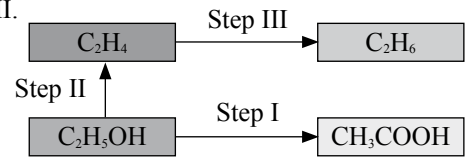

Diagram 12

Which of the following processes are applicable for step I, II and III?

	R	S	T
A	Oxidation	Dehydration	Hydrogenation
B	Reduction	Hydration	Hydrogenation
C	Esterification	Dehydration	Hydration
D	Dehydration	Oxidation	Reduction

41. The following chemical equation shows the reaction between stearate ions, $CH_3(CH_2)_{16}COO^-$ and alkyl sulphate ions, $ROSO_3^-$ with calcium ions, Ca^{2+} in hard water. R represents the hydrocarbon long chain.

$$2CH_3(CH_2)_{16}COO^-(aq) + Ca^{2+}(aq)$$
$$\downarrow$$
$$[CH_3(CH_2)_{16}COO]_2Ca(s)$$

$$ROSO_3^- Na^+(aq) + Ca^{2+}(aq)$$
$$\downarrow$$
$$(ROSO_3^-)_2 Ca^{2+}(aq) + 2Na^{2+}(aq)$$

What is the effect of the addition of calcium ion on the concentration of stearate ion or alkyl sulphate ion?
A The concentration of stearate ion increases
B The concentration of stearate ion decreases
C The concentration of alkyl sulphate ion increases
D The concentration of alkyl sulphate ion decreases

42. Diagram 13 shows the set up of the apparatus to plate an iron spoon with silver.

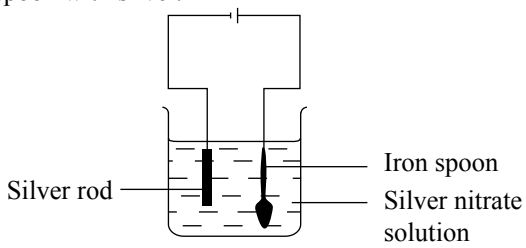

Diagram 13

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After 30 minute it was found that no plating took place on the iron spoon. What should be done ?

A Increase the cell voltage
B Interchange the terminals in the cell
C Rub the ion spoon with sand paper
D Use iron(II) sulphate solution as the electrolyte

43. A dibasic acid, H_2J has the concentration of 0.5 mol dm^{-3}. Letter J is not the actual symbol of the element. What is the volume of potassium hydroxide, KOH, 1.0 mol dm^{-3} that can neutralize 25.0 cm^3 of the H_2J acid solution?

A 6.25 cm^3
B 12.50 cm^3
C 25.00 cm^3
D 50.00 cm^3

44.

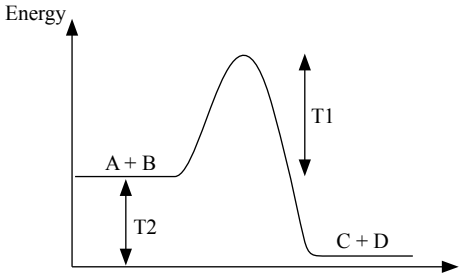

Diagram 14

Diagram 14 shows the energy level for a neutralization reaction. Which of the following statements is correct?
A Reaction between A and B is an endothermic reaction.
B T2 is the total heat energy released
C The temperature of this reaction decreases
D T1 is the Heat of reaction

45. In an experiment, 25 cm^3 of ethanoic acid was added to 20 cm^3 of aqueous ammonia. The temperature of mixture increased by 5°C. How much was the heat energy released? [The specific heat capacity of mixture=4.2 $Jg^{-1}{}^{o}C^{-1}$; density of mixture = 1 gcm^{-3}]
A 840 J
B 900 J
C 945 J
D 1000 J

46. Which of the following chemical reactions are representing a redox reaction?
I $H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$
11 $Cu + 2AgN0_3 \longrightarrow Cu(N0_3)_2 + 2Ag$
III $Pb(NO_3)_2 + Na_2CO_3 \longrightarrow PbCO_3 + 2NaNO_3$
IV $2A\ell + Fe_20_3 \longrightarrow A\ell_20_3 + 2Fe$
A I and II only
B I,II and IV only
C III and IV only
D II and IV only

47. What is the structure of the product of reaction when propane is passed into liquid bromine?

A CH_3-CH_2-CH_2Br solution
B CH_2=CH-CH_2-CH_2Br
C CH_3-CH_2-CHBr-CH_2Br
D CH_3- CHBr-CH_2Br

48. Diagram 15 shows the experiment to study the effect of different metals on the rusting of iron when in contact with iron.

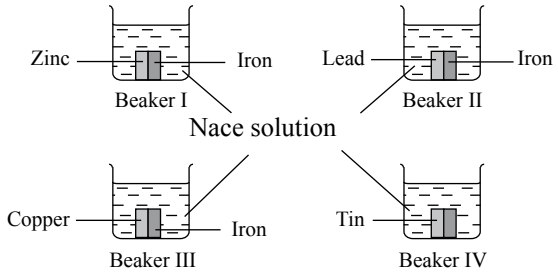

Diagram 15

The iron bar in which beaker will not rust?

A Beaker IV
B Beaker III
C Beaker II
D Beaker I

49. Which of the following has the lowest pH?

A 0.01 mol dm^{-3} of ammonia solution
B 0.01 mol dm^{-3} of sulphuric acid solution
C 0.001 mol dm^{-3} of ethanoic acid solution
D 0.001 mol dm^{-3} of ammonia solution

50. Diagram 16 shows the graph obtained when an experiment was repeated with the change of one variable.

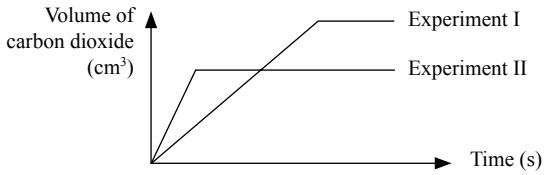

Diagram 16

Which of the following statements is true to describe the above graph?

A The rate of reaction of Experiment I is higher than experiment II
B The rate of reaction of Experiment II is higher because catalyst was used in Experiment II
C The difference in temperatures is not the factor affecting the rate of reaction of Experiment I and II
D The time taken for reaction in Experiment I to stop is shorter than reaction in Experiment II

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CHEMISTRY
Paper 2
Nov./Dis
1 hour 30 minutes

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1. Answer all the questions

2. Think thoroughly before answering any of the questions. If you need to change your answer, erase the answer properly and thoroughly before remarking the question sheet.

This question paper contains 8 printed pages and 0 non printed pages

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Paper 2

Section A (60 marks)

Answer all questions in this Section. You are advised to spend 90 minutes on this section

1. Diagram below shows the set-up of apparatus to investigate the redox reaction in a chemical cell.

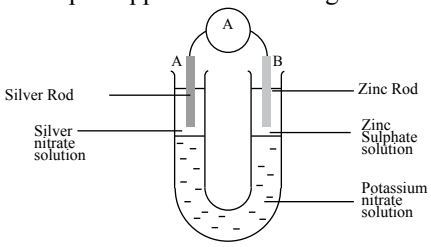

Diagram 1

(a) What is the energy change that occurrs in the experiment? (1 mark)

(b) What is the function of potassium nitrate solution in the above experiment? (1 mark)

(c) State one observation that can be made in the above experiment. Explain why. (2 marks)

(d) (i) Name the process that occurrs in electrode A. (1 mark)

(ii) Write an ionic equation for the reaction that occurrs in electrode A. (1 mark)

(e) State the negative terminal for this cell. Explain your answer. (2 marks)

(f) Write a complete ionic equation for the reaction that occurrs in this experiment. (2 marks)

2.

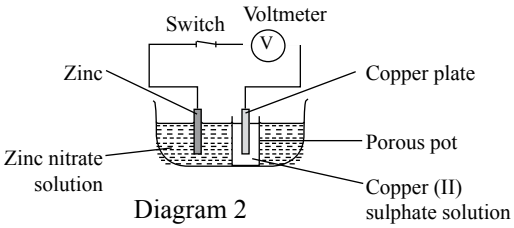

Diagram 2

Diagram 2 shows a chemical cell.

(a) Write the formula of zinc nitrate [1 mark]

(b) Write the half ionic equation for reactions at
(i) negative terminal
(ii) positive terminal [2 marks]

(c) Name the reaction that occurs at
(i) negative terminal
(ii) positive terminal [2 marks]

(d) State one observation in the experiment [1 mark]

(e) (i) Shows the direction of electron flow in Diagram 2 [1 mark]
(ii) State the change in energy in this experiment [1 mark]

(f) State the change in oxidation number for copper in this reaction [1 mark]

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3.

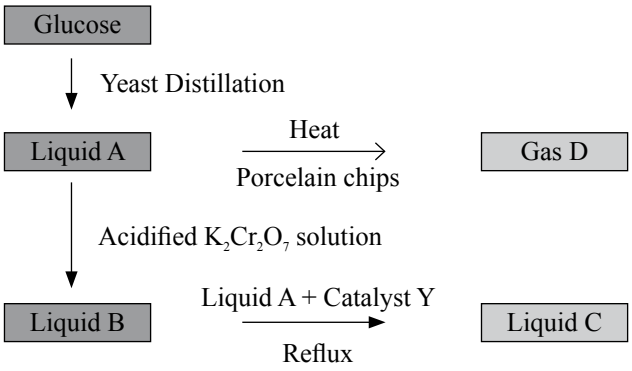

Diagram 3

Diagram 3 shows a series of changes involving glucose.

(a) Liquid A has a structural formula of C_2H_6O and the functional group – OH. Draw the structural formula for liquid A.

_____

[1 mark]

(b) Liquid B produces carbon dioxide gas when it reacts with sodium carbonate.

(i) What is liquid B?

_____

[1 mark]

(ii) Write the molecular formula for liquid B

_____

[1 mark]

(c) Liquid C has a sweet, fruity smell

(i) Name catalyst Y.

_____

[1 mark]

(ii) Name the homologous series for liquid C.

_____

[1 mark]

(d) When gas D is passed through bromine water, the brown colour of bromine water is decolourised

(i) Name gas D.

_____

[1 mark]

(ii) Write down the molecular formula for the compound that is produced when gas D reacts with bromine water.

_____

[1 mark]

(e) i) Write the equation for the reaction involving the combustion of liquid A.

_____

[1 mark]

(ii) What is the volume of oxygen at room temperature needed to burn 2.3 g of liquid A completely?
[Atomic relative mass : H,2 ; C,12 ; O,16. Volume of 1 mole of gas at room temperature is 24 dm^3]

_____

(10 marks)

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4. Diagram 4 shows part of the Periodic Table of Element. A, B, C, D, E, F, G and H do not represent the actual symbol of elements

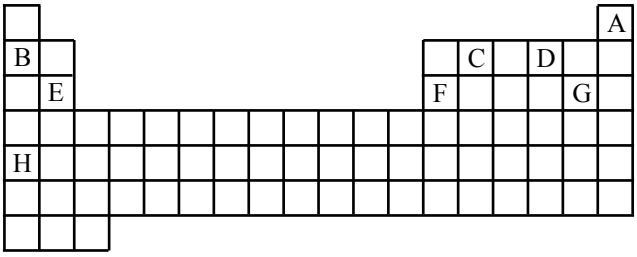

Diagram 4

Using the letters in the Periodic Table of Elements in Diagram 4, answer the following questions.

(a) (i) State the number of proton of atom G.

_____

[1 mark]

(ii) Write the formula of ion of atom G.

_____

[1 mark]

(b) $^{12}_{6}C$ is one isotope of C.

(i) Name another isotope of C

_____

(ii) Both isotopes have same chemicals properties. Eaplain why.

_____

[2 marks]

(c) Atom D is more electronegative compared to atom C. Explain why.

_____

_____

[3 marks]

(d) E reacts with G to form a compound

(i) Write the chemical equation for the reaction.

_____

[1 mark]

(ii) Draw the diagram of electron arrangement for the compound that is formed between E and G.

_____

_____

[2 marks]

(10 marks)

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5. An experiment is carried out to determine the rate of reaction for the reaction between 50 cm^3 of dilute sulphuric acid and excess copper(II) carbonate powder. Table 1 shows the results of the volume of carbon dioxide gas collected at regular intervals of 30 seconds.

Time, s	0	30	60	90	120	150	180	210	240
Volume of CO_2, cm^3	0.0	20.0	29.0	36.0	41.0	44.0	45.0	45.0	45.0

Diagram 5

(a) Draw a labeled diagram for a set-up of the apparatus used in this experiment.

[2 marks]

(b) Plot the graph of volume of carbon dioxide gas collected against time for this experiment.

[4 marks]

(c) Based on the graph plotted, determine

(i) the average rate of reaction in this experiment

(ii) the instantaneous rates of reaction at 2 minutes.

[3 marks]

(d) Explain why the rate of reaction decreases with time.

[1 mark]

(10 marks)

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6.

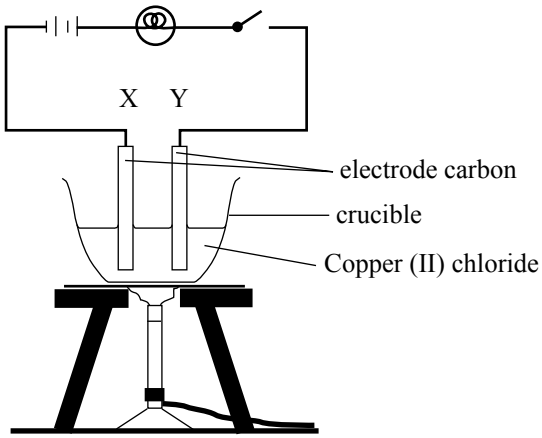

Diagram 6

Diagram 6 shows an electrolytic cell that is used to electrolyse copper (II) chloride, $CuCl_2$.

(a) Name the electrode where oxidation occurs.

_____

(1 mark)

(b) Describe the transfer of electrons in this electrolysis.

_____

_____

(2 marks)

(c) i) Name the ion that is reduced.

_____

(1 mark)

ii) Write the reduction half-equation

_____

(1 mark)

iii) State the change in the oxidation number during the reduction.

_____

_____

(2 marks)

d) i) State an observation at Y electrode.

_____

(1 mark)

ii) Name the reaction that occurs at Y

_____

(1 mark)

e) Write the ionic equation for this experiment

_____

_____

(2 marks)

(11 marks)

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SECTION B (20 MARKS)

Answer One question in this section. The time suggested to answer this question is 30 minutes

7. (a) Benzene, C_6H_6 is an unsaturated hydrocarbon. Benzene burns completely in excess air.

(i) Write a balanced chemical equation to show the burning process above. [3 marks]

(ii) The relative molecular mass of benzene is 78'. What is meant by this statement ? [3 marks]

(iii) When 7.8 g of benzene is completely burned, determine the volume of oxygen gas evolved in cm^3.
[1 mole of gas occupies 24 dm^3 at room temperature and pressure] [4 marks]

(b) The diagram below shows a molecular formula of 2-methyl propan-2-ol.

$$C_4H_9OH$$

(i) Draw the structural formula of 2-methylpropan-2-ol.

(ii) Draw and name other isomers of 2-methylpropan-2-ol.

(iii) Compare the physical and chemical properties between the isomers [10 marks]

8. Diagram below shows three symbols for the elements X, Y and Z

7 X 3	12 Y 6	35 Z 17

(a) Compare the subatomic particles between any two of the elements. [4 marks]

(b) Element X reacts with element Z to form a compound. Based on a labeled diagram, explain the formation of the compound [10 marks]

(c) Element Y also can react with element Z to form a compound. Explain how the compound is formed [3 marks]

(d) Compare the melting point of compound in (b) and (c). Explain your answer [3 marks]

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Section C (20 marks)

Instructions: Answer any one question from this section. The time suggested to complete this section is 30 minutes.

9. (a) " A chef who makes cakes for his restaurant wants to make the food tastier, last longer and of course look better."
State the food additives that can help the chef with the above purpose. Explain how the additives act. (6 marks)

(b) "A fish seller washes his oily hands using soap"
Explain the cleansing action of the soap on the oily dirt on the hand. (6 marks)

c) "Ionic compounds can conduct electricity in molten state but cannot conduct electricity in solid state. Covalent compounds cannot conduct electricity in solid and molten states."
Describe an experiment to prove the above statements. In your description, include all the chemicals apparatus and observations involved. (8 marks)

10. Diagram 7.1 and Diagram 7.2 show the electron arrangement for atoms of two elements from Group 17 in the Periodic Table of Elements.

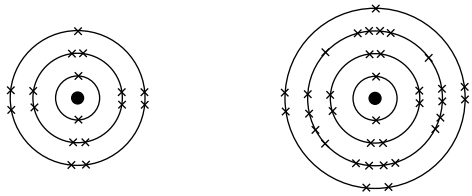

Diagram 7.1 Diagram 7.2

(a) Based on Diagram 7.1:
(i) Write the electron arrangement for the atom of the element and name the element. [2 marks]
(ii) Write a chemical equation for the reaction between these elements and sodium hydroxide. [3 marks]

(b) Compare the attractive forces between the nuclei and the valence electrons in the atoms in Diagram 7.1 and Diagram 7.2 and relate this to their respective reactivity. [6 marks]

(c) Another element in Group17 is a black coloured solid. Predict the reactivity of this element in its reaction with sodium hydroxide compared to that of the element in Diagram 7.2 [1 mark]

(d) Diagram 7.3 shows the set up of the apparatus to investigate the reaction of an element from Group 17 with iron metal

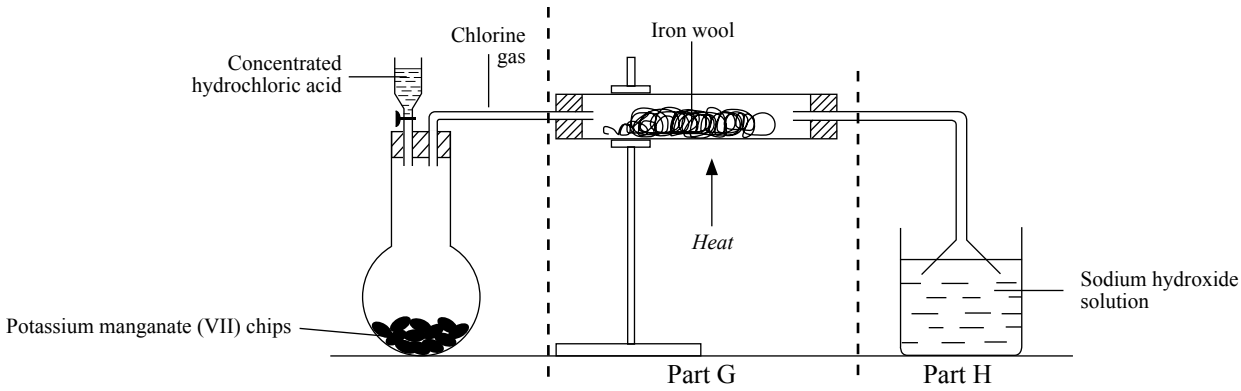

Diagram 7.3

(i) State two safety precautions that are needed to be taken when carrying out the experiment [2 mark]

(ii) Explain and write down the chemical equations for the reactions occurring in Part G and Part H. [6 mark]

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TIMES HIGHER EDUCATION

SOALAN ULANGKAJI SPM 2008
CHEMISTRY
Paper 3
Nov./Dis
1 hour 30 minutes

DO NOT OPEN UNTILL INTSRUCTED TO

1. Answer all the questions

2. Think thoroughly before answering any of the questions. If you need to change your answer, erase the answer properly and thoroughly before remarking the question sheet.

This question paper contains 5 printed pages and 0 non printed pages

SULIT

Time : 1 hour 30 minutes
Answer all Questions

1.

Time/minutes	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
Experiment I (volume of gas/cm3)	0	3.0	5.5	8.0	10.5	13.0	15.0	16.5	18.0	19.5	20.5	21.5	22.5	23.5	24.5
Experiment II (volume of gas/cm3)	0	6.0	10.5	15.5	18.5	21.5	24.5	27.0	29.0	31.0	x	34.0	35.0	36.0	37.0

Table 1

Table 1 Shows the data obtained by a student fromm two experiments that were carried out to study the decomposition of hydrogen peroxide.
In Experiment I, 8 cm^3 of 2.0 mol dm^{-3} hydrogen peroxide solution was added to 42 cm^3 of distilled water and 2 chips of manganese(IV) oxide. The total volume of gas produced was recorded at regular intervals.
In Experiment II, 8 cm^3 of 3.0 mol dm^{-3} hydrogen peroxide solution was added to 42 cm^3 of distilled water and 2 chips of manganese(IV) oxide. The total volume of gas produced was recorded at regular intervals.

(a) Name the gas produced in the above experiments.

_____

[1 markah]

(b) (i) State the manipulated variable and the responding variable in the experiment.

Manipulated variable : _____

Responding variable : _____

[2 markah]

(ii) State the hypothesis of the experiment.

_____

_____

[1 markah]

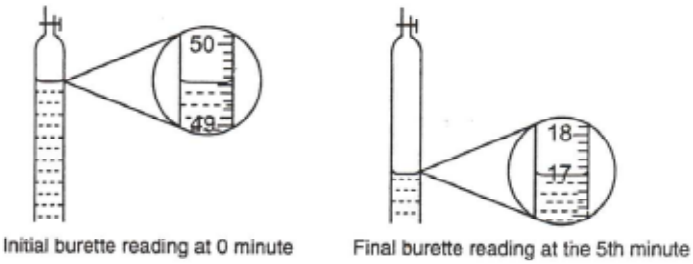

Diagram 1

Diagram 1 shows the initial burette reading at 0 minute and the final burette reading after 5 minutes.
Determine the value of X, which is the volume of gas collected at the 5th minute.

_____

_____

[1 markah]

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(d) (i) Plot the graphs of the volume of gas against time for Experiment I and Experiment II on the graph paper below by using the same axes

[3 markah]

(ii) Predict the volume of the gas produced at the 7.5th minute of Experiment II from the graph in (d)(i).

_____

[1 markah]

(iii) Determine the rate of reaction in Experiments I and II at the 3rd minute using the graph in (d)(i).

Rate of reaction in Experiment I at the 3rd minute

_____

[1 markah]

Rate of reaction in Experiment II at the 3rd minute

_____

[1 markah]

(e) What is the factor that caused the difference in the rates of reaction for the two experiments in (d)(iii)?

_____

[1 markah]

(f) Why does the rate of decomposition of hydrogen peroxide decrease with time ?

_____

[1 markah]

(g) What is the function of manganese(IV) oxide in both the experiments?

_____

[1 markah]

(h) The total volume of gas released with 7 minutes in Experiments II is greater than that in Experiment I. Give your reason.

_____

[1 markah]

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(i) Write a balanced chemical equation for the decomposition of hydrogen peroxide.

_____

[1 markah]

2. Diagram 2 below displays the set-up of the apparatus of an experiment to determine the heat of neutralization between aqueous sodium hydroxide and dilute hydrochloric acid.

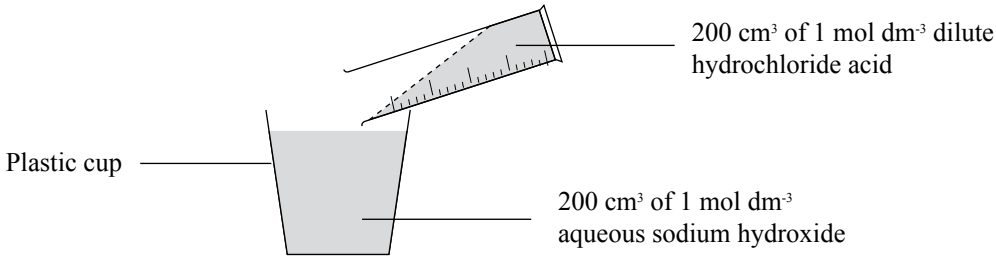
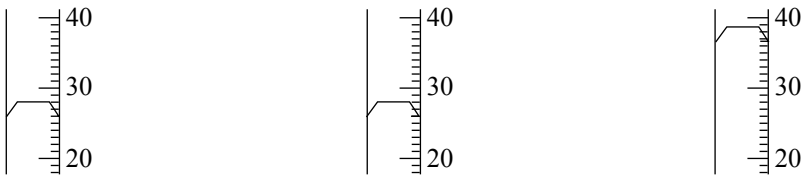


Diagram 2

The respective initial temperatures of the two reactants and the maximum temperature of the mixture are displayed by the thermometer readings in the figure below.



Initial temperature of aqueous sodium hydroxide | Initial temperature of dilute hydrochloric acid | Maximum temperature of the mixture

(a) Based on the figure above, write the temperature readings of each of the solutions in the appropriate spaces in the table below.

Initial temperature of aqueous sodium hydroxide/ ^{o}C	
Initial temperature of dilute hydrochloric acid/ ^{o}C	
Maximum temperature of the mixture/ ^{o}C	

[3 markah]

(b) (i) Write the equation for this neutralization reaction.

_____

[1 markah]

(ii) Calculate the total energy that was released from this reaction.
[The specific heat capacity of water = 4.2 J g^{-1} $^{o}C^{-1}$; Density of the solution = 1.0 g cm^{-3}]

[2 markah]

(c) (i) Calculate the heat of neutralization for this reaction

_____

[2 markah]

(ii) Draw the energy level diagram of this reaction.

_____

[3 markah]

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(d) (i) Write the observation noted in this experiment other than changes in the temperature.

_____

[1 markah]

(ii) What is the inference deduced from the observation above?

_____

[2 markah]

(e) What are the precautions to be taken for this experiment.

_____

_____

[3 markah]

3. Food that is kept in a refrigerator will last longer than that of food being kept at room temperature.
Based on the above statement, plan a laboratory experiment to investigate the effect of temperature on the rate of reaction between magnesium ribbon and dilute sulphuric acid.

Your planning should include the following aspect :

(a) Statement of the problem

(b) All the variables involved

(c) Hypothesis

(d) List of apparatus and materials

(e) Procedure

(f) Tabulation of data

[17 markah]

END OF QUESTION PAPER