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Chemistry

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Kertas 1

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

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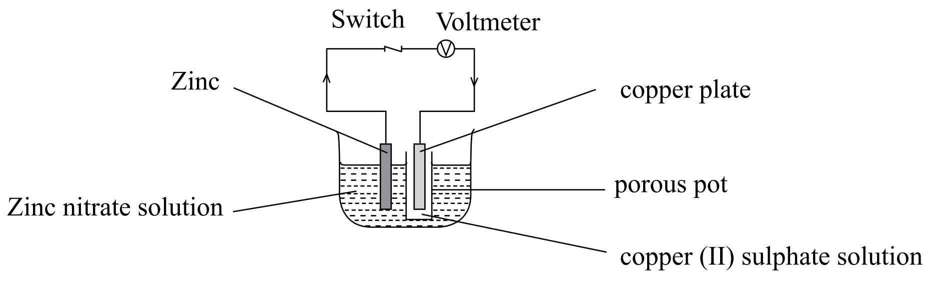
Kertas 2

Soalan	Butiran
	SECTION A
1. (a)	A change from chemical energy to electrical energy
(b)	It serves as the salt bridge to complete the electric circuit so that ions can move through it.
(c)	The mass of zinc rod decreases gradually. Zinc rod gives up its electrons to silver rod.
(d) (i)	Oxidation
(ii)	$Zn \rightarrow Zn^{2+} + 2e^-$
(e)	Zinc rod is the negative terminal. Zinc is more electropositive than silver and its position is higher than silver in the electrochemical series. It has a greater tendency to donate its electrons.
(f)	$Zn + 2Ag^+ \rightarrow Zn^{2+} + 2Ag$
2. (a)	Zn(NO3)2
(b) (i)	$Zn \rightarrow Zn^{2+} + 2e^-$
(ii)	$Cu^{2+} + 2e^- \rightarrow Cu$
(c) (i)	Oxidation
(ii)	Reduction
(d)	The blue colour of copper (II) sulphate solution diminishes gradually.
(e) (i)	
(ii)	A change from chemical energy to electrical energy.
(f)	A change from 0 to +2

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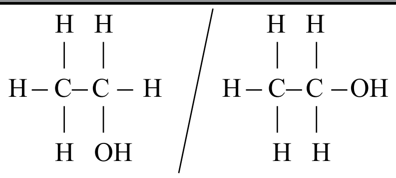
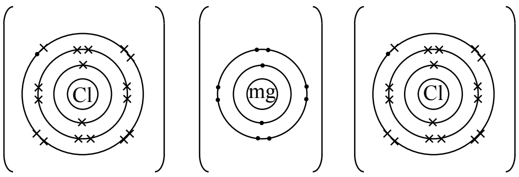
Kertas 2

Soalan	Butiran
3. (a)	
(b) (i)	Ethanoic acid
(ii)	CH_3COOH / $C_2H_4O_2$
(c) (i)	Concentrated sulphuric acid
(ii)	Ester
(d) (i)	Ethene
(ii)	$C_2H_4Br_2$
(e) (i)	$C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$ (complete combustion)
(ii)	2.3 g of ethanol = 2.3/46 = 0.05 mol (to react with) 0.05 x 3 = 0.15 mol of oxygen gas Volume of oxygen is 0.15/1 x 24 dm^3 = 3.6 dm^3
4.(a)(i)	17
(ii)	Cl^-
(b) (i)	Carbon-13
(ii)	Both have the same number of valence electrons which is 4. Hence, they demonstrate similar reactivity.
(c)	Atom D has 6 valence electrons compared to atom C which has 4. Atom D requires only 2 more electrons to reach its octet stability. Therefore, it is more electronegative.
(d) (i)	$Mg + Cl_2 \rightarrow MgCl_2$
(ii)	

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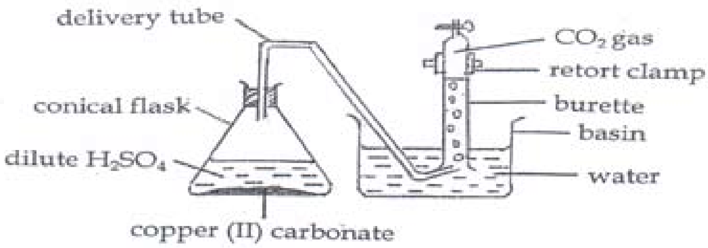
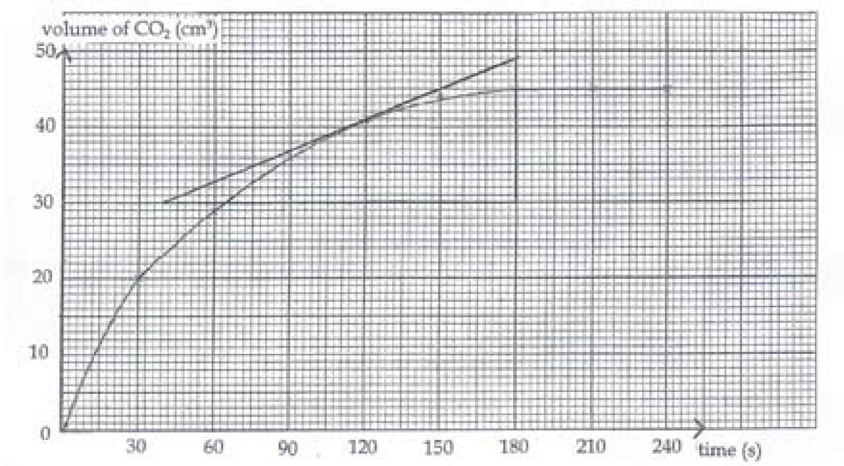
Kertas 2

Soalan	Butiran
5. (a)	
(b)	
(c) (i)	45/180 = 0.25 cm3 s-1
(ii)	19/141 = 0.135 cm3 s-1
(d)	The rate of reaction in inversely proportional to the time taken. This means the longer the time taken, the lower the rate of reaction.
6. (a)	Electrode Y
(b)	Electrons are transferred from the anode (electrode Y) to the cathode (electrode X)
(c) (i)	Copper ion
(ii)	$Cu^{2+} + 2e^- \rightarrow Cu$
(iii)	The oxidation number of copper decreases from +2 to 0
(d) (i)	Greenish-yellow gas is evolved.
(ii)	Oxidation
(e)	$CuCl_2 \rightarrow Cu^{2+} + 2Cl^-$

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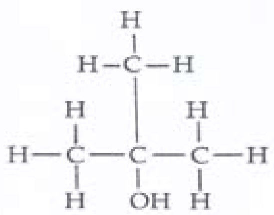
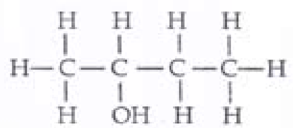
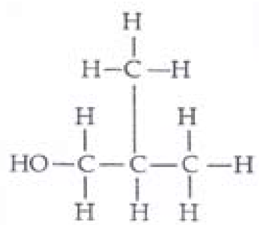
Kertas 2

Soalan	Butiran
7.(a)(i)	SECTION B General formula CxHy $C_xH_y + (x + y/4)O_2 \rightarrow xCO_2 + y/2\ H_2O$ $C_6H_6 + 7\frac{1}{2} \rightarrow 6CO_2 + 3H_2O$
(ii)	Relative atomic mass: H,1 ; C,12 (12x6) + (1x6) = 78 78 is the relative molecular mass of one molecule of benzene, which means, it is 78 times heavier than one twelfth (1/12) of the mass of carbon-12 atom.
(iii)	7.8 g/78 g x 1 mol = 0.1 mol 0.1 mol/1 mol x 24 dm^3 = 2.4 dm^3
(b) (i)	 2-methylpropan-2-ol
(ii)	 butan-2-ol  2-methylpropan-1-ol
(iii)	2-methylpropan-2-ol has a branched carbon chain and the hydroxyl (OH) group is positioned at carbon 2. Butan-2-ol has a straight carbon chain and the hydroxyl (OH) group is positioned at carbon 2. 2-methylpropan-1-ol has a branched carbon chain and the hydroxyl (OH) group is positioned at carbon 1. The isomers have different physical properties such as melting and boiling points because they have different molecular structures; but they have the same chemical properties because they belong to the same homologous series.

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Kertas 2

<table>
<tr><th>Soalan</th><th>Butiran</th></tr>
<tr><td>8. (a)</td><td>
<table>
<tr><td>Subatomic particles</td><td>Element X</td><td>Element Y</td></tr>
<tr><td>Electron</td><td>3</td><td>6</td></tr>
<tr><td>Proton</td><td>3</td><td>6</td></tr>
<tr><td>Neutron</td><td>4</td><td>6</td></tr>
</table>
</td></tr>
<tr><td>(b)</td><td>Element X reacts with element Z to produce a compound with formation of ionic bond.

The electronic configuration of atom X is 2.1 and the electronic configuration of atom Z is 2.8.7. To attain the stable duplet electron arrangement, atom X donates one electron to form a positive ion.
$X \rightarrow X^+ + e^-$
Atom Z will receive an electron to form Z- ion and attains the stable octet electron arrangement with 8 electrons in the valence electron shell.
$Z + e^- \rightarrow Z^-$
The X+ ion and Z- ion will attract each other with a strong electrostatic force and form an ionic compound with the formula XZ.</td></tr>
<tr><td>(c)</td><td>Element Y reacts with element Z to form a compound with formation of covalent bond.
To attain the stable octet electron arrangement with 8 electrons in the valence electron shell, atom Y shares electrons with atom Z. One atom Y contributes 4 electrons and four atom Z contribute one electron each. Atom Y shares 4 pairs of electrons with four atom Z to form a covalent compound with the formula YZ.</td></tr>
<tr><td>(d)</td><td>Compound XZ has a higher melting point than compound YZ. In compound XZ, the electrostatic force of attraction between oppositely charged ions is very strong and a lot of heat energy is required to overcome it. In compound YZ, the intermolecular force of attraction between molecules is weak and a little heat energy is required to overcome it.</td></tr>
<tr><td>9. (a)</td><td>For those purposes, the chef can use flavouring agents, preservatives, antioxidants and colouring agents.
Flavoring agents are added to food to make it taste better. The agents are of two types: artificial flavours and flavour enhancers.
Artificial flavours include sweeteners and others such as peppermint or vanilla. Examples are aspartame and saccharin. These two are actually substitutes for sugar to enhance the sweetness of food.
Flavour enhancers are chemicals added to food to bring out the flavours or to enhance the taste, for example, monosodium glutamate (MSG).
Preservatives and antioxidants protect food from being spoiled by bacterial and fungal attack, and atmospheric oxidation, respectively.
Preservatives, for example sodium nitrite, benzoic acid and sodium benzoate, retard or prevent growth of microorganisms so that food can be kept longer.
Examples of antioxidants include sulphur dioxide and sodium sulphite. They are added to food to prevent oxidation of fats and oils by oxygen in air.
Colouring agents are synthetic dyes used to restore the colour of food lost during processing and enhance natural colours to increase attractiveness. Examples are azo and triphenyl compounds.</td></tr>
<tr><td>(b)</td><td>Soap molecules contain hydrophilic and fat insoluble heads and hydrophobic hydrocarbon tails.
When soap is used on oily wetted hands, the negatively charged heads of soap ions dissolve in water, whereas, the hydrocarbon tails dissolve in the layer of oil. During washing, the oily dirt is lifted and washed away from the hands.
Soap also can emulsify the oily dirt by breaking large drops of oil into smaller droplets.
If the hands are dipped in water, the oily droplets repel one another because they carry the same charge. As a result, the oil is suspended.
During washing, the droplets will be carried away.</td></tr>
</table>

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Kertas 2

Soalan	Butiran
(c)	To investigate the electrical conductivity of compounds

Apparatus

Crucible, spatula, graphite rods, batteries, light bulb, switch, connecting wires, tripod stand, clay triangle and Bunsen burner.

Materials

Lead (II) bromide and naphthalene.

Methods

1. Three spatula of lead (II) bromide solid is put in a crucible.
2. Two graphite rods are dipped in the lead (II) bromide solid and the circuit is completed by connecting to the batteries and switch.
3. The switch is turned on and the bulb is checked if it lights up.
4. Lead (II) bromide is heated strongly until it melts. The switch is turned on again to check if the bulb lights up.
5. Steps 1 to 4 are repeated using naphthalene to replace lead (II) bromide.

Results

Compound	*State*	*Observation*	*Inference*
Lead (II) bromide	Solid Molten	Light bulb does not light up Light bulb lights up	Conducts electricity in the molten but not in the solid state
Naphthalene	Solid Molten	Light bulb does not light up Light bulb does not light up	Does not conduct electricity in any state

10. (a)

(i) The electronic configuration for Diagram 7.1 is 2.8.7. The element is chlorine.

(ii) $Cl_2 + 2NaOH \rightarrow NaCl + NaOCl + H_2O$

(b) The distance between the nucleus and the valence electrons of atom in Diagram 7.2 is greater than that in Diagram 7.1 as the atom in Diagram 7.1 has 3 electron shells but the atom in Diagram 7.2 has 4 electron shells. Because of this, the attractive forces between the nucleus and the valence electrons become weaker in Diagram 7.2 compared to the atom in Diagram 7.1.
As a result, the atom in Diagram 7.1 has a stronger attraction towards electrons compared to the atom in Diagram 7.2. The atom in Diagram 7.1 is more electronegative, therefore, it is more reactive compared to the atom in Diagram 7.2.

(c) The element in Diagram 7.2 reacts more actively with sodium hydroxide compared to the black coloured solid.

(d) (i)
1. Concentrated acid is corrosive and the experiment must be conducted in a fume chamber.
2. Make sure that the apparatus are connected tightly to prevent leakage of chlorine gas, which is poisonous.

(ii)

Part G — Chlorine gas will react with iron wool to produce iron (III) chloride solid.
$2Fe + 3Cl_2 \rightarrow 2FeCl_2$

Part H — The excessive chlorine gas will flow into sodium hydroxide solution to produce sodium chloride, sodium chlorate and water.
$Cl_2 + 2NaOH \rightarrow NaCl + NaOCl + H_2O$

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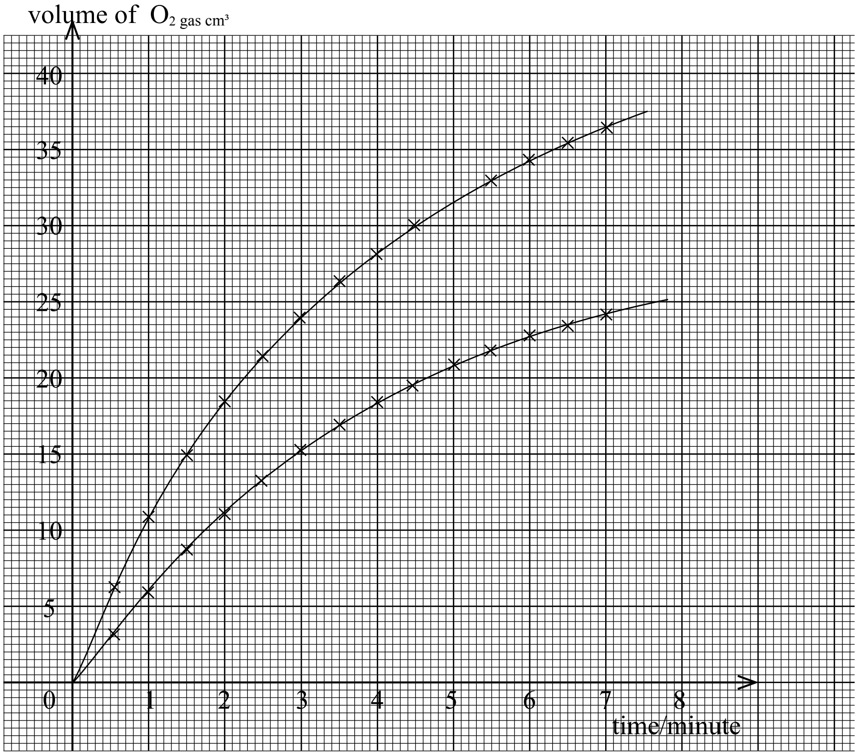
Kertas 3

Soalan	Butiran
1.(a)	Oxygen gas
(b)(i)	Manipulate variable : concentration of hydrogen peroxide Responding variable : decomposition rate of hydrogen peroxide
(b)(ii)	The higher the concentration of hydrogen peroxde, the higher is the rate of its decomposition
(c)	x= 49.5-17.0 = 32.5 cm^3
(d)(i)	
(ii) (iii)	38.0 cm^3 (±0.5cm^3) Rate of reaction of Experiment I at the 3rd minute = 3.6cm^3 min (+0.2) Rate of reaction of Experiment II at the 3rd minute = 5.6cm^3 min (+0.2)
(e)	Concentration of hydrogen peroxide in Experiment II is higher than that in Experiment I.
(f)	Concentration of hydrogen peroxide decreases with time due to occurrence of decomposition.
(g)	It acts as a catalyst.
(h)	The reason being the higher concentration of hydrogen peroxide in Experiment II compared to the concentration of hydrogen peroxide in Experiment I
(i)	$2H_2O_2 \longrightarrow 2H_2O + O_2$

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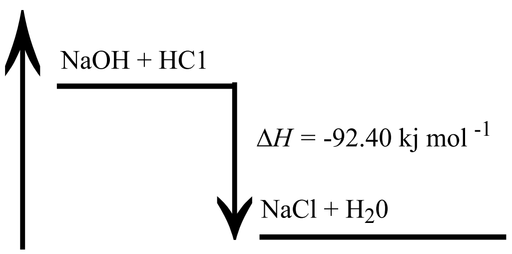
Kertas 3

Soalan	Butiran
2.(a)	28°C; 28°C ; 39°C
(b)(i)	NaOH + HC1 → NaC1 + H2O
(ii)	Total (heat) energy released = mass of solution x specific heat capacity x rise in temperature = (200 + 200) x 4.2 x (39 – 28) = 400 x 4.2 x 11 = 18480 J
(c)(i)	no. of moles of NaOH = (200 x 1.0) ÷ 1000 = 102mol no. of moles of HCI = (200 x 1.0) ÷ 1000 = 0.2 mol no. of moles of H_2O produced = 0.2 mol Heat Neutralisation = -[(1 ÷ 0.2) x 18.480 kJ] = - 92.40 kJ mol^{-1}
(ii)	Energy 
d)(i)	The plastic cup becomes hot
(ii)	The reaction is an exothermic reaction.
(e)	1 – A plastic cup must be used for this experiment 2 – The mixture must be stirred constantly with the thermometer 3 – The dilute acid must be added quickly and carefully to the alkali
3.(a)	**Problem Statement** Does the increase in the temperature of sulphuric acid increase the rate of reaction.
(b)	**Variables**
i.	Manipulated variable: temperature of sulphuric acid
ii.	Responding variable: time take for magnesium ribbon to dissolve completely / rate of action
iii.	Fixed variable: mass of magnesium ribbon; volume and concentration of sulphuric acid.
(c)	**Hypothesis** The higher the temperature of sulphuric acid, the shorter is the time taken for the magnesium ribbon to dissolve completely; the higher the temperature of sulphuric acid, the higher is the reaction between sulphuric acid and magnesium.
(d)	**Apparatus and materials**
(i)	Magnesium ribbon 0.1 mol^3 dm sulphuric acid
(ii)	stopwatch, conical flask, electronic balance, measuring cylinder, Bunsen burner, thermometer, tripod stand, wire gauze.

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Kertas 3

Soalan	Butiran
(e)	**Procedure** 1 – 25 cm^3 of 0.1 mol dm^3 sulphuric acid is measured and poured into a conical flask. 2 – Using a thermometer, the temperature of sulphuric acid solution is measured. 3 -5g of magnesium ribbon is weighed out and put into the acid in the conical flask. 4 – A stop watch is started simultaneously 5 – The conical flask is slowly shaken throughout the experiment 6 – The time taken for the magnesium ribbon to dissolve completely in sulphuric acid is recorded. 7 – Steps 1 to 6 are repeated with unchanged conditions and methods at different temperatures i.e 35°C, 40°C, 45°C, 50°C and 55°C respectively.
(f)	**Tabulation Of Data**

Temperature, ^0C	*Time for magnesium ribbon to dissolve completely, S*
Initial Time	
35^0C	
40^0C	
45^0C	
50^0C	
55^0C	

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