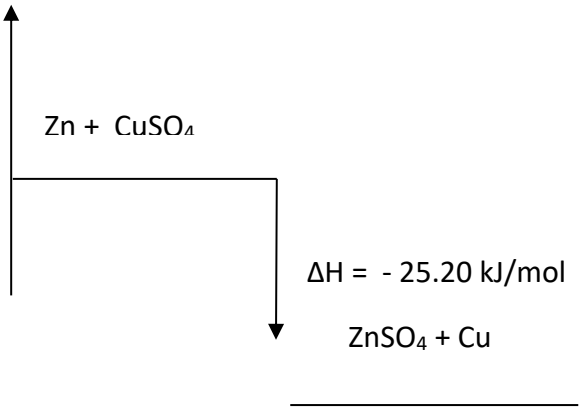
OBJECTIVE QUESTION

SOALAN OBJEKTIF

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

STRUCTURE QUESTION PAPER 2

SOALAN STRUKTUR KERTAS 2

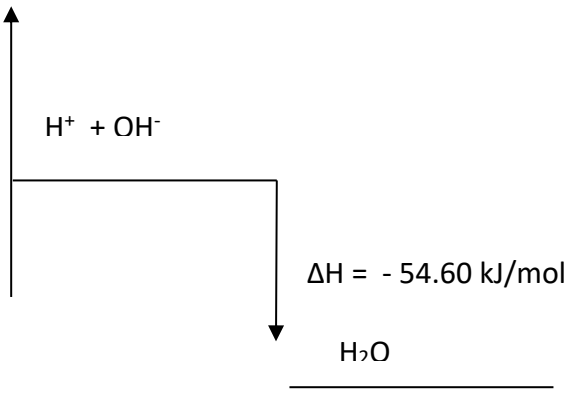
Question No		Mark scheme	Sub mark	Total
1 a)		Heat released when Copper metal is displaced from Copper(II) sulphate solution by zinc *Haba yang dibebaskan apabila kuprum disesarkan dari larutan Kuprum(II) sulfat oleh zink*		
b)		Blue to colourless/ pale blue *Biru ke tidak berwarna /biru muda*		
c)	(i) (ii) (iii)	*1260 J* *0.05 mol* *25.20 kj/mol*	1 1	2
d)		Energy  	1 1	2
e)	i) ii)	Remain the same *Tidak berubah* No of mole does not change *Bilangan mol tidak berubah*	1 1	2
f)	i)	18 kJ/mol because the distance is nearer from Cu in ECS: accept in less than 25.20kJ/mol		2

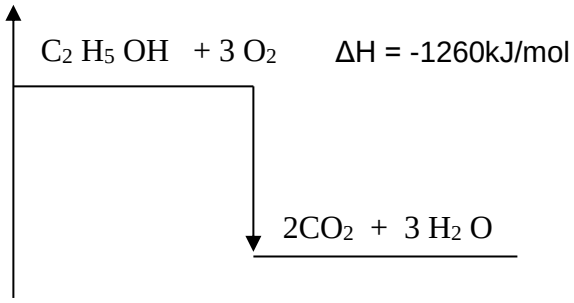
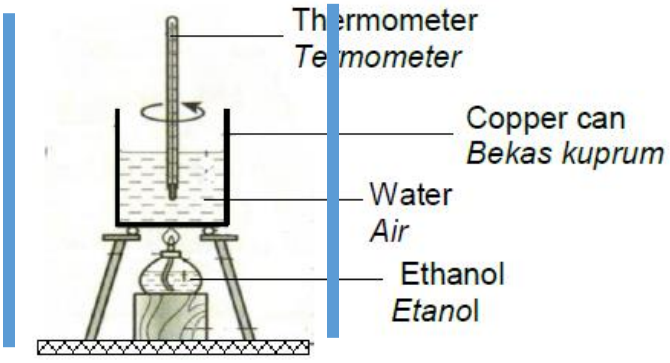
	ii) iii)	*18 kJ/mol kerana jarak lebih dekat daripada Cu dalam SEK : terima jika kurang dari 25.20kJ/ mol* 35 kJ/mol (more than 25.20) *35kJ /mol (lebih daripada 25.20)* 0, no reaction occur *0, tindakbalas tidak berlaku*		
g)		1. Stir the mixture using thermometer/ 2. Add metal powder excessively/ 3. Use plastic cup *1. Kacau larutan menggunakan thermometer/* *2. Tambahkan serbuk logam secara berlebihan/* *3. Menggunakan cawan plastik*	1 1	2

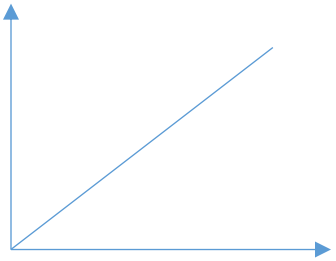
Question No		Mark scheme	Sub mark	Total
2	a)	To reduce the heat lost to the surroundings/ good insulator of heat *Mengurangkan kehilangan haba ke persekitaran/ penebat haba yang baik*	1	
	b)	(i) exorthermic reaction/ *tindakbalas eksotermik* (ii) total energy of product is less than total energy of reactants/ *jumlah tenaga hasil tindak balas kurang berbanding jumlah tenaga bahan tindakbalas*	1	
	c)	1. Mix the solutions quickly/ 2. stir the reaction mixture/ 3. intial temperature of both solution taken after a few minute *1. Campurkan larutan dengan cepat/* *2. Kacau campuran tindakbalas/* *3. Ambil bacaan thermometer selepas beberapa minit*	1	1
	d(i) (ii)	No of moles, Ag^+ = 0.0125 mol 525 J		

	(iii)	- 42 kJ/mol		
	e)	Some of the heat is released to surrounding/ absorbed by polystyrene cup *Sebahagian dari haba terbebas ke persekitaran/ diserap oleh cawan polisterena*	1	1
	f)i)	Same/no change *Sama/tidak berubah* Same no of / mol of Hydrogen ion from hydrochloric acids *Bilangan mol ion hydrogen yang disumbangkan oleh asid hidroklorik adalah sama*	1	2
	G0	Remain the same. Volume of both solution double / the no of moles double so heat change also double *Tidak berubah.* *Isipadu kedua-dua larutan berganda/ Bilangan mol ion berganda* *Oleh itu perubahan haba juga berganda*	1 1	2

Question No		Mark scheme	Sub mark	Total
3	a	Heat released when 1 mol of water formed from 1 mol of hydroxide ion and 1 mol of hydrogen ion *Haba terbebas apabila 1 mol air terbentuk dari 1 mol ion hidroksida dan 1 mol ion hydrogen*	1	
	b) i) ii) iii) iv)	 5460 J 0.1 mol 54.60 kJ/mol $H^+ + OH^- \rightarrow H_2O$ $\Delta H = 54.60$ kJ/mol	1 1 1 1	1

		Energy  		
d)		Ammonia is a weak alkali Some of heat energy from neutralization is used to to complete the dissociation of molecule ammonia in water. *Ammonia adalah alkali lemah.* *Sebahagian haba dari peneutralan digunakan untuk memutuskan ikatan dalam molekul ammonia yang tak terion di dalam air*		
e)		Plastic cup/ *cawan plastik*		
Question No		Mark scheme	Sub mark	Total
4	a	i) Ethanol/ *etanol* ii) 1260 kJ/mol heat is released when 1 mol ethanol burnt completely in excess oxygen *1260 kJ/mol haba terbebas apabila 1 mol etanol terbakar lengkap di dalam oksigen berlebihan*		
	b)	i)6300 J ii)7.5 ^{0}C		
	c)	Part of heat has been lost to the surrounding/	1	1

		Part of heat from the ethanol flame has been absorbed by the tin/ The combustion of ethanol not complete *Sebahagian haba terbebas ke persekitaran/* *Sebahagian haba dari pembakaran etanol diserao oleh tin/* *Pembakaran etanol tidak lengkap*	1	
	d) i)		1	
	ii)		3	
	iii)	Good conductor of heat/ can absorb heat *Konduktor haba yang baik/ boleh menyerap haba*	1	
	iv)	Can. Aluminium also good conductor of heat *Boleh. Aluminium boleh mengkonduksikan haba*	1	
	e) i)	Using blue cobalt chloride paper turn to pink *Warna biru kertas kobalt klorida betukar merah jambu*	1	

	ii)	Incomplete combustion of alcohol produce soot *Pembakaran tak lengkap menghasilkan jelaga*	1	
	F i)	2660 kJ/mol	1	
	ii)	No of carbon atom per molecule is more than methanol *Bilangan atom karbon permolekul propanol lebih banyak dari metanol*	1	
		Heat of combustion *Haba pembakaran, kJ/mol*  No of carbon atom per molecule *Bilangan atom karbon permolekul*	3	

ESSAY QUESTION

SOALAN ESEI

PAPER /KERTAS 2

Question No		Mark scheme	Sub mark	Total
1	a	

Characteristic	Diagram 1.1	Diagram 1.2
Change in temperature *Perubahan suhu*	Increase *Meningkat*	Decrease *Berkurang*
Type of chemical reaction *Jenis tindakbalas*	Exothermic reaction *Eksotermik*	Endothermic reaction *Endotermik*
Energy content of reactants and products	The total energy content of the reactants is more	The total energy content of the reactants is less

		Kandungan tenaga bahan tindakbalas dan hasil	than the energy content of the products *Jumlah Kandungan tenaga bahan tindakbalas lebih tinggi berbanding hasil*	than the energy content of the products *Jumlah Kandungan tenaga bahan tindakbalas kurang berbanding hasil*		
		Amount of heat energy absorbed/ released during breaking of bonds *Amaun tenaga haba diserap/dibebaskan apabila ikatan diputuskan*	Amount of heat absorbed for the breaking of bond in the reactant is less than heat released during formation of bond in the products *Amaun tenaga haba diserap apabila memutuskan ikatan kurang daripada haba yang dibebaskan semasa pembentukan ikatan hasil tindak balas*	Amount of heat absorbed for the breaking of bond in the reactant is more than heat released during formation of bond in the products *Amaun tenaga haba diserap apabila memutuskan ikatan lebih daripada haba yang dibebaskan semasa pembentukan ikatan hasil tindak balas*		
		Exothermic: Neutralisation/ *Peneutralan* $NaOH\ (aq) + HCl\ (aq) \rightarrow NaCl\ (aq) + H_2O\ (l)$ Displacement /*Pemendakan* $Zn\ (s) + CuSO_4\ (aq) \rightarrow ZnSO_4\ (aq) + Cu\ (s)$			4	8

		Endothermic: Dissolve ammonium nitrate in water. *Ammonium nitrat larut di dalam air.* NH_4NO_3 (s) + H_2O (l) → NH_2NO_3 (aq) Decomposition of calcium carbonate: *Penguraian kalsium karbonat* $CaCO_3$ (s) →CaO (s) + CO_2 (g)	4	
c	(i)	If heat energy is absorbed from the surroundings, it is an endothermic reaction. The water molecules gain kinetic energy, move faster, and able to overcome the forces between them. *Tenaga haba diserap dari sekeliling, tindakbalas endotermik berlaku.* *Molekul air menerima tenaga kinetic, bergerak laju, dan memutuskan ikatan antara zarah*	1 1	2
	(ii)	Water on the wet shirt evaporated Evaporation absorbs heat energy from body *Air pada baju basah tersejat* *Penyejatan menyerap tenaga haba dari badan*	1 1	2

Question No		Mark scheme	Sub mark	Total
2	a (i)	- The heat of neutralization in Experiment l is higher than the heat of neutralization in experiment ll *Haba peneutralan dalam eksperimen I lebih tinggi daripada haba peneutralan dalam eksperimen II* - Hydrochloric acid is a strong acid, *Asid hidroklorik ialah asid kuat* - Ionises completely in water, HCl → H^+ + Cl^- *Mengion lengkap dalam air* HCl → H^+ + Cl^- - A high concentration of hydrogen ions is produced for the reaction, *Tindakbalas menghasilkan kepekatan ion hydrogen yang tinggi* - Ethanoic acid is a weak acid, *Asid etanoik adalah asid lemah*		6

		- Only ionises partially in water, $CH_3COOH \rightarrow CH_3COO^- + H^+$ *Mengion separa di dalam air,* $CH_3COOH \rightarrow CH_3COO^- + H^+$ - A low concentration of hydrogen ion is produced for the reaction, *Tindakbalas menghasilkan kepekatan ion hydrogen yang rendah* - Heat need to be absorbed to break the bond in ethanoic acid molecules to ionises the hydrogen ions. *Haba diserap untuk memutuskan ikatan molekul asid etanoik bagi mengion ion hidrogen*		
	(ii)	- Hydrochloric acid is a monoprotic acid, *-asid hidroklorik adalah asid monoprotik* - 1 mol of hydrochloric acid ionises completely in water to produce 1 mol of hydrogen ion, $HCl \rightarrow H^+ + Cl^-$ *- 1 mol asid hidroklorik mengion sepenuhnya dalam air untuk menghasilkan 1 mol ion hidrogen , $HCl \rightarrow H^+ + Cl^-$* - Sulphuric acid is a diprotic acid, *- asid sulfuric adalah asid diprotic* - 1 mol of sulphuric acid ionises completely in water to produce 2 mol of hydrogen ions, $H_2SO_4 \rightarrow 2H^+ + SO_4^{2-}$ *-1 mol asid sulfuric mengion sepenuhnya dalam air untuk menghasilkan 2 mol ion hydrogen, $H_2SO_4 \rightarrow 2H^+ + SO_4^{2-}$* - Therefore, the heat of neutralisation of sulphuric acid is two times more than the heat of neutralisation of hydrochloric acid, *Oleh itu, haba peneutralan asid sulfuric dua kali ganda daripada haba peneutralan asid hidroklorik*	4 4	6 **12**
	b(i)	- 114 kJ mol^{-1}	1 1	2
	(ii)	- Sodium hydroxide solution and potassium hydroxide solution are strong alkalis, *-Larutan natrium hidroksida dan kalium hidroksida adalah alkali kuat.*	1 1	3

		-1 mol of strong alkali ionises completely in water to produce 1 mol of hydroxide ions, *-1 mol alkali kuat mengion penuh dalam air menghasilkan 1 mol ion hidroksida* - In the process of neutralisation, the main reaction is between 1 mol of hydrogen ion and 1 mol of hydroxide ion to form 1 mol of water, *-dalam peneutralan, tindakbalas antara 1 mol ion hydrogen dan 1 mol ion hidroksida menghasilkan 1 mol air* - Therefore the heat of neutralisation between a strong acid and a strong alkali is the same *-Oleh itu,haba peneutralan antara asid kuat dan alkali kuat*		
c		1 mol of water formed : 55 kJ The number of moles of water from the experiment : $\frac{2\ x\ 100}{1000}$= 0.2 mol 0.2 mol of water produced = 11 kJ *1 mol air terbentuk = 55 kJ* *bilangan mol air daripada eksperimen =*$\frac{2\ x\ 100}{1000}$= 0.2 mol *0.2 mol air terhasil = 11 kJ*		3

Question No	Mark scheme	Mark	
3		sub	Total
(a)	1. Exothermic reaction is a reaction that releases heat to the surrounding *Tindakbalas eksotermik adalah tindakbalas yang membebaskan haba ke persekitaran* *2.* Energy content of reactants is higher than that of products *Kandungan tenaga bahan tindakbalas lebih tinggi dari hasil tindakbalas* *3.* Endothermic reaction is a reaction that absorbs heat from the surroundings *Tindakbalas endotermik adalah tindakbalas yang menyerap haba dari persekitaran*	1 1 1 1	4

	4. Energy content of reactants is lower than that of products *Kandungan tenaga bahan tindakbalas kurang dari hasil tindakbalas*		
(b)	1. $AgNO_3$ and NaCl are reactants while AgCl and $NaNO_3$ are products *Bahan tindakbalas ialah $AgNO_3$ dan NaCl* *Hasil tindakbalas ialah AgCl and $NaNO_3$* 2. The reaction is exothermic // heat is released *Tindakbalas eksotermik// haba dibebaskan* 3. Temperature of the mixture increases *Suhu campuran meningkat* 4. Total / content of energy of 1 mole reactants is more than the total / content energy of 1 mole products *Jumlah/kandungan tenaga 1 mol bahan hasil tindakbalas lebih daripada jumlah/kandungan tenaga bagi 1 mol hasil tindakbalas.*	1 1 1 1	4
(c)	**Procedures:** 1. [100 – 200] , V cm3 of water is measured using a measuring cylinder *[100 – 200] , V cm^3 air disukat menggunakan selinder penyukat* 2. Pour into a copper container *Tuangkan ke dalam bekas kuprum* 3. The initial temperature of the water is measured and recorded *Suhu awal air diukur dan direkod* 4. A spirit lamp containing ethanol is weighed and recorded *Pelita yang mengandungi etanol ditimbang dan direkod* 5. The wick of the spirit lamp is lighted *Sumbu pelita dinyalakan* 6. When temperature of water increase 30°C, the flame is put off *Apabila suhu meningkat sebanyak 30°C, nyalaan dipadamkan* 7. The highest temperature is recorded *Suhu tertinggi direkodkan* 8. The spirit lamp is weighed again *Pelita ditimbang semula* **Result /*Keputusan*** Initial temperature of water = T1 °C	1 1 1 1 1 1 1 1 1 1	8

	Suhu awal air = T1 °C Highest temperature of water = T2 °C *Suhu tertinggi air = T2 °C* Rise in temperature Ø = T2- T1 = T °C *Kenaikan suhu = T2- T1 = T °C* Mass of lamp + ethanol before combustion = m1 g *Jisim pelita + etanol sebelum pembakaran = m1 g* Mass of lamp + ethanol after combustion = m2 g *Jisim pelita + etanol selepas pembakaran = m2 g* Mass of ethanol burnt = (m1 - m2) g *Jisim etanol yang terbakar = (m1-m2)g* **Calculation /Pengiraan** Number of mole of ethanol burnt = mass of ethanol burnt / Molar mass of ethanol Heat released = mcØ		

Question No	Mark scheme	Mark	
4		sub	Total
(a)	X: magnesium/ Mg / Y: zinc/ Zn Noted: X must be more electropositive then Y,both must more electropositive than Cu *Nota: X lebih elektropositif, Y lebih elektropositif daripada Cu* Heat of displacement for the experiment I is more than experiment II The distance between X/Cu is bigger/futher in electrochemical siries// X is more electropositive than Y *Haba penyesaran untuk eksperimen I lebih banyak berbanding ekperimen II* *Jarak antara X/Cu lebih besar/jauh dalam siri elektrokimia/Y lebih elektropositif berbanding Y*	1 1 1 1	4

(b)	$Mg + CuSO_4 \rightarrow MgSO_4 + Cu$ [Correct chemical formula of reactant and product] [balanced chemical equation] Accept any metal but should be more electropositive than Cu *[formula kimia bahan dan hasil yang betul]* *[persamaan kimia yang seimbang]* *Terima sebarang logam tetapi lebih elektropositif daripada Cu* No of mole of $CuSO_4$= (0.2 x 50)/1000 // 0.01 mol 2 mol of Cu displaced release 336000 J heat 0.01 mol of Cu$\rightarrow \frac{336000}{1}$x 0.01mol heat = 3360J Change in temperature/*perubahan suhu* $= \frac{3360}{50\ x\ 4.2} = 16^0C$	 1 1 1 1 1 1 1 1	6
	Material: 1.Sodium sulphate solution, Na2 SO4 2. Lead(II) nitrate solution, $Pb(NO_3)_2$ ***Bahan:*** ***1.*** *Larutan Natrium sulfat, Na2 SO4* *2. Larutan Plumbum(II) nitrat, $Pb(NO_3)_2$* **Apparatus:** 1. Polystrene cup/plastic cup 2. cup cover 3. 50 cm3 measuring cylinder 4. Thermometer (0-110 ^{0}C) ***Radas:*** 1. cawan plastik 2. penutup cawan 3. selinder penyukat 50 cm^3 4. Termometer (0-110 ^{0}C) **Procedures:** 1. Measure [20-200cm3] of [0.1 – 2 mol/dm3] Na2 SO4 solution and pour into polystyrene cup 2. Measure [20-200cm3] of [0.1 – 2 mol/dm3] Pb(NO3)2 solution and pour into another polystyrene cup 3. Initial temperature of both solutions are recorded 4. Mix and stir the solution together **Ionic equation:** $Pb^{2+} + SO_4^{2-} \rightarrow PbSO_4$ **Result /*Keputusan*** Initial temperature of Sodium sulphate solution = T1 °C	 1 1 1 1 1 1 1	Max 10

	Suhu awal natrium sulfat = T1 °C Highest temperature of Lead(II) nitrate solution = T2 °C *Suhu tertinggi Plumbum(II) nitrat = T2 °C* Rise in temperature Ø = T2- T1 = T °C *Kenaikan suhu = T2- T1 = T °C* **Calculation/pengiraan** [based on molarity and volume in procedur] Example: 1.Heat released Q = mcØ m= mass of mixture c= 4.2J g^{-1} ^oC 2. no of mol $PbSO_4$ = no of mol Pb^{2+} = (0.1X 20)/1000 // 0.0002 mol Heat of the displacement = -Q/ 0.0002 k J/mol	1 1 1 1	

ESSAY QUESTION

SOALAN ESEI

PAPER /KERTAS 3

Question	Rubric	Score
1(a)	**[Able to give the aim of the experiment accurately]** ***[dapat menyatakan tujuan eksperimen dengan tepat]*** To compare the heat of combustion of different alcohols/ methanol, ethanol and propan-1-ol *Untuk membandingkan haba pembakaran alcohol yang berbeza/methanol,etanol dan propa-1-ol*	3
	[Able to give the aim of the experiment less accurately] ***[dapat menyatakan tujuan eksperimen dengan kurang tepat]*** .	2
	[Able to give an idea of aim of the experiment.] ***[dapat memberi idea tujuan eksperimen]***	1

	[No response given or wrong response] ***[tiada respon atau respon salah]***	0
1(b)	**[Able to state the three variables correctly.]** ***[dapat menyatakan tiga pemboleh ubah dengan tepat]*** Sample answer: All the variables Manipulated variable: Type of alcohols / Methanol, ethanol and propan-1-ol *Pembolehubah manipulasi: jenis alcohol/methanol,etanol dan propan-1-ol* Responding variable: Heat of combustion *Pembolehubah bergerakbalas: Haba pembakaran* Controlled variable: Volume of water / copper can / thermometer *Pembolehubah malar: isipadu air/tin kuprum/termometer*	3
	[Able to state two variables correctly.] ***[dapat menyatakan dua pemboleh ubah dengan tepat]***	2
	[Able to state one variables correctly.] ***[dapat menyatakan satu pemboleh ubah dengan tepat]***	1
	[No response given or wrong response] ***[tiada respon atau respon salah]***	0
1(c)	**[Able to state the relationship between the manipulated variable and the responding variable accurately.]** ***[dapat menyatakan hubungan antara pemboleh ubah manipulasi dan pemboleh ubah bergerak balas dengan tepat]*** Sample answer: Hypothesis: The higher the number of carbon atoms in the alcohol molecules, the higher the heat of combustion *Lebih banyak bilangan atom karbon permolekul,lebih tinggi haba pembakaran*	
	[*Able to state the relationship between the manipulated variable and the responding variable.]** ***[dapat menyatakan hubungan antara pemboleh ubah manipulasi dan pemboleh ubah bergerak balas] The higher the number of carbon atoms , the higher the heat of combustion *Lebih banyak bilangan atom karbon ,,lebih tinggi haba pembakaran*	

	[Able to state the idea of hypothesis correctly.] ***[dapat menyatakan idea hipotesis dengan tepat]*** Different type of alcohol ,different heat of combustion *Jenis alkohol yang berlainan menghasilkan haba pembakaran yang berlainan*	
	[No response given or wrong response] ***[tiada respon atau respon salah]***	
1(d)	**[Able to give adequate list of substance and apparatus.]** ***[dapat menyenaraikan senarai bahan dan radas yang cukup]*** Sample answer: Material: methanol, ethanol, propan-1-ol, water *Bahan: methanol,etanol,propan-1-ol,air* Apparatus: Copper can, thermometer, spirit lamp weighing scale, wooden block, pipe-clay triangle, tripod stand *Radas: bekas kuprum,thermometer,pelita,penimbang,bongkah kayu, segitiga tanah liat,tungku kaki tiga*	3
	[Able to list down the materials and apparatus correctly but not complete] ***[dapat menyenaraikan senarai bahan dan radas tetapi tidak lengkap]*** Material: methanol, ethanol, propan-1-ol, water Apparatus: Copper can, thermometer, spirit lamp *Bahan: methanol,etanol,propan-1-ol,air* *Radas: bekas kuprum,thermometer,pelita,*	2
	[Able to give an idea on the list of apparatus and substances correctly] ***[Dapat memberi idea senarai radas dan bahan yang betul]*** Any one materials and one apparatus *with* thermometer *Sebarang satu bahan dan satu radas dengan termometer*	1
	No response or wrong response **Reject : no thermometer** ***Tiada respons atau respons salah*** *Tolak: jika tiada termometer*	0

1(e)	**Able to state all the steps of the experiment accurately** 3 ***Dapat menyatakan semua langkah eksperimen dengan lengkap*** Example 1. [100-250] cm^3 of water is measured and poured into a copper can. 2. The initial temperature of water is recorded. 3. The copper can is placed onto a tripod stand. 4. A spirit lamp is filled with methanol/fuel X and the initial mass is weighed and recorded. 5. The spirit lamp is put under the copper can and the wick of the lamp is lighted immediately. 6. The water is stirred with the thermometer until the temperature rises about 30°C. 7. The flame is put off and the highest temperature is recorded. 8. The spirit lamp and its content is weighed immediately and the final mass is recorded. 9. Steps 1-8 are repeated using ethanol and propan-1-ol/fuel Y to replace methanol/ fuel X. *Contoh:* 1. *Sukat [100-250]cm^3 air disukat dan dituangkan ke dalam bekas kuprum* 2. *Suhu awal air direkodkan* 3. *Letakkan bekas kuprum di atas tungku kaki tiga* 4. *Isi pelita dengan propanol dan ditimbang. Jisim pelita ditimbang dan direkod* 5. *Nyalakan sumbu pelita dengan segera* 6. *kacau air di dalam bekas kuprum sehingga mencapai kenaikan suhu sebanyak* 30°C 7. *Padamkan nyalaan dan suhu tertinggi direkodkan* 8. *timbang jisim pelita sekali lagi, jisim pelita direkodkan* 9. *langkah 1-8 diulang menggunakan etanol dan propan-1-ol/bahan api Y menggantikan methanol/bahan api X*	3
	Able to state 5 steps of the experiments Steps 2,4,5,6,7 *Dapat menyatakan 5 langkah eksperimen* *Langkah 2,4,5,6,7*	2
	Able to state 2 minimum steps correctly Steps 5,6 *Dapat menyatakan minium 2 langkah dengan tepat* *Langkah 5,6*	1

<table>
<tr><td></td><td>[No response given or wrong response]
[tiada respon atau respon salah]</td><td>0</td></tr>
<tr><td>1(e)</td><td>[Able to exhibit the tabulation of data that include the following four information]
1. Correct heading for manipulated variable
2. Correct heading for responding variable
3. Substance used as manipulated variable listed.
4. Table has four rows and two columns

Dapat menunjukkan penjadualan data dengan perkara berikut
1. Tajuk pemboleh ubah manipulasi
2. Tajuk pemboleh ubah manipulasi
3. Bahan yang digunakan sebagai pembolehubah manipulasi
4. Jadual mengandugi 4 lajur dan 2 baris

<table>
<tr><td>Type of alcohol

Jenis alkohol</td><td>Initial temperature of water /°C

Suhu awal air/°C</td><td>Highest temperature of water /°C

Suhu tertinggi air//°C</td><td>Initial mass of spirit lamp /g

Jism awal pelita/ g</td><td>Final mass of spirit lamp /g

Jisim akhir pelita/ g</td></tr>
<tr><td>Methanol</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Ethanol</td><td></td><td></td><td></td><td></td></tr>
<tr><td>Propan-1-ol</td><td></td><td></td><td></td><td></td></tr>
</table>
</td><td>2</td></tr>
<tr><td></td><td>[Able to exhibit the tabulation of data less accurately]
1. One correct heading or at least substances listed
2. Table has at least two rows and two column

[dapat menunjukkan penjadual data dengan kurang tepat]
1.satu tajuk yang betul atau bahan yang disenaraikan
2. sekurangnya mempunyai dua lajur dan dua baris</td><td>1</td></tr>
<tr><td></td><td>[Empty table or no response given or wrong response]
[jadual kosong atau tiada respon atau respon salah</td><td>0</td></tr>
</table>

Question	Rubric	Score

2(a)	*[Able to give the aim of the experiment accurately]* To decide which fuel is more economical by determination of heat combustion of fuel X and Y *Untuk memilih bahan api yang lebih ekonomikal dengan mencari haba pembakaran antara bahan api X dan Y*	3
	[Able to give the aim of the experiment less accurately] ***[dapat menyatakan tujuan eksperimen dengan kurang tepat]*** .	2
	[Able to give an idea of aim of the experiment.] ***[dapat memberi idea tujuan eksperimen]***	1
	[No response given or wrong response] ***[tiada respon atau respon salah]***	0
2(b)	**[Able to state the three variables correctly.]** ***[dapat menyatakan tiga pemboleh ubah dengan tepat]*** Sample answer: All the variables Manipulated variable: Type of alcohols / Methanol, ethanol and propan-1-ol *Pembolehubah manipulasi: jenis alcohol/methanol,etanol dan propan-1-ol* Responding variable: Heat of combustion *Pembolehubah bergerakbalas: Haba pembakaran* Controlled variable: Volume of water / copper can / thermometer *Pembolehubah malar: isipadu air/tin kuprum/thermometer*	3
	[Able to state two variables correctly.] ***[dapat menyatakan dua pemboleh ubah dengan tepat]***	2
	[Able to state one variables correctly.] ***[dapat menyatakan satu pemboleh ubah dengan tepat]***	1
	[No response given or wrong response] ***[tiada respon atau respon salah]***	0
2(c)	[Able to state the relationship between the manipulated variable and the responding variable accurately.]	3

	[dapat menyatakan hubungan antara pemboleh ubah manipulasi dan pemboleh ubah bergerak balas dengan tepat] Sample answer: Hypothesis: The mass of fuel Y used is less than fuel X and fuel Y is more economical. / The heat of combustion of fuel Y is greater than the heat of combustion of fuel X.Fuel Y is more economical/. The higher the number of carbon atoms in the alcohol molecules, the higher the heat of combustion *Jisim bahan api Y kurang daripada bahan api X dan Bahan api Y lebih ekonomi/* *Haba pembakaran bahan api Y lebih besar daripada bahan api X. Y lebih ekonomi./* *Lebih banyak atom karbon permolekul alcohol,lebih tinggi haba pembakaran.*	
	[Able to state the relationship between the manipulated variable and the Responding variable.] *[Dapat menyatakan hubungan antara pemboleh ubah manipulasi dan pemboleh ubah bergerakbalas]* The higher the number of carbon atoms , the higher the heat of combustion *Lebih banyak atom karbon, lebih tinggi haba pembakaran*	2
	[Able to state the idea of hypothesis correctly.] *[dapat menyatakan idea hipotesis dengan betul]*	1
	[No response given or wrong response] ***[tiada respon atau respon salah]***	0
2(d)	**[Able to give adequate list of substance and apparatus.]** ***[dapat menyatakan senarai bahan dan radas yang cukup]*** Sample answer: Material: methanol, ethanol, propan-1-ol, water *Bahan: methanol,etanol,propan-1-ol,air* Apparatus: Copper can, thermometer, spirit lamp weighing scale, wooden block, pipe-clay triangle, tripod stand	3

	Radas: bekas kuprum,thermometer,pelita,penimbang,bongkah kayu, segitiga tanah liat,tungku kaki tiga	
	[**Able to list down the materials and apparatus correctly but not complete]** ***[Dapat menyenaraikan bahan dan radas yang betul tetapi tidak lengkap]*** Material: methanol, ethanol, propan-1-ol, water Apparatus: Copper can, thermometer, spirit lamp *Bahan: methanol,etanol,propan-1-ol,air* *Radas: bekas kuprum,thermometer,pelita,*	2
	[Able to give an idea on the list of apparatus and substances correctly] ***[dapat menyatakan idea senarai radas dan bahan yang betul]*** Any one materials and one apparatus *with* thermometer *sebarang satu bahan dan satu radas dengan thermometer*	1
	No response or wrong response **Reject : no thermometer** ***Tiada respons atau respons salah*** *Tolak: jika tiada termometer*	0
2(e)	**Able to state all the steps of the experiment accurately** ***Dapat menyatakan semua langkah eksperimen dengan lengkap*** Example 1. [100-250] cm^3 of water is measured and poured into a copper can. 2. The initial temperature of water is recorded. 3. The copper can is placed onto a tripod stand. 4. A spirit lamp is filled with methanol and the initial mass is weighed and recorded. 5. The spirit lamp is put under the copper can and the wick of the lamp is lighted immediately. 6. The water is stirred with the thermometer until the temperature rises about 30°C. 7. The flame is put off and the highest temperature is recorded. 8. The spirit lamp and its content is weighed immediately and the final mass is recorded. 9. Steps 1-8 are repeated using ethanol and propan-1-ol to replace methanol.	3

	Contoh: 1. *Sukat [100-250]cm^3 air disukat dan dituangkan ke dalam bekas kuprum* 2. *Suhu awal air direkodkan* 3. *Letakkan bekas kuprum di atas tungku kaki tiga* 4. *Isi pelita dengan propanol dan ditimbang. Jisim pelita ditimbang dan direkod* 5. *Nyalakan sumbu pelita dengan segera* 6. *kacau air di dalam bekas kuprum sehingga mencapai kenaikan suhu sebanyak* 30^{o}C 7. *Padamkan nyalaan dan suhu tertinggi direkodkan* 8. *timbang jisim pelita sekali lagi, jisim pelita direkodkan* 9. *langkah 1-8 diulang menggunakan etanol dan propan-1-ol/bahan api Y menggantikan methanol*	
	Able to state 5 steps of the experiments Steps 2,4,5,6,7 ***Dapat menyatakan 5 langkah eksperimen*** *Langkah 2,4,5,6,7*	
	Able to state 2 minimum steps correctly Steps 5,6 ***Dapat menyatakan minimum 2 langkah yang betul*** *Langkah 5,6*	
	[No response given or wrong response] ***[tiada respon atau respon salah]***	
3(e)	Able to exhibit the tabulation of data that include the following four information] 1. Correct heading for manipulated variable 2. Correct heading for responding variable 3. Substance used as manipulated variable listed. 4. Table has four rows and two columns *Dapat menunjukkan penjadualan data dengan perkara berikut* *1. Tajuk pemboleh ubah manipulasi* *2. Tajuk pemboleh ubah manipulasi* *3. Bahan yang digunakan sebagai pembolehubah manipulasi* *4. Jadual mengandugi 4 lajur dan 2 baris*	

	<table><tr><td>Type of alcohol *Jenis alkohol*</td><td>Initial temperature of water /°C *Suhu awal air*/°C</td><td>Highest temperature of water /°C Suhu tertinggi air//°C</td><td>Initial mass of spirit lamp /g *Jism awal pelita/ g*</td><td>Final mass of spirit lamp /g *Jisim akhir pelita/ g*</td></tr><tr><td>Methanol/ Fuel X</td><td></td><td></td><td></td><td></td></tr><tr><td>Ethanol/fuel Y</td><td></td><td></td><td></td><td></td></tr><tr><td>Propan-1-ol</td><td></td><td></td><td></td><td></td></tr></table>	
	[Able to exhibit the tabulation of data less accurately.] *1. One correct heading or at least substances listed* *2. Table has at least two rows and two column*	
	[Empty table or no response given or wrong response] *[jadual kosong atau tiada respon atau respon salah*	

Question	Rubric	Score
3(a)	**[Able to give the problem statement accurately.]** ***[dapat memberi penyataan masalah dengan tepat]*** Sample answer: How do the heat of neutralization for reactions between acids and alkalis of different strengths differ? Does the heat of neutralisation between hydrochloric acid and sodium hydroxide solution is higher than the heat of neutralisation between ethanoic acid and sodium hydroxide solution ?	3

	Bagaimanakah perbezaan haba peneutralan bagi tindakbalas asid dan alkali bagi kekuatan yang berbeza? *Adakah haba peneutralan tindakbalas anatara asid hidroklorik dan natrium hidroksida lebih tinggi dari haba peneutralan antara asid etanoik dan natrium hidroksida?*	
	[Able to give the problem statement less accurately.] ***[dapat menyatakan penyataan masalah tetapi kurang tepat]*** Does the heat of neutralisation between strong acid and weak acid with strong alkali different? *Adakah haba peneutralan tindakbalas anatara asid kuat dan asid lemah dengan alkali kuat berbeza?//* //To study the heat of neutralisation between strong acid and weak acid with strong alkali. *Mengkaji haba peneutralan antara asid kuat dan asid lemah dengan alkali kuat.*	2
	[Able to give an idea of statement of the problem.] ***[dapat memberi idea tentang peryataan masalah]*** Heat of neutralisation is affected by the strength of acid. *Haba peneutralan dipengaruhi oleh kekuatan asid*	1
	[No response given or wrong response] ***[tiada respon atau respon salah]***	0
3(b)	**[Able to state the three variables correctly.]** ***[dapat menyatakan tiga pemboleh ubah dengan tepat]*** Sample answer: Manipulated variable: Strength of acid / hydrochloric acid and ethanoic acid Responding variable: Heat of neutralization Fixed variable: Volume and concentration of acid / volume and concentration of alkali / polystyrene cup *Pemboleh ubah manipulasi: kekuatan asid/asid hidroklorik dan asid etanoik* *Pemnboleh ubah gerakbalas: haba peneutralan* *Pemboleh ubah malar: Isipadu dan kemolaran asid/alkali/cawan polisterina*	3

	[Able to state two variables correctly.] ***[dapat menyatakan dua pemboleh ubah dengan tepat]***	2
	[Able to state one variables correctly.] ***[dapat menyatakan satu pemboleh ubah dengan tepat]***	1
	[No response given or wrong response] ***[tiada respon atau respon salah]***	0
3(c)	**[Able to state the relationship between the manipulated variable and the responding variable accurately.]** ***[dapat menyatakan hubungan antara pemboleh ubah manipulasi dan pemboleh ubah bergerak balas dengan tepat]*** Sample answer: Hypothesis: The reaction between hydrochloric acid/strong acid and sodium hydroxide will give the higher value of heat of neutralisation than the reaction between ethanoic acid /weak acid with sodium hydroxide *Tindakbalas antara asid hidroklorik/asid kuat dan natrium hidroksida memberi nilai haba peneutralan yang lebih tinggi berbanding tindakbalas antara asid etanoik.asid lemah dengan natrium hidroksida*	3
	[Able to state the relationship between the manipulated variable and the responding variable.] ***[dapat menyatakan hubungan antara pemboleh ubah manipulasi dan pemboleh ubah bergerak balas]*** The value of heat of neutralization for reaction between strong acid/hydrochloric acid and strong alkali/sodium hydroxide is higher than of reaction between weak acid/ethanoic acid and strong alkali./ sodium hydroxide *Haba peneutralan antara asid kuat/asid hidroklorik dan alkali kuat/natrium hidroksida lebih tinggi dari tindakbalas asid lemah/asid etanoik dengan alkali kuat/natrium hidroksida*	2
	[Able to state the idea of hypothesis correctly.] ***[dapat mennyatakan idea bagi hipotesis dengan tepat]*** The strength of acid affect the heat of neutralisation	1

	Different strength of acid react with sodium hydroxide, different value of heat of neutralisation	
	[No response given or wrong response] ***[tiada respon atau respon salah]***	0
3(d)	**[Able to give adequate list of substance and apparatus.]** ***[dapat menyatakan senarai bahan dan radas yang cukup]*** Sample answer: Materials :[0.5-2.0 moldm^{-3}] sodium hydroxide solution, [0.5 – 2.0 moldm^{-3}] hydrochloric acid, [0.5 -2.0 moldm-^{3}] ethanoic acid (any suitable strong and weak named acid) Apparatus :Polystyrene/plastic cup, thermometer,[50- 100 cm^{3}] measuring cylinder *Bahan: :[0.5-2.0 moldm^{-3}] natrium hidroksida, [0.5 – 2.0 moldm^{-3}] asid hidroklorik, [0.5 -2.0 moldm^{-3}] Asid etanoik (sebarang asid kuat dan asid lemah)* *Radas: cawan plastic/polisterina,thermometer, selinder penyukat ,[50- 100 cm^{3}]*	3
	Able to list down the materials and apparatus correctly but not complete ***[dapat menyatakan senarai bahan dan radas tetapi tidak lengkap]*** Material :sodium hydroxide solution, hydrochloric acid/ ethanoic acid(any suitable strong and weak named acid) Apparatus :Polystyrene/plastic cup, thermometer *Bahan: natrium hidroksida, asid hidroklorik, Asid etanoik (sebarang asid kuat dan asid lemah)* *Radas: cawan plastic/polisterina,thermometer,*	2
	Able to give an idea on the list of apparatus and substances correctly ***Dapat menyatakan idea bahan dan radas dengan betul*** Any one materials and one apparatus *with* thermometer	1

	sebarang satu bahan dan satu radas dengan thermometer	
	No response or wrong response **Reject : no thermometer** ***Tiada respons atau respons salah*** *Tolak: jika tiada termometer*	0
3(e)	**Able to state all the steps of the experiment accurately** ***Dapat menyatakan semua langkah eksperimen dengan lengkap*** Example 1. [25 – 100 cm^3] of sodium hydroxide is measured and poured into a polystyrene cup using a measuring cylinder. 2. The initial temperature of sodium hydroxide solution is recorded. 3. [25- 100 cm3] of hydrochloric acid is measured into another polystyrene cup. 4. The initial temperature of hydrochloric acid is recorded. 5. Hydrochloric acid is then poured quickly into a cup containing sodium hydroxide solution. 6. The mixture is stirred using thermometer and the highest temperature is recorded. 7. Repeat steps 1 to 6 using ethanoic acid instead of hydrochloric acid. *Contoh* 1. *[25 – 100 cm^3] natrium hidroksida disukat dan di tuang ke dalam cawan polisterina menggunakan selinder penyukat* 2. *Suhu awal natrium hidroksida direkod* 3. *25 – 100 cm^3] asid hidroklorik disukat dan di tuang ke dalam cawan polisterina* 4. *Suhu awal asid hidroklorik direkod* 5. *Asid hidroklorik dituang dengan cepat ke dalam cawan yang mengandungi larutan natrium hidroksida* 6. *Campuran dikacau menggunakan thermometer dan suhu tertinggi direkod* 7. *Ulang langkah 1-6 menggunakan asid etanoik menggantikan asid hidroklorik*	3
	Able to state 5 steps of the experiments Steps 2,4,5,6,7 ***Dapat menyatakan 5 langkah eksperimen*** *Langkah 2,4,5,6,7*	2
	Able to state 2 minimum steps correctly Steps 5,6 ***Dapat menyatakan minimum 2 langkah yang betul*** *Langkah 5,6*	1

<table>
<tr><td></td><td>[No response given or wrong response]
[tiada respon atau respon salah]</td><td>0</td></tr>
<tr><td>3(e)</td><td>[Able to exhibit the tabulation of data that include the following four information]
1. Correct heading for manipulated variable
2. Correct heading for responding variable
3. Substance used as manipulated variable listed.
4. Table has four rows and two columns

Dapat menunjukkan penjadualan data dengan perkara berikut
5. Tajuk pemboleh ubah manipulasi
6. Tajuk pemboleh ubah manipulasi
7. Bahan yang digunakan sebagai pembolehubah manipulasi
8. Jadual mengandugi 4 lajur dan 2 baris
<table>
<tr><td></td><td>Hydrochloric acid</td><td>Ethanoic acid</td></tr>
<tr><td>Initial temperature of sodium hydroxide solution / °C
Suhu awal asid hidroklorik</td><td></td><td></td></tr>
<tr><td>Initial temperature of sodium hydroxide solution /°C
Suhu awal natrium hidroksida</td><td></td><td></td></tr>
<tr><td>Highest temperature of the reaction mixture / °C
Suhu tertinggi campuran tindakbalas</td><td></td><td></td></tr>
</table>
</td><td>2</td></tr>
<tr><td></td><td>[Able to exhibit the tabulation of data less accurately.]
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[dapat menunjukkan penjadual data dengan kurang tepat]
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