

Structure {Paper03}

[SPM10-P3-01]

- (a) Experiment I : 13.0
 Experiment II : 13.1
 Experiment III : 13.0

(b)

Experiment	Observation
I	Lithium burns with a white flame
II	Potassium burns with a purple flame
III	Sodium burns with a yellow flame

- (c) 1. Potassium reacts very vigorously with water
 2. an alkaline solution is produced
 3. Heat is released

(d) the lower the position of the element in Group 1, the higher is the reactivity of the element with water

(e) the brighter the flame, the higher is the reactivity of the element in the group 1 with water.

(f)(i) Lithium, Sodium, Potassium

(ii) The atomic size increases from lithium to potassium, where the force of attraction of the nucleus towards single valence electron becomes weaker, making it easier to release the electrons

- (g) (i). rubidium burns very brightly
 (ii). A lot of bubbles are produced
 (iii). A colourless solution with pH 13.3 is formed

[SBPtrial08-02-P3]

2(a) KK0510 - State variables

EXPLANATION		SCORE
<i>[Able to state the three variables correctly]</i>		3
Manipulated variable	Type of elements/metals	
Responding variable:	Rate of reaction//Reactivity of the reaction	
Fixed variable:	Water, size of metal used	
<i>[Able to state any two variables correctly]</i>		2
<i>[Able to state any one variable correctly]</i>		1

2 (b) KK051202 – Stating hypothesis

EXPLANATION	SCORE
<p><i>[Able to state the relationship between manipulated variable and responding variable correctly]</i> Suggested answer:</p> <p>The metal which is below in Group 1 is more reactive the reaction with water//The lower the metal in Group 1 the more reactive the reaction with water</p>	3
<p><i>[Able to state the relationship between manipulated variable and responding variable but in the opposite direction]</i> Suggested answer:</p> <p>The more reactive the reaction, the lower the position of the metal in Group 1</p>	2
<p><i>[Able to state an idea of the hypothesis]</i> Suggested answer:</p> <p>Metals in Group 1 can react with water</p>	1

2(c) KK0509 – Operational definition

EXPLANATION	SCORE
<p><i>[Able to state the operational definition accurately]</i> Suggested answer:</p> <p>The metal that reacts more vigorously with water is a more reactive metal</p>	3
<p><i>[Able to give the operational definition correctly but inaccurate]</i> Suggested answer:</p> <p>The metals can react with water at a different rate.</p>	2
<p><i>[Able to state an idea of the operational definition]</i> Suggested answer:</p> <p>Metals can react with water.</p>	1

2(d) KK0504 – Making inference

EXPLANATION	SCORE
<p><i>[Able to state the inference accurately]</i> Suggested answer:</p> <p>The solution produced is a strong alkali.</p>	3
<p><i>[Able to state the inference correctly]</i> Suggested answer:</p> <p>The solution produced is an alkali.</p>	2
<p><i>[Able to give idea for inference]</i> The metals dissolve in water.</p>	1

2(e) KK0507- Making relationship

EXPLANATION	SCORE
[Able to state the relationship accurately] Suggested answer: The lower the position of the metal in Group 1, the higher the reactivity of the metal towards oxygen.	3
[Able to state the relationship correctly but less accurate] Suggested answer: The reactivity of the metals is inversely proportional to their position in the group.	2
[Able to state an idea of a relationship] Suggested answer: Position of metals affect the reactivity	1

2(f) KK 0508 – Interpreting Data

EXPLANATION	SCORE
[Able to arrange the metals in descending order based on their reactivity] Rb, K, Na, Li	3
[Able to arrange the metals in ascending order based on their reactivity] Li, Na, K, Rb	2
[Able to arrange the position of at least three metals in descending order based on their reactivity]	1

[SBPdiag05-02-P3]

2(a) Mengawal pemboleh ubah

Skor	Penerangan
3	Dapat menyatakan pemboleh ubah dimanipulasi, pemboleh ubah bergerak balas dan pemboleh ubah yang dimalarkan dengan lengkap Cadangan jawapan: Pemboleh ubah dimanipulasikan : logam unsur Kumpulan 1 / natrium, litium, kalium. Pemboleh ubah bergerak balas : kecergasan tindakbalas dengan air // Kelajuan pergerakan logam di atas air Pemboleh ubah yang dimalarkan : saiz ketulan / jisim logam, isipadu air
2	Dapat menyatakan mana-mana dua pemboleh ubah dengan lengkap // mana-mana tiga pemboleh ubah yang tidak lengkap
1	Dapat menyatakan mana-mana satu pemboleh ubah dengan lengkap // idea bagi mana-mana dua pemboleh ubah
0	Tidak memberikan respons atau respons salah

2(b) Membuat hipotesis

Skor	Penerangan
3	Dapat menyatakan perhubungan antara pemboleh ubah dimanipulasikan dengan pemboleh ubah bergerak balas dengan betul Cadangan jawapan: Kereaktifan unsur Kumpulan 1 semakin bertambah apabila menuruni Kumpulan.
2	Dapat menyatakan perhubungan antara pemboleh ubah dimanipulasikan dengan pemboleh ubah bergerak balas dengan kurang tepat Cadangan jawapan: Kereaktifan unsur semakin bertambah apabila menuruni Kumpulan.
1	Dapat menyatakan idea hipotesis atau tujuan eksperimen Cadangan jawapan: Jenis logam mempengaruhi kereaktifan logam.
0	Tidak memberikan respons atau respons salah

2(c) Mentafsir data

Skor	Penerangan
3	Dapat menyusun siri kereaktifan logam mengikut tertib menurun dengan betul. Jawapan: kalium, natrium, litium
2	Dapat menyusun dua logam siri kereaktifan logam mengikut tertib menurun dengan betul. Jawapn: litium, kalium, natrium // natrum, litium, kalium
1	Dapat menyusun logam siri kereaktifan logam mengikut tertib menaik Jawapan: litium, natrium, kalium
0	Tidak memberikan respons atau respons salah

2(d) Mengelas

Skor	Penerangan
3	Dapat mengelas ion-ion dengan betul. - [menamakan atau menulis formula semua ion dengan betul pada kumpulan kation dan anionnya yang betul] Jawapan: Ion positif/kation - ion natrium / Na ⁺ , ion hydrogen / H ⁺ Ion negatif/anion - ion hidroksida / OH ⁻

2	Dapat mengelas ion-ion dengan kurang tepat. Cadangan jawapan: - [menamakan semua ion tetapi disertakan formulanya yang salah pada kumpulan kation dan anionnya] - [menyatakan dua ion pada kumpulan kation dan anion yang betul]
1	Dapat memberikan idea pengkelasan ion-ion dengan kurang tepat. Cadangan jawapan: - [menamakan atau menulis formula semua ion dengan betul pada kumpulan kation dan anionnya yang salah] [menyatakan satu daripada tiga ion dengan menyatakan ion itu positif atau negatif]
0	Tidak memberikan respons atau respons salah

[SBPdiag08-02-P3]

2(a) KK0510 - State the variables

EXPLANATION		SCORE								
<p><i>[Able to state the three variables and action to be taken correctly]</i></p> <table border="1"> <thead> <tr> <th>Name of variables</th> <th>Action to be taken</th> </tr> </thead> <tbody> <tr> <td>(i) Manipulated variable: Type of group 1 metals used</td> <td>(i) The way to manipulate variable: Use lithium, sodium and potassium metal for each experiment.</td> </tr> <tr> <td>(ii) Responding variable: Rate of reaction//Reactivity of the reaction</td> <td>(ii) What to observe in the responding variable: The movement of metal on the water surface.</td> </tr> <tr> <td>(iii) Fixed variable: Quantity/size of metal used.</td> <td>(iii) The way to maintain the fixed variable: Use the same quantity/size of metal.</td> </tr> </tbody> </table>		Name of variables	Action to be taken	(i) Manipulated variable: Type of group 1 metals used	(i) The way to manipulate variable: Use lithium, sodium and potassium metal for each experiment.	(ii) Responding variable: Rate of reaction//Reactivity of the reaction	(ii) What to observe in the responding variable: The movement of metal on the water surface.	(iii) Fixed variable: Quantity/size of metal used.	(iii) The way to maintain the fixed variable: Use the same quantity/size of metal.	6
Name of variables	Action to be taken									
(i) Manipulated variable: Type of group 1 metals used	(i) The way to manipulate variable: Use lithium, sodium and potassium metal for each experiment.									
(ii) Responding variable: Rate of reaction//Reactivity of the reaction	(ii) What to observe in the responding variable: The movement of metal on the water surface.									
(iii) Fixed variable: Quantity/size of metal used.	(iii) The way to maintain the fixed variable: Use the same quantity/size of metal.									
<i>[Able to state any five items correctly]</i>		5								
<i>[Able to state any four items correctly]</i>		4								
<i>[Able to state any three items correctly]</i>		3								
<i>[Able to state any two items correctly]</i>		2								
<i>[Able to state any one item correctly]</i>		1								
No response given / wrong response		0								

2 (b) KK0512 – Stating hypothesis

EXPLANATION	SCORE
[Able to state the relationship between manipulated variable and responding variable correctly] Suggested answer: The metal which is below in Group 1 is more reactive in the reaction with water//The lower the metal in Group 1 the more reactive is the reaction with water.	3
[Able to state the relationship between manipulated variable and responding variable but in the opposite direction] Suggested answer: The more reactive the reaction, the lower the position of the metal in Group 1	2
[Able to state an idea of the hypothesis] Suggested answer: Metals in Group 1 can react with water	1
No response given / wrong response	0

2(c) KK 0508 – Interpreting Data

EXPLANATION	SCORE
[Able to arrange the metals in descending order based on their reactivity] Suggested answer: K, Na, Li	3
[Able to arrange the metals in ascending order based on their reactivity] Answer: Li, Na, K,	2
[Able to arrange the position of at least two metals in descending/ascending] Suggested answer: Na, Li, K// Li, K, Na// Na, K, Li	1
No response given / wrong response	0

2(d) KK0507- Making relationship

EXPLANATION	SCORE
[Able to state the relationship accurately] Suggested answer: The lower the position of the metal in Group 1, the higher the reactivity of the metal.	3
[Able to state the relationship correctly but less accurate] Suggested answer: The reactivity of the metals is inversely proportional to their position in the group.	2
[Able to state an idea of a relationship] Suggested answer: Position of metals affect the reactivity	1
No response given / wrong response	0

c2(e) KK 0508 – Predicting

EXPLANATION	SCORE
[Able to predict the reactivity of rubidium correctly] Suggested answer: The reaction of Rubidium is most reactive among lithium, sodium and potassium when react with water	3
[Able to predict the arrangement of the metals based on their reactivity] Suggested answer: The reaction of Rubidium is most reactive.	2
[Able to give an idea Suggested answer: Rubidium is a reactive metal	1
No response given / wrong response	0

[SBPtrial10-01](a) State **one** hypothesis for this experiment.

	Marking Scheme	Marks
1(a)	Able to state the hypothesis accurately. Sample answer. Metal which is lower down in Group 1 is more reactive towards oxygen// X is more reactive than sodium and lithium towards oxygen.	3
	Able to state the inference less accurately. Sample answer. Reactivity towards oxygen increases when going down Group 1 //Sodium is more reactive than lithium towards oxygen.	2
	Able to state the idea of inference. Sample answer. Metal can react with oxygen	1
	Wrong or no response	0

(b) Record the observation for Set III in Diagram 1.1. [3 marks]

	Marking Scheme	Marks
1(b)	Able to record the observation correctly. Sample answer. Metal X burns more vigorously and produces white fumes.	3
	Able to record the observation less correctly. Sample answer. Metal X burns vigorously and produces white fumes.	2
	Able to state an idea of the observation. Sample answer Metal X burns in oxygen/produces white fumes.	1
	Wrong or no response	0

(c) Construct a table to record the observations for Set I, Set II and Set III. [3 marks]

	Marking Scheme	Marks								
1(b)	<p>Able to construct a table with the following aspects correctly</p> <p>1. Title 2. Observations</p> <p>Sample answer:</p> <table border="1"> <thead> <tr> <th>Set</th> <th>Observations</th> </tr> </thead> <tbody> <tr> <td>I</td> <td>Lithium burns slowly and produces white fumes.</td> </tr> <tr> <td>II</td> <td>Sodium burns vigorously and produces whites fumes</td> </tr> <tr> <td>III</td> <td>Metal X burns vigorously and produces whites fumes.</td> </tr> </tbody> </table>	Set	Observations	I	Lithium burns slowly and produces white fumes.	II	Sodium burns vigorously and produces whites fumes	III	Metal X burns vigorously and produces whites fumes.	3
Set	Observations									
I	Lithium burns slowly and produces white fumes.									
II	Sodium burns vigorously and produces whites fumes									
III	Metal X burns vigorously and produces whites fumes.									
	<p>Able to construct a table less accurately</p> <p>Sample answer:</p> <table border="1"> <thead> <tr> <th>Set</th> <th>Observations</th> </tr> </thead> <tbody> <tr> <td>I</td> <td>Lithium burns slowly and produces white fumes.</td> </tr> <tr> <td>II</td> <td>Sodium burns vigorously and produces whites fumes.</td> </tr> <tr> <td>III</td> <td>Metal X burns vigorously and produces whites fumes.</td> </tr> </tbody> </table>	Set	Observations	I	Lithium burns slowly and produces white fumes.	II	Sodium burns vigorously and produces whites fumes.	III	Metal X burns vigorously and produces whites fumes.	2
Set	Observations									
I	Lithium burns slowly and produces white fumes.									
II	Sodium burns vigorously and produces whites fumes.									
III	Metal X burns vigorously and produces whites fumes.									
	<p>Able to construct a table less accurately</p> <p>Sample answer:</p> <table border="1"> <thead> <tr> <th>Set</th> <th>Observations</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> <tr> <td></td> <td></td> </tr> </tbody> </table>	Set	Observations							1
Set	Observations									

(d) Based on the observation in Set III, predict metal X. [3 marks]

	Marking Scheme	Marks
1(d)	Able to predict metal X accurately. Potassium	3
	Able to predict metal X less accurately Rubidium	2
	Able to give an idea to predict metal X. Francium//Caesium	1
	Wrong or no response	0

(f) Record the pH value to one decimal place for Set I, Set II and Set III. [3 marks]

	Marking Scheme	Marks
1(f)	Able to record the pH meter readings to one decimal place. Set I: 12.1 Set II: 12.7 Set III: 12.9	3
	Able to record the pH meter readings or at least 2 pH readings accurately. Set I: 12.145	2

	Set II: 12.651 Set III: 12.912	
	Able to record at least 2 pH meter readings accurately.	1
	Wrong or no response	0

(Marking Scheme	Marks						
1(g)	Able to give six statements correctly. Sample answers <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%;">Manipulated variable: Types of solution//Lithium hydroxide, Sodium hydroxide, Potassium hydroxide.</td> <td style="width: 50%;">Method to manipulate the variable: Use different solution for each reading/experiment</td> </tr> <tr> <td>Responding variable: pH meter readings//pH values</td> <td>How the variable is responding: pH meter shows different readings with different solutions</td> </tr> <tr> <td>Fixed variable: pH meter</td> <td>Method to maintain the fixed variable: Use same pH meter for each solution.</td> </tr> </table>	Manipulated variable: Types of solution//Lithium hydroxide, Sodium hydroxide, Potassium hydroxide.	Method to manipulate the variable: Use different solution for each reading/experiment	Responding variable: pH meter readings//pH values	How the variable is responding: pH meter shows different readings with different solutions	Fixed variable: pH meter	Method to maintain the fixed variable: Use same pH meter for each solution.	6
Manipulated variable: Types of solution//Lithium hydroxide, Sodium hydroxide, Potassium hydroxide.	Method to manipulate the variable: Use different solution for each reading/experiment							
Responding variable: pH meter readings//pH values	How the variable is responding: pH meter shows different readings with different solutions							
Fixed variable: pH meter	Method to maintain the fixed variable: Use same pH meter for each solution.							
	Able to give five statements correctly.	5						
	Able to give four statements correctly.	4						
	Able to give three statements correctly.	3						
	Able to give two statements correctly.	2						
	Able to give one statement correctly.	1						
	Wrong or no response.	0						

[SBPdiag07-01-P3]

1.(a) KK0501 – Making observations

Score	Rubric								
3	(Able to tabulate all the expected observations correctly) Suggested answer : <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th>Element</th> <th>Observations</th> </tr> <tr> <td>P</td> <td>It burns slowly .White fume is formed</td> </tr> <tr> <td>Q</td> <td>It burns rapidly . White fume is formed.</td> </tr> <tr> <td>R</td> <td>It burns very rapidly and brightly . White fume is formed.</td> </tr> </table>	Element	Observations	P	It burns slowly .White fume is formed	Q	It burns rapidly . White fume is formed.	R	It burns very rapidly and brightly . White fume is formed.
Element	Observations								
P	It burns slowly .White fume is formed								
Q	It burns rapidly . White fume is formed.								
R	It burns very rapidly and brightly . White fume is formed.								
2	(Able to state any two observations correctly)								
1	(Able to state any one observation correctly)								
0	No response or wrong response								

1 (b) KK0502 – Classifying

Score	Rubric
3	(Able to arrange the metals in correct order) Suggested answer : R, Q, P
2	(Able to arrange at least R as the first metal) Suggested answer : R, P, Q
1	(Wrong order of arrangement) Suggested answer : P, Q, R
0	No response or wrong response

1 (c) KK054 – Making inference

Score	Rubric
3	(Able to deduce the reactivity of metals based on the three observations) Suggested answer : Reactivity of R is the highest, followed by Q while P has the lowest reactivity
2	(Able to deduce reactivity of metals based on two observations) Suggested answer : Reactivity of R is the highest while reactivity of P is the lowest
1	(Able to deduce at least one observation correctly) Suggested answer : Reactivity of R is the highest / Reactivity of P is the lowest.
0	No response or wrong response

1 (d) KK0510 – Controlling variables

Score	Rubric
3	(Able to state 3 correct and complete variables) Suggested answer Manipulated : Type of metals Responding : Reactivity of metal with oxygen gas Fixed : Size of metal
2	(Able to state 2 correct and complete variables)
1	(Able to give one correct and complete variable)
0	No response or wrong response

1 (e) KK0503 – Measuring And Using Number

Score	Rubric
3	(Able to calculate the number of moles and concentration of solution correctly) Suggested answer : 2.3g of Q = $2.3 / 23 = 0.1$ mol 250 cm ³ of water = $250 / 1000 = 0.25$ dm ³ Concentration of solution = $0.1 / 0.25 = 0.4$ mol dm ⁻³
2	(Incorrect calculation) Suggested answer : 2.3g of Q = $2.3 / 23 = 0.1$ mol Concentration of solution = $0.1 / 250 = 0.0004$ mol dm ³
1	(At least the number of moles of Q is correct)
0	No response or wrong response

[SBPdiag06-02-P3]

2 (a)

Score	Rubric						
6	[Able to state all variables dan how to control the variables correctly] Example: <table border="1" style="width: 100%;"> <tr> <td style="width: 50%;">Manipulated variable: Types of halogens</td> <td style="width: 50%;">Use different types of halogens i.e chlorine, bromine and iodine</td> </tr> <tr> <td>Responding variable: The reactivity of halogens</td> <td>Observe the burning / glowing of iron wool when it is heated</td> </tr> <tr> <td>Fixed variable: Mass and size of Iron wool</td> <td>Use the same size /mass / type of iron</td> </tr> </table>	Manipulated variable: Types of halogens	Use different types of halogens i.e chlorine, bromine and iodine	Responding variable: The reactivity of halogens	Observe the burning / glowing of iron wool when it is heated	Fixed variable: Mass and size of Iron wool	Use the same size /mass / type of iron
Manipulated variable: Types of halogens	Use different types of halogens i.e chlorine, bromine and iodine						
Responding variable: The reactivity of halogens	Observe the burning / glowing of iron wool when it is heated						
Fixed variable: Mass and size of Iron wool	Use the same size /mass / type of iron						
5	[Able to state any five items correctly]						
4	[Able to state any four items correctly]						
3	[Able to state any three items correctly]						
2	[Able to state any two items correctly]						
1	[Able to state any one item correctly]						
0	No response or wrong response						

2 (b)

Score	Rubric
3	[Able to relate the manipulated variable to the responding variable correctly] Example: The higher the position of a halogen, the more reactive it is when heated with iron wool // going down the group halogen, The reactivity of halogens with iron wools

2	[Able to relate the manipulated variables to the responding variables with less accuracy] Example: The reactivity of halogens decreases when going down the group.
1	[Able to give ideas on the statement of hypothesis] Example: The reactivity depends on the type of halogen // The reactivity of halogens towards iron is different.
0	No response or wrong response

2 (c)

Score	Rubric
3	[Able to state the relationship between the position and reactivity of halogens correctly] Example: The higher the position of a halogen in the Periodic Table, the more reactive it is in the reaction with iron // The reactivity of halogens towards iron decreases when going down the group.
2	[Able to state the relationship between the position and reactivity of halogens with less accuracy] Example: Chlorine is the most reactive, bromine is reactive and iodine is the least reactive.
1	[Able to give ideas on the relationship between the position of halogens with less accuracy] Example: The reactivity of halogens towards iron are different. Chlorine is the most reactive halogen.
0	No response or wrong response

2 (d)

Score	Rubric
3	[Able to arrange halogen correctly] Example: Chlorine, bromine, iodine
2	[Able to arrange halogen with less accuracy] Example: Chlorine, iodine, bromine
1	[Able to give ideas on the reactivity] Example: Iodine, bromine, chlorine
0	No response or wrong response