Section A / *Bahagian A*
[60 markah / *60 marks*]
Answer **all** questions
Jawab semua soalan

1. Table 1 shows the names of some chemical substance with its chemical formula
Jadual 1 menunjukkan nama beberapa bahan kimia dengan formula kimia.

Chemical Substance *Bahankimia*	Chemical formula *Formula kimia*
Iodine *Iodin*	I_2
X *X*	$CuSO_4$
Aluminium *Aluminium*	Al
Tetrachloromethane *Tetraklorometana*	CCl_4

Table 1
Jadual 1

a) Answer the following questions based on Table 1
Jawab soalan berikut berdasarkan Jadual 1

i) State the types of particles of tetrachloromethane
Nyatakan jenis zarah bagi tetraklorometana

.....
(1 mark / *1 markah*)

ii) Name substance X.
Namakan bahan X

.....
(1 mark / *1 markah*)

iii) Classify the substance into elements and compounds by completing the table below
Kelaskan bahan kepada unsur dan sebatian dengan menyempurnakan jadual berikut

Element *Unsur*	Compound *Sebatian*

(2 marks / *2 markah*)

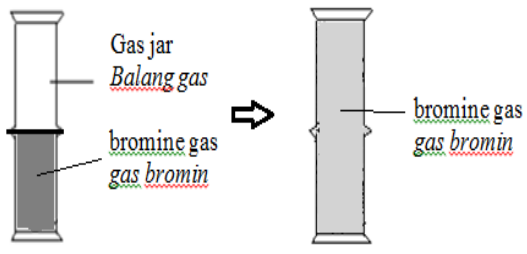
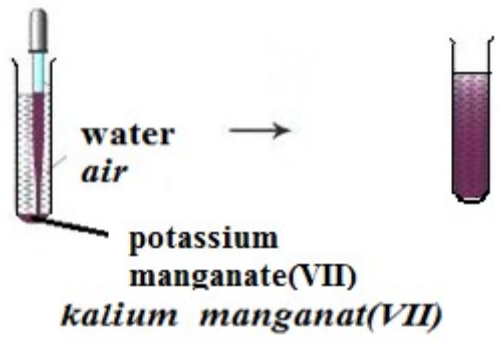
	
Experiment 1 *Eksperimen 1*	Experiment 2 *Eksperimen 2*

Diagram 1
Rajah 1

b) Diagram 1 shows two experiments carried out to investigate the rate of diffusion in different state of matters.
Rajah 1 menunjukkan dua eksperimen yang dijalankan untuk menyiasat kadar resapan didalam keadaan jirim yang berbeza.

i) What is meant by diffusion?
Apa yang dimaksudkan dengan resapan?

……

……

(1 mark / *1 markah*)

ii) Compare the rate of diffusion in Experiment 1 and Experiment 2.
Bandingkan kadar resapan dalam Eksperimen 1 dan Eksperimen 2

……

(1 mark / *1 markah*)

iii) Give a reason why the rate of diffusion differs in b)(ii)
Berikan satu sebab mengapa kadar resapan berbeza dalam b)(ii)

……

(1 mark / *1 markah*)

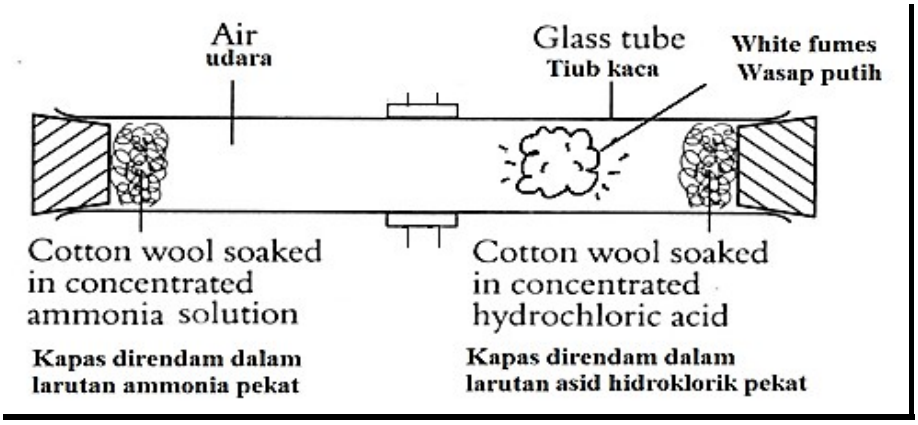


Diagram 2
Rajah 2

c) Diagram 2 shows another experiment carried out to investigate effects of the mass of molecule on its rate of diffusion. The reaction takes place between ammonia gas and hydrogen chloride gas to form a white fume named ammonium chloride.
Rajah 2 menunjukkan satu eksperimen lain yang dijalankan untuk menyiasat kesan jisim molekul ke atas kadar resapan. Tindakbalas yang berlaku ialah di antara gas ammonia dan gas hydrogen klorida dan membentuk satu wasap putih bernama ammonium klorida.

i) Write the balanced chemical equation between the reaction of ammonia gas and hydrogen chloride gas.
Tuliskan satu persamaan kimia yang seimbang bagi tindakbalas di antara gas ammonia dan gas hidrogenklorida

……..

(2 marks / *2 markah*)

ii) From the observation above, what is your inference on the mass of ammonia and hydrogen chloride?
Daripada pemerhatian diatas, apakah inferens anda terhadap jisim ammonia dan jisim hydrogen klorida

……..... (1 mark / *1 markah*)

2. (a)Diagram 3 shows the atomic structure of Z element.
Rajah 3menunjukkanstruktur atom bagiunsur Z

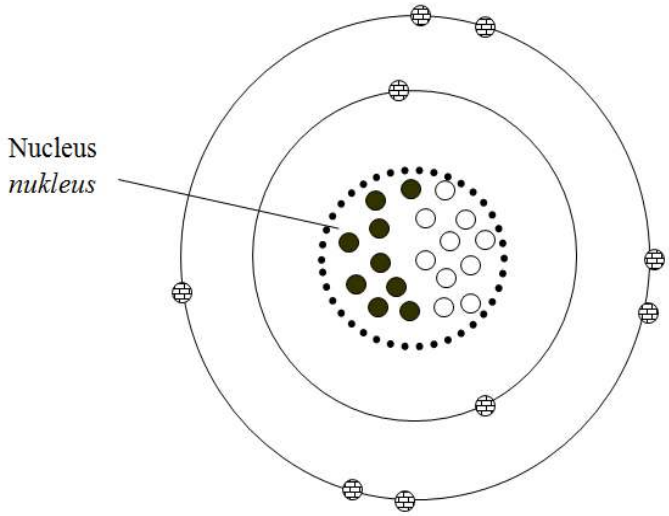


Diagram 3
Rajah 3

Based on Diagram 3, answer the questions below.
Berdasarkan Rajah 3, jawab soalan berikut.
i) Define nucleon number.
Takrifkan number nukleon

……..... (1 mark / *1 markah*)

ii) The structure of atom consists of three subatomic particles. Refer to Diagram 3, complete the following table with the correct name of subatomic particles.
Struktur atom mengandungi tiga jenis zarah subatom. Merujuk kepada Rajah 3 , lengkapkan jadual berikut dengan nama zarah subatom yang betul.

Symbol *Simbol*	Subatomic particles *Zarahsubatom*
●	
●	
○	

(3 marks / *3markah*)

(iii) State the number of valence electrons in Z atom.
Nyatakan bilangan electron valensdalam atom Z

……..... (1 mark / *1 markah*)

(iv) State the position of Z element in the Periodic Table of Elements
Nyatakan kedudukan unsur Z dalam Jadual Berkala Unsur

……..... (2 marks / *2markah*)

Diagram 4
Rajah 4

(b) Diagram 4 shows two isotopes of R elements
Rajah 4 menunjukkan dua isotop bagi unsur R.

(i) What are isotopes?
Apa itu isotop?

……..... ……..... (2 marks / *2markah*)

ii) Is the chemical properties of both isotopes differs? Explain your answer.
Adakah sifat kimia kedua-dua isotop berbeza? Terangkan jawapan anda.

……..... ……..... (2 marks / *2markah*)

3. Sodium reacts with water to form alkali and a colourless gas. The chemical equation of the reaction is as below :
Natrium bertindakbalas dengan air untuk menghasilkan alkali dan sejenis gas tidak berwarna. Persamaan kimia adalah seperti yang berikut :

……..Na (s) + ……..H_2O(l) ⟶ …….NaOH (aq) + …….H_2(g)

a) (i) Balance the chemical equation above by putting the number in the space provided.

Seimbangkan persamaan kimia di atas dengan melengkapkan ruangan yang disediakan.

(1 mark / *1 markah*)

(ii) Name the reactants
Namakan bahan tindak balas

…….....

(1 mark / *1 markah*)

(iii) Name the products
Namakan hasil tindak balas

…….....

(1 mark / *1 markah*)

iv) Interpret the above equation quantitatively.
Jelaskan persamaan di atas secara kuantitatif.

…….....

…….....

(2 marks / *2markah*)

b) A total of 5 g of calcium carbonate is reacted with excess nitric acid solution to produce calcium nitrate solution, carbon dioxide gas and water.
The chemical equation of the reaction is stated as below.
Sejumlah 5 g kalsium karbonat bertindakbalas dengan asid nitric berlebihan untuk menghasilkan larutan kalsium nitrat, gas karbon dioksida dan air.
Persamaan kimia bagi tindak balas adalah dinyatakan seperti yang berikut.

$$CaCO_3(s) + 2HNO_3(aq) \longrightarrow Ca(NO_3)_2(aq) + CO_2(g) + H_2O(l)$$

(Relative atomic mass :Ca = 40, C =12, O =16; 1 mol of gas occupies 24 dm^3 at room condition)
(Jisim atom relatif :Ca = 40, C =12, O =16; 1 mol gas menempati 24 dm^3 pada keadaan bilik)

i) Calculate the relative formula mass of calcium carbonate.
Hitungkan jisim formula relative bagi kalsium karbonat

(1 mark / *1 markah*)

ii) Determine the total volume of gas released in this reaction.
Tentukan jumlah isipadu gas yang dibebaskan dalam tindak balas ini.

(3 marks / *3markah*)

4. Diagram 5 shows the structural formula of X compound.
Rajah 5 menunjukkan formula struktur bagi sebatian X.

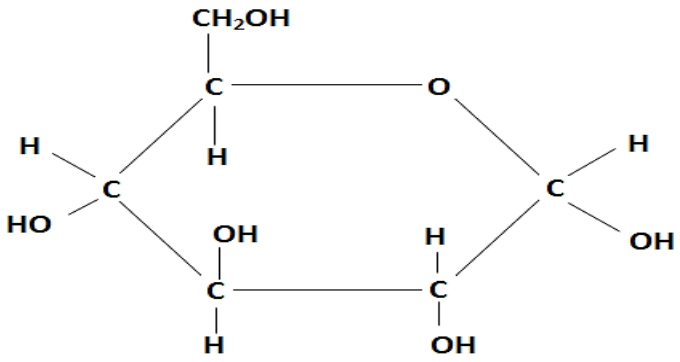


Diagram 5
Rajah 5

(a) Define molecular formula?
Takrifkan formula molekul?

……

……
(2 marks / *2markah*)

(b) Write the molecular formula of compound X.
Tuliskan formula molekul bagi sebatian X

……
(1 mark / *1 markah*)

(c)(i) State the type of compound for compound X.
Nyatakan jenis sebatian bagi sebatian X

……
(1 mark / *1 markah*)

(ii) State one physical property of compound X
Nyatakan satu sifat fizik bagi sebatian X

……
(1 mark / *1 markah*)

(d) Compound Y contains 52.2% of carbon, 13.0% of hydrogen and 34.8% of oxygen by mass.
Sebatian Y mengandungi 52.2% karbon, 13.0% hidrogendan 34.8% oksigen mengikut jisim.
Given that the relative atomic mass of H=1, C=12, O=16.
Diberi jisim atom relative H=1, C=12, O=16.

(i) Determine the empirical formula of compound Y.
Tentukan formula empiric bagi sebatian Y

(3 marks / *3markah*)

(ii) If the molar mass of compound Y is 46 $gmol^{-1}$, find its molecular formula.
Jikajisim molar bagisebatian Y ialah 46$gmol^{-1}$, carikan formula molekulbaginya.

(2 marks / *2markah*)

5. The position of eight elements represented by the letters A, B, C, D, E, F, G and H are shown in the Periodic Table in Diagram 6.
Kedudukanlapanjenisunsur yang ditandakansebagai A, B, C, D, E, F, G dan H ditunjukkandalamJadualBerkalaUnsursepertidalam Rajah 6.

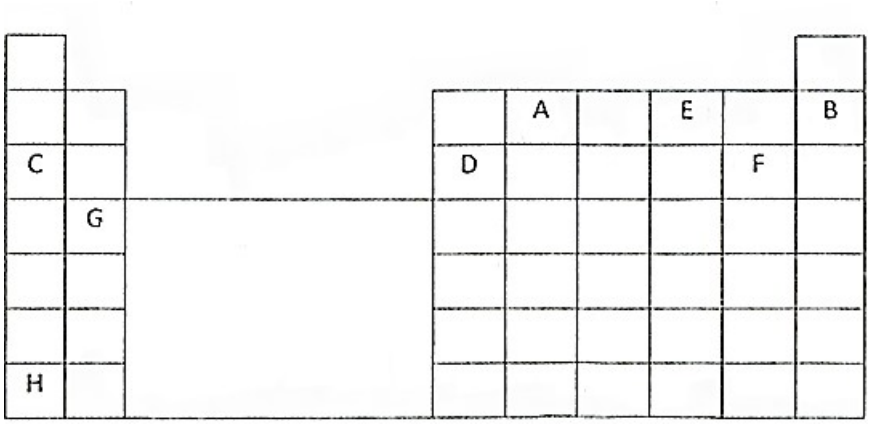


Diagram 6
Rajah 6

a) State **one** metal and **one** non-metal.
*Nyatakan**satu**unsurlogamdan**satu**unsurbukanlogam.*

Metal/*Logam* : .....

Non-metal/*Bukanlogam* : .....

(2 marks / *2markah*)

b) i) Which element is chemically inert?
Unsur yang manakahlengaisecarakimia?

.....

(1 mark/ *1markah*)

ii) Explain your answer.
Jelaskanjawapananda.

.....

(1 mark/ *1markah*)

c) i) Write the formula of the compound formed by G and E
Tuliskan formula kimia bagi sebatian yang terbentuk antara G dan E

.....

(1 mark/ *1markah*)

ii) Draw a diagram to show the arrangement of electrons in the compoundformed by A and F.
Lukiskan gambarajah susunan electron bagi sebatian kimia yang terbentuk antara unsur A dan F.

(2 marks / *2markah*)

d) Write the formula of ion formed by D.
Tuliskan formula untuk ion yang terbentuk daripada unsur D.

.....

(1 mark/ *1markah*)

e) Which element is the most electronegative in period 3?
Unsur yang manakah paling elektronegatif dalam kala 3?

.....

(1 mark/ *1markah*)

6. Diagram 7 shows the set up of the apparatus used in an experiment to determine the empirical formula of an oxide of copper
Rajah 7 menunjukkan susunan alatradas yang digunakan dalam satu eksperimen untuk menentukan formula empiric bagi oksida kuprum

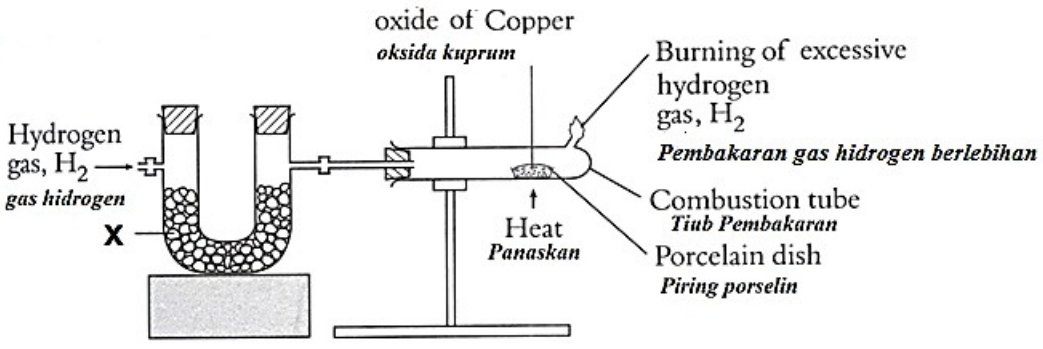


Diagram 7
Rajah 7

(a) What is meant by empirical formula?
Apa yang dimaksudkan dengan formula empirik?

…….....

…….....
(2 marks / *2markah*)

(b) Substance X is used to dry the hydrogen gas. Name substance X.
Bahan X digunakan untuk mengeringkan gas hidrogen. Namakan bahan X

…….....
(1 mark / *1markah*)

(c) Write the chemical equation for the reaction between hydrogen and the oxide of copper.
Tuliskan persamaan kimia bagi tindakbalas antara gas hydrogen dengan oksidakuprum

…….....
(2 marks / *2markah*)

(d) State **one** observation in this experiment.
Nyatakan satu pemerhatian dalam eksperimen ini.

…….....
(1 mark / *1markah*)

(e) State **one** precaution step when carrying out this experiment
Nyatakan satu langkah berjaga-jaga semasa menjalankan eksperimen tersebut.

…….....
(1 mark / *1markah*)

(f) Describe briefly a chemical test on how to ensure all the air in the combustion tube has been expelled completely.
Huraikan secara ringkas satu ujian kimia bagaimana untuk memastikan semua udara dalam tiub pembakaran sudah disingkirkan secaralengkap?

…….....

…….....
(2 marks / *2markah*)

(g) Is the empirical formula of magnesium oxides can be determined using the method above? State your reason.
Adakah formula empiric oksida logam magnesium boleh ditentukan melalui kaedah eksperimen di atas? Berikansebabnya.

…….....

…….....
(2 marks / *2markah*)

Section B
Bahagian B
(20 marks / *20 markah*)
Answer any **one** questions from this section.
*Jawab mana-mana **satu** soalan daripada bahagian ini*

7. (a) What is meant by "freezing point"?
During the freezing of naphthalene, the temperature remains constant even though heat is lost to the surrounding. Explain why.
Apa yang dimaksudkan dengan "takatbeku"?
Semasa pembekuan naftalena, suhu kekal malar walaupun haba sedang dibebaskan kepersekitaran. Terangkan mengapa?

(4 marks / *4markah*)

(b) Table shows the melting point and boiling point of three chemical substance.
Jadual menunjukkan takat lebur dan takat didih bagi tiga bahan kimia.

Substance *Bahan*	Melting Point /^{o}C *Takatlebur /* ^{o}*C*	Boiling Point /^{o}C *Takatdidh /* ^{o}*C*
X	45	87
Y	-55	-8
Z	20	58

Table 2
Jadual 2

(i) Determine the states of matter of substance X, Y and Z at room condition (30^{o}C).
Tentukan keadaan jirim bahan X, Y dan Z pada suhu dalam keadaan bilik (30^{o}C)

(3 marks / *3markah*)

(ii) Sketch a labelled graph of cooling for substance X from 100^{o}C to temperature at room condition. In your graph use arrow " —> " to indicate the melting point and boiling point of substance X.
Lakarkan satu graf berlabel bagi penyejukan bahan X daripada 100^{o}C kepada suhu pada keadaan bilik. Dalam graf anda gunakan anak panah "—> " untuk menunjukkan takat lebur dan takat didih bagi bahan X.

(3 marks / *3markah*)

(c)

Melting is the process where a solid changes to its liquid state at a certain temperature and pressure when it is heated.

Peleburan ialah proses di mana sesuatu pepejal bertukar kepada keadaan cecair pada suhu dan tekanan yang tetap apabila dipanaskan.

Describe the changes in terms of the physical states with its arrangement of particles (drawing and description), movement of particles and the forces of attraction between the particles at the following states:

- before melting

- after melting completely
  Huraikan perubahan dari segi susunan zarah mengikut keadaan jirim (melukis dan menghurai), pergerakan zarah dan daya tarikan antara zarah pada keadaan yang berikut :
- *sebelum melebur*
- *selepas lengkap melebur*

(10 marks / *10markah*)

8. Diagram 8.1 and Diagram 8.2 show the diagrams of the electron arrangement for atoms of two elements from a group in the Periodic Table of Elements
Rajah 8.1 dan Rajah 8.2 menunjukkan rajah susunan electron bagi atom dua unsur dari Kumpulan 17 dalam Jadual Berkala Unsur.

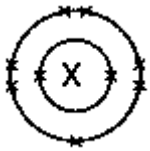


Diagram 8.1

Diagram 8.2

Rajah 8.1 *Rajah 8.2*

(a) Based on Diagram 8.1 and Diagram 8.2 :
Berdasarkan Rajah 8.1 dan Rajah 8.2 :

i) Name the Group that represent both atoms in the Periodic Table of Elements
Namakan kumpulan yang mewakili kedua-dua atom dalam Jadual Berkala Unsur

(1 mark / *1 markah*)

ii) Compare the reactivity between X atom and Y atom. Explain your answers.
Bandingkan kereaktifan antara atom X dan atom Y. Jelaskan jawapan anda.

(4 marks / *4 markah*)

(b) Diagram 8.3 shows the set up of the apparatus to investigate the reaction of bromine gas with iron metal.
Rajah 8.3 menunjukkan susunan radas untuk mengkaji tindakbalas gas bromine dengan logam besi.

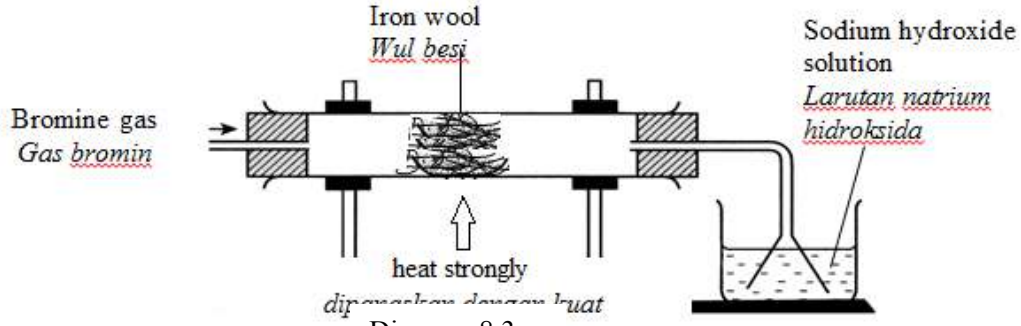


Diagram 8.3
Rajah 8.3

(i) State **one** observation while carrying out the experiment.
Nyatakan satu pemerhatian semasa menjalani eksperimen ini

(1 mark / *1markah*)

(ii) State the function of sodium hydroxide solution in this experiment
Nyatakan satu fungsi bagi larutan natrium hidroksida dalam eksperimen ini.

(1 mark / *1markah*)

(iii) The chemical equation for the reaction is as follow:

$2Fe(s) + 3Br_2(g) \rightarrow 2FeBr_3(s)$

1.4 g of iron wool is burned completely with bromine gas.

[Relative atomic mass of Br = 80and Fe = 56 ; 1 mol of gas occupies 24 dm^3 at room condition]
Calculate the volume of bromine gas reacted with iron at room condition.
Persamaan kimia bagi tindak balas adalah seperti yang berikut

$2Fe(s) + 3Br_2(g) \rightarrow$ $2FeBr_3(s)$

1.4 g kapasbesidibakardenganlengkapdalam gas bromin.
[Jisim atom relative bagi Br = 80 dan Fe = 56 ; 1 mol gas menempati 24 dm^3 pada keadaan bilik]
Kirakan isipadu gas bromin yang telah bertindakbalas pada keadaan bilik.

(4 marks / *4markah*)

(c) Table 3 shows the elements in Period 3
Jadual 3 menunjukkan unsur-unsur dalam Kala 3.

Na	Mg	Al	Si	P	S	Cl

Table 3
Jadual 3

Based on Table 3 :
BerdasarkanJadual 3 :

i) State one element that can form amphoteric oxides
Nyatakan satu unsur yang boleh membentuk oksida amfoterik (1 mark / *1markah*)

ii) State elements that can conduct electricity
Nyatakan unsur-unsur yang boleh mengalir arus elektrik (1 mark / *1markah*)

iii) Predict the changes of atomic size of elements when move across the period
Ramalkan perubahan saiz atom bagi unsur apabila bergerak merentasi kala (1 mark / *1markah*)

iv) Explain your answer in (d)(iv).
Terangkan jawapan anda dalam (d)(iv) (3 marks / *3 markah*)

Z element is solid at room temperature and has shiny surface. The element has high melting point and is a good electrical conductor. Z element can form coloured ions.

Unsur Z ialah pepejal pada suhu bilik dan mempunyai permukaan berkilat. Unsur itu mempunyai takat lebur yang tinggi dan merupakan pengalir elektrik baik. Unsur Z bolehmembentuk ion berwarna.

(d) The statement above shows the physical properties of Z element.
Pernyataan di atas menunjukkan sifat fizik bagi unsur Z.

i) What is the name given to Z element in Periodic Table of Element.
Apakah nama yang diberikan kepada unsur Z dalam Jadual Berkala Unsur

(1 mark / *1markah*)

ii) State the other two special characteristic of Z element.
Nyatakan dua lagi sifat istimewa bagi unsur Z.

(2 marks / *2markah*)

Section C
BahagianC
(20 marks / *20 markah*)
Answer any **one** questions from this section.
*Jawab mana-mana **satu** soalan daripada bahagian ini*

9 (a) Element M react with element N to form a compound.
Diagram 9.1 shows the electron arrangement of the compound.
Unsur M bertindakbalas dengan unsur N untuk membentuk satu sebatian.
Rajah 9.1 menunjukkan susunan electron bagi sebatian itu.

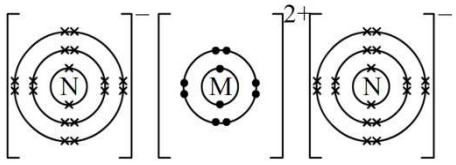


Diagram 9.1
Rajah 9.1

(i) Write the electron arrangement of atom of element M and N.
State the position of element M and N in the Periodic Table of element.
Tuliskan susunan electron bagi atom unsur M dan N.
Nyatakan kedudukan unsur M dan N dalam Jadual Berkala.

(6 marks /*6 markah*)

(ii) Write the chemical equation for the reaction between element M and N.
Explain how the bond in the compound formed.
Tuliskan persamaan kimia bagi tindak balas antara unsur M dengan unsur N.
Terangkan bagaimana ikatan dalam sebatian terbentuk.

(7 marks / *7 markah*)

(b) Diagram 9.2 shows the set-up of apparatus to investigate the electrical conductivity of lead(II) bromide and naphthalene.
Rajah 9.2 menunjukkan radas yang disediakan untuk menyiasat kekonduksian elektrik bagi plumbum (II) bromide dan naftalena.

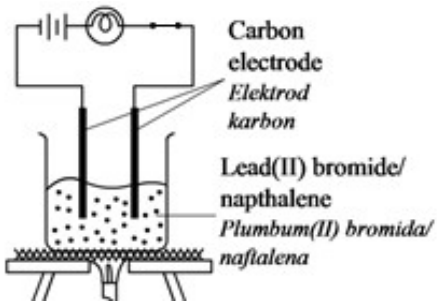


Diagram 9.2
Rajah 9.2

Table 4 shows the result obtained.
Jadual 4 menunjukkan keputusan yang diperoleh.

Substance ***Bahan***	**State of substance** ***Keadaanbahan***	**Observation** ***Pemerhatian***
Lead(II) bromide *Plumbum(II) bromida*	Solid *Pepejal*	The bulb does not glow *Mentol tidak menyala*
	Molten *Leburan*	The bulb glows brightly *Mentol menyala dengan terang*
Napthalene *Naftalena*	Solid *Pepejal*	The bulb does not glow *Mentol tidak menyala*
	Molten *Leburan*	The bulb does not glow *Mentol tidak menyala*

Table 4
Jadual4

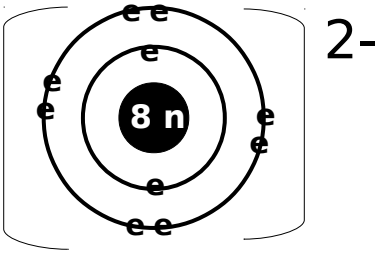
Explain the observation in Table 4. *Terangkan pemerhatian dalam Jadual 4.*

(7 marks / *7 markah*)

10. (a) Define "atom" and "ion"
Takrifkan "atom" dan "ion"

(2 marks / *2markah*)

(b) Diagram 9 shows the electron arrangement of X^{2-} ion
Rajah 9 menunjukkan susunan electron bagi ion X^{2-}



n– neutron
e – electron

Diagram 9
Rajah 9

(i) State the proton number of X atom.
Kirakan nombor proton bagi atom X

(1 mark / *1markah*)

(ii) Determine the nucleon number of X atom.
Tentukan nombor nucleon bagi atom X

(1 mark / *1markah*)

(iii) Write X atom in the form of standard representation, ${}^{A}_{Z}X$

Tuliskan atom X dalam bentuk perwakilan piawai, ${}^{A}_{Z}X$

(2 marks / *2markah*)

(c) Z reacts with oxygen gas to form oxide Z, with the formula Z_2O.
The chemical equation for reaction Z with oxygen is show as:

$4Z + O_2 \rightarrow 2Z_2O$ [ ]

Given that the relative atomic mass of Z = 39 and O = 16.
Calculate the mass of oxide Z, Z_2O formed when 1.95 g Z is completely burnt in oxygen.

Z bertindakbalas dengan oksigen untuk membentuk oksida Z, dengan formula Z_2O
Persamaan kimia bagi tindak balas Z dengan oksigen ditunjukkan seperti berikut :

$4Z + O_2 \rightarrow 2Z_2O$ [ ]

Diberi jisim atom relatif Z = 39 dan O = 16
Hitungkan jisim oksida Z, Z_2O dibentuk apabila 1.95 g Z dibakar dengan lengkap dalam oksigen.

(4 marks / *4markah*)

d) The empirical formula of magnesium oxide can be determined by heating magnesium ribbon in oxygen gas.
Describe one experiment how you could determine the empirical formula of magnesium oxide in the laboratory. Your description should include

- procedure of experiment
- tabulation of result
- steps of calculation
  (Relative atomic mass: O,16; Mg,24)

Formula empiric bagi magnesium oksida boleh ditentukan dengan memanaskan pita magnesium dalam gas oksigen.
Huraikan satu eksperimen bagaimana anda dapat menentukan formula empirik magnesium oksida dalam makmal .Huraian anda harus mengandungi

- *prosedur eksperimen*
- *penjadual data*
- *langkah pengiraan*
  (Jisim atom relatif: O,16; Mg,24) (10 marks / *10markah*)

Ends
Tamat

THE PERIODIC TABLE OF ELEMENTS