2023

KIMIA

PRAKTIS TOPIKAL

KERTAS 1 & KERTAS 2

TINGKATAN 4

Unit Kimia

Bahagian Pendidikan Menengah MARA

BAB 2 : JIRIM DAN STRUKTUR ATOM

1 (Q1, SPM 2021)

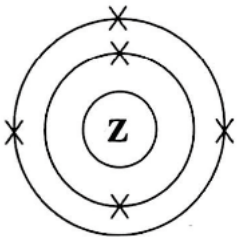
Rajah 1 menunjukkan perwakilan piawai bagi atom Z.
Diagram 1 shows the standard representation of the atom Z.

$$^{11}_{5}Z$$

Rajah / *Diagram 1*

Antara yang berikut, rajah manakah yang menunjukkan struktur atom yang betul untuk atom itu?
Which of the following diagrams shows the correct atomic structure of the atom?

A



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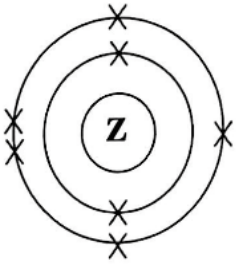

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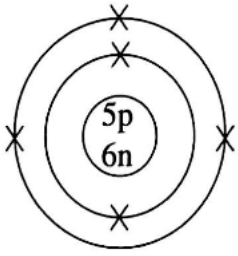

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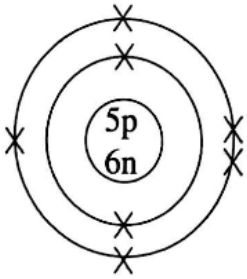
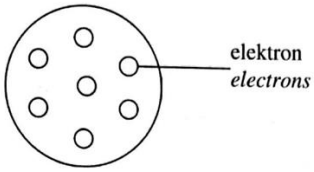


2 (Q2, SPM 2021)

Antara yang berikut, model atom yang manakah dikemukakan oleh Rutherford?
Which of the following atomic models was presented by Rutherford?

A



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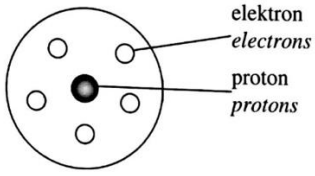

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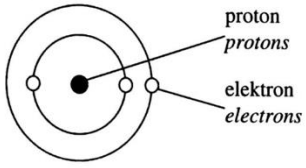
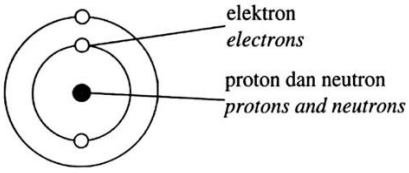


D



3 (Q3, SPM 2021)

Seorang penduduk di Kampung Sentosa membuat aduan kepada Jabatan Air bahawa bil air rumahnya melonjak naik secara drastic. Pegawai jabatan itu mendapati terdapat kebocoran paip air di bawah tanah di Kawasan rumahnya dengan menggunakan sebuah alat pengesan.

Apakah bahan dalam alat pengesan yang digunakan oleh pegawai itu?

A resident in Kampung Sentosa made a complaint to the Water Department because his water bill increased drastically. The officer of the department found that there was an underground water pipe leakage in the house area by using a detector.

What is the substance in the detector used by the officer?

A Karbon-14
Carbon-14

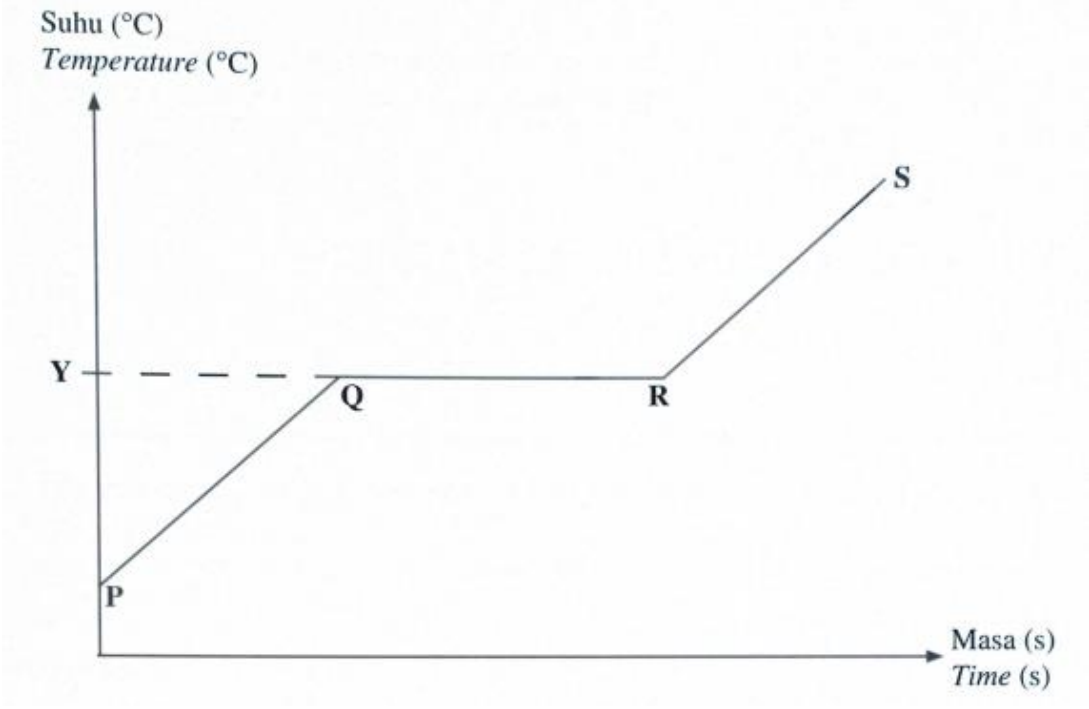
B Kobalt-60
Cobalt-60

C Fosforus-32
Phosphorus-32

D Natrium-24
Sodium-24

4 (Q1, SPM 2022)

Rajah 1 menunjukkan satu lengkung perubahan keadaan jirim bagi pepejal **X**.
Diagram 1 shows a curve of change in state of matter for solid **X**.



Rajah / *Diagram 1*

Apakah keadaan fizik X dan takat Y dari Q ke R?
What is the physical state of X and point Y from Q to R?

	Keadaan fizik X ***Physical state of X***	**Takat Y** ***Point Y***
A	Pepejal *Solid*	Lebur *Melting*
B	Cecair *Liquid*	Beku *Freezing*
C	Pepejal dan cecair *Solid and liquid*	Lebur *Melting*
D	Pepejal dan cecair *Solid and liquid*	Beku *Freezing*

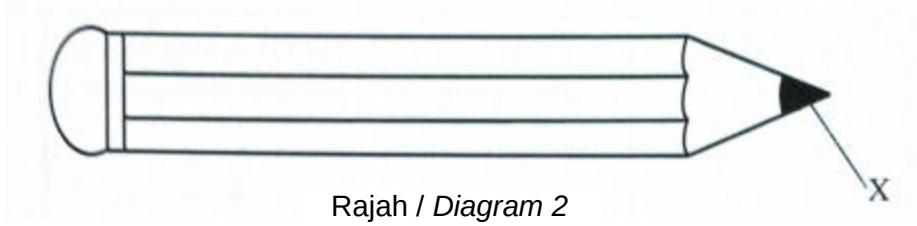
5 (Q2, SPM 2022)

Antara yang berikut, padanan manaah yang betul bagi setiap bahan dan jenis zarahnya?
Which of the following is the correct match of each substance and its type of particles?

	Parasetamol ***Paracetamol***	**Detergen** **Detergent**	**Gas belon kaji cuaca** ***Weather balloon gas***
A	Molekul *Molecule*	Ion *Ion*	Atom *Atom*
B	Atom *Atom*	Molekul *Molecule*	Ion *Ion*
C	Ion *Ion*	Atom *Atom*	Molekul *Molecule*
D	Ion *Ion*	Molekul *Molecule*	Atom *Atom*

6 (Q3, SPM 2022)

Rajah 2 menunjukkan suatu kegunaan balm X.
Diagram 2 shows a use of substance X.



Rajah / *Diagram 2*

Antara yang berikut. pernyataan manakah yang betul tentang X?
Which of the following statements is correct about X?

A Tidak boleh mengkonduksikan arus elektrik
Cannot conduct electricity

B Mempunyai takat lebur dan takat didih yang rendah
Has low melting point and boiling point

C Isotop bagi X boleh digunakan untuk mengesan kebocoran paip dalam tanah
Isotope for X can be used to detect leakage in underground pipes

D Digunakan sebagai atom piawai dalam menentukan jisim atom relatif suatu unsur
Used as a standard atom to determine the relative atomic mass of an element

7 (Q1, SPMRSM 2021)

Antara bahan berikut, yang manakah terdiri daripada ion?
Which of the following substances is made up of ions?

A Air
Water

B Argon
Argon

C Gas oksigen
Oxygen gas

D Natrium klorida
Sodium chloride

8 (Q16, SPMRSM 2021)

Unsur manakah mempunyai isotop yang boleh mengesan kebocoran paip bawah tanah?
Which element has an isotope that can detects the leakage in underground pipe?

A Fosforus
Phosphorus

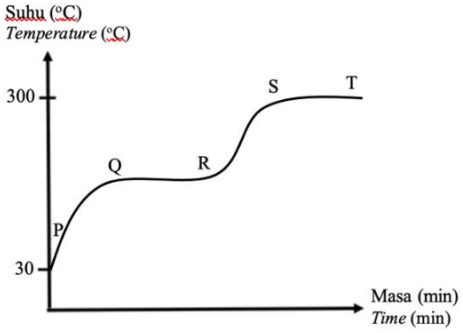
B Karbon
Carbon

C Natrium
Sodium

D Kobalt
Cobalt

9 (Q17, SPMRSM 2021)

Rajah 2 menunjukkan lengkung pemanasan bahan M.
Diagram 2 shows the heating curve of substance M.



Rajah / Diagram 2

Berdasarkan Rajah 2, pada bahagian manakah bahan M wujud sebagai campuran pepejal dan cecair?
Based on Diagram 2, at which section does substance M exists as a mixture of solid and liquid?

A P hingga Q
P to Q

B Q hingga R
Q to R

C R hingga S
R to S

D S hingga T
S to T

10 (Q18, SPMRSM 2021)

Klorin-35 dan klorin-37 adalah isotop bagi klorin.
Antara yang berikut, penyataan manakah yang betul?
[Nombor proton klorin = 17]
Chlorine-35 and chlorine-37 are isotopes of chlorine.
Which of the following statement is correct?
[*Proton number of chlorine* = 17]

A Klorin-37 mempunyai 17 proton dan 20 neutron
Chlorine-37 has 17 protons and 20 neutrons

B Klorin-35 mempunyai 17 proton dan 18 elektron
Chlorine-35 has 17 protons and 18 electrons

C Klorin-35 mempunyai bilangan elektron kurang daripada klorin-37
Chlorine-35 has less number of electrons than chlorine-37

D Klorin-35 mempunyai bilangan neutron yang sama dengan klorin-37
Chlorine-35 has same number of neutrons as chlorine-37

11 (Q1, SPMRSM 2022)

Protium, deuterium dan tritium adalah isotop bagi unsur hidrogen.
Antara berikut, apakah persamaan bagi ketiga-tiga isotop?

Protium, deuterium and tritium are the isotopes of hydrogen.
Which of the following is the similarity of the isotopes?

A Sifat kimia
Chemical property

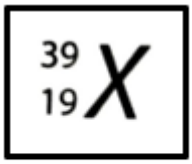
B Sifat fizikal
Physical property

C Nombor nukleon
Nucleon number

D Jisim atom relatif
Relative atomic mass

12 (Q15, SPMRSM 2022)

Rajah 7 menunjukkan simbol atom bagi unsur **X**.
Diagram 7 shows the atomic symbol of element **X**.



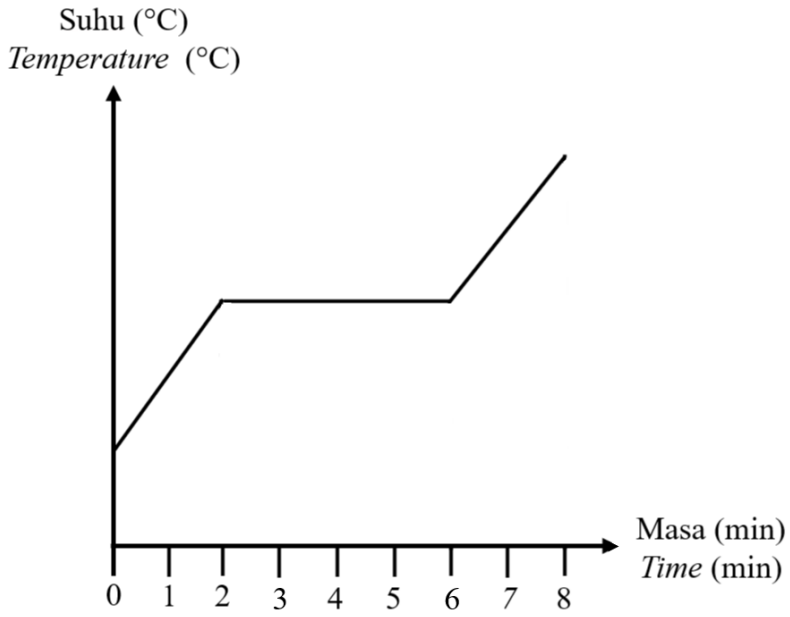
Rajah 7
Diagram 7

Antara yang berikut, yang manakah benar tentang atom bagi unsur **X**?
Which of the following is true about the atom of element **X**?

	Bilangan neutron ***Number of neutrons***	**Susunan elektron** ***Electron arrangement***
A	39	2.8.8.1
B	20	2.8.8.1
C	20	2.8.8.2
D	19	2.8.8.2

13 (Q16, SPMRSM 2022)

Rajah 8 menunjukkan lengkung pemanasan bagi pepejal asid asetik.
Diagram 8 *shows the heating curve of solid acetic acid.*



Rajah / Diagram 8

Penyataan manakah yang boleh dideduksikan daripada Rajah 8?
Which statement can be deduced from Diagram 8*?*

A Tiada haba diserap dalam 2 minit pertama
No heat is absorbed in the first 2 *minutes*

B Asid asetik memerlukan 8 minit untuk melebur selengkapnya
Acetic acid needs 8 *minutes to melt completely*

C Asid asetik mengalami perubahan fizikal di antara minit kedua hingga minit keenam
Acetic acid undergoes physical changes between second minute to sixth minute

D Daya tarikan antara zarah-zarah asid asetik menjadi semakin kuat selepas 6 minit
The attractive forces between particles of acetic acid become stronger after 6 *minutes*

14 (Q3, SBP 2021)

Antara yang berikut, bahan yang manakah merupakan suatu unsur?
Which of the following substances is an element?

A Air
Water

B Neon
Neon

C Etanol
Ethanol

D Naftalena
Napthalene

15 (Q17, SBP 2021)

Jadual 17 menunjukkan takat lebur dan takat didih bagi bahan P.
Table 17 shows the melting point and boiling point of substance P.

Takat lebur (°C) *Melting point (°C)*	78
Takat didih (°C) *Boiling point (°C)*	245

Jadual/*Table 17*

Apakah keadaan fizik bahan P pada suhu 100°*C?*
What is the physical state of substance P at 100°*C?*

A Pepejal
Solid

B Cecair
Liquid

C Pepejal dan cecair
Solid and liquid

D Cecair dan gas
Liquid and gas

16 (Q31, SBP 2021)

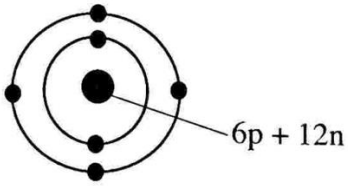
Rajah 31 menunjukkan perwakilan piawai bagi atom unsur X.
Diagram 31 shows the standard representation of the atom of element X.

$$^{12}_{6}X$$

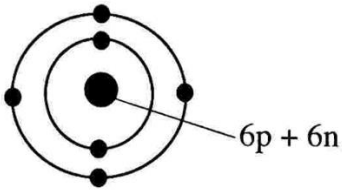
Rajah / Diagram 31

Antara berikut, yang manakah menunjukkan struktur atom X?
Which of the following shows the structure of atom X?

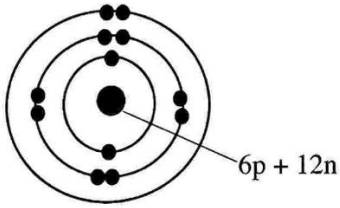
A



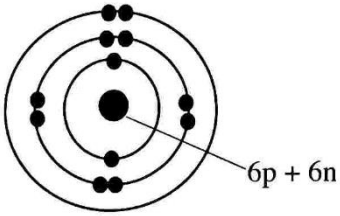
B



C



D



17 (Q1, SBP 2022)

Apakah jenis zarah bagi neon?
What is the type of particles of neon?

A Ion
Ion

B Atom
Atom

C Molekul
Molecule

18 (Q2, SBP 2022)

Antara yang berikut, isotop manakah yang digunakan untuk mengesan kebocoran paip bawah tanah?
Which of the following isotopes is used to detect the leakage of underground pipe?

A Karbon- 14
Carbon 14

B Natrium-24
Sodium-24

C Kobalt-60
Cobalt - 60

D Iodin-131
Iodine-131

19 (Q16, SBP 2022)

M dan N merupakan dua unsur berbeza.
Antara berikut, pernyataan yang manakah betul tentang atom-atom unsur tersebut?
M and N are two different elements.
Which of the following statements is correct about the atoms of elements?

A Atom M dan atom N mempunyai bilangan elektron yang sama
Atom M and atom N have the same number of electrons

B Atom M dan atom N mempunyai bilangan proton yang berbeza
Atom M and N have different number of protons

C Bilangan neutron untuk atom M dan atom N berubah ketika pembentukan ion *Number of neutrons for atoms M and N change during the formation of ion*

D Nombor nukelon bagi atom M dan atom N adalah jumlah bilangan proton dan elektron dalam nukleus masing-musing.
Nucleon number for atoms M and N is the total number of protons and electrons in their respective nucleus

20 (Q31, SBP 2022)

Encik Aaron mendapati ais kering dalsin kotak kek aiskrim bertukar menjadi wasap. Apakah proses dan perubahan tenaga haba yang terjadi kepada ais kering itu?

Mr. Aaron found that the dry ice in the box of ice cream cake change into fumes. What is the process and heat energy change occurred to the dry ice?

	Proses ***Process***	**Perubahan tenaga haba** ***Heat energy change***
A	Pengendapan *Deposition*	Tenaga haba dibebaskan *Heat energy is released*
B	*Pemejalwapan* *Sublimation*	Tenaga haba diserap *Heat energy is absorbed*
C	Pengendapan *Deposition*	Tenaga haba diserap *Heat energy is absorbed*
D	Pemejalwapan *Sublimation*	Tenaga haba dibebaskan *Heat energy is released*

BAB 3: KONSEP MOL, FORMULA DAN PERSAMAAN KIMIA

1 (Q4, SPM 2021)

Antara yang berikut, bahan manakah yang bersamaan dengan 1 mol?
Which of the following substances equal to 1 mole?

[Pemalar Avogadro, $N_A = 6.02 \times 10^{23}\ mol^{-1}$]
[*Avogadro constant, $N_A = 6.02 \times 10^{23}\ mol^{-1}$*]
[Jisim atom relatif: Na = 23, Cl = 35.5]
[*Relative atomic mass: Na = 23, Cl = 35.5*]
[Isi padu molar gas pada keadaan bilik = 24 $dm^3\ mol^{-1}$]
[*Molar volume of gas at room conditions = 24 $dm^3\ mol^{-1}$*]

I Zink Idorida mengandungi 6.02×10^{24} formula unit
Zinc chloride has 6.02×10^{24} formula units

II Natrium klorida mempunyai jisim 58.5 g
Sodium chloride has mass of 58.5 g

III Isi padu gas karbon dioksida pada keadaan bilik adalah 2400 cm^3
The volume of carbon dioxide gas at room conditions is 2400 cm^3

IV Ferum mengandungi 6.02×10^{23} atom
Iron has 6.02×10^{23} atoms

A I dan II
I and II

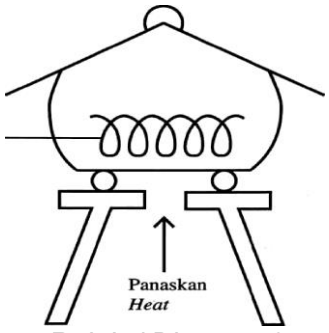
B I dan III
I and III

C III dan IV
III and IV

D II dan IV
II and IV

2 (Q5, SPM 2021)

Rajah 2 menunjukkan susunan radars untuk menentukan formula empirik bagi suatu logam oksida.
Diagram 2 shows the apparatus set-up to determine the empirical formula of a metal oxide.



Rajah / Diagram 2

Antara yang berikut, logam manakah yang menggunakan kaedah yang saMAa untuk menentukan formula empiriknya?
Which of the following metals uses the same method to determine its empirical formula?

A Stanum
Tin

B Ferum
Iron

C Zink
Zinc

D Kuprum
Copper

3 (Q26, SPM 2021)

Persamaan kimia yang manakah mewakili tindak balas yang menghasilkan haba paling tinggi?
Which chemical equation represents the reaction that produces the highest heat?

A $HCl + NaOH \rightarrow NaCl + H_2O$

B $HCl + NH_4OH \rightarrow NH_4Cl + H_2O$

C $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_20$

D $H_2SO_4 + 2NH_4OH \rightarrow (NH_4)_2SO_4 + 2H20$

4 (Q36, SPM 2021)

Formula empirik bagi suatu hidrokarbon ialah CH_2.
The empirical formula of a hydrocarbon is CH_2.

Apakah formula molekul bagi hidrokarbon itu?
[Jisim atom relatif: C = 12, H = 1; Jisim molar hidrokarbon = 56 g mol^{-1}]
What is the molecular formula of the hydrocarbon?
[Relative atomic mass: C = 12, H = 1; Molar mass of hydrocarbon = 56 g mol^{-1}]

A C_4H_8

B C_4H_{10}

C C_2H_4

D C_2H_6

5 (Q38, SPM 2021)

Persamaan berikut mewakili tindak balas penguraian zink nitrat.
The following equation represents the decomposition reaction of zinc nitrate.

$$\mathbf{2\ Zn(NO_3)_2 \rightarrow 2\ ZnO + 4\ NO_2 + O_2}$$

Berapakah isi padu maksimum gas nitrogen dioksida yang terbebas pada suhu dan tekanan piawai (STP) apabila 18.9 g zink nitrat dipanaskan?
[Jisim formula relatif: $Zn(NO_3)_2$ = 189 g mol^{-1}; Isipadu molar gas pada STP = 22.4 $dm^3\ mol^{-1}$]
What is the maximum volume of nitrogen dioxide gas released at standard temperature and pressure (STP) when 18.9 g of zinc nitrate was heated? [*Relative formula mass:* $Zn(NO_3)_2$ *= 189 g* mol^{-1}*; Molar volume of gas at STP = 22.4* $dm^3 mol^{-1}$]

A 1.12 dm^3

B 2.24 dm^3

C 3.36 dm^3

D 4.48 dm^3

6 (Q4, SPM 2022)

Apabila Ahmad menjalankan satu experiment dengan menambahkan larutan kalium iodide kepada larutan plumbum(II) nitrat, mendakan kuning dan larutan tidak berwarna terhasil.

Antara yang berikut, pernyataan manakah yang betul untuk menerangkan eksperimen itu?

When Ahmad carried out an experiment by adding potassium iodide solution to lead(II) nitrate solution, a yellow precipitate and colourless solution are formed.

Which of the following statements is correct to describe the experiment?

A 1 mol kalium iodida bertindak balas dengan 1 mol plumbum(II) nitrat menghasilkan 1 mol plumbum(II) iodida dan 1 mol kalium nitrat

1 mole of potassium iodide reacts with 1 mole of lead(II) nitrate produce 1 mole of lead(II) iodide and 1 mole of potassium nitrate

B 1 mol kalium iodida bertindak balas dengan 2 mol plumbum(II) nitrat menghasilkan 2 mol plumbum(II) iodida dan 1 mol kalium nitrat

1 mole of potassium iodide reacts with 2 moles of lead(II) nitrate produce 2 moles of lead(II) iodide and 1 mole of potassium nitrate

C 2 mol kalium iodida bertindak balas dengan 1 mol plumbum(II) nitrat menghasilkan 1 mol plumbum(II) iodida dan 2 mol kalium nitrat

2 moles of potassium iodide reacts with 1 mole of lead(II) nitrate produce 1 mole of lead(II) iodide and 2 moles of potassium nitrate

D 2 mol kalium iodida bertindak balas dengan 1 mol plumbum(II) nitrat menghasilkan 2 mol plumbum(II) iodida dan 2 mol kalium nitrat

2 moles of potassium iodide reacts with 1 mole of lead(II) nitrate produce 2 moles of lead(II) iodide and 2 moles of potassium nitrate

7 (Q30, SPM 2022)

Berapakah bilangan ion magnesium yang terdapat dalam 8.88 g magnesium nitrat?
[Jisim atom relative: N=14, O=16, M =24; Pemalar Avogadro = $6.02 \times 10^{23}\ mol^{-1}$]

What is the number of magnesium ions that can be found in 8.88 g magnesium nitrate?
[Relative atomic mass: N=14, O=16, Mg=24; Avogadro constant = $6.02 \times 10^{23}\ mol^{-1}$]

A 9.90×10^{23}

B 6.22×10^{23}

C 4.05×10^{23}

D 3.61×10^{23}

8 (Q31, SPM 2022)

Apabila 1.50 g unsur X terbakar dengan lengkap, 3.2 g oksida X terbentuk. Apakah formula empiric bagi oksida logam tersebut?

When 1.50 g of element X is burnt completely, 3.2 g of oxide of X is formed. What is the empirical formula of the metal oxide?
[Relative atomic mass: X = 31, O = 16]

A XO_2

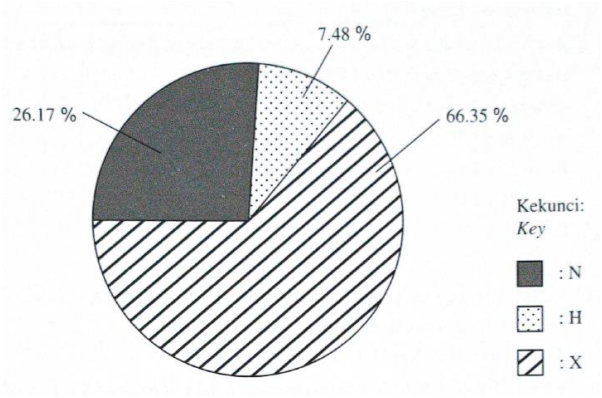
B X_2O

C X_2O_4

D X_4O_2

9 (Q32, SPM 2022)

Rajah 16 menunjukkan carta pai bagi peratusan komposisi jisim untuk baja R.
Diagram 16 shows a pie chart of the percentage of mass composition of fertiliser R.



Rajah / Diagram 16

Baja R dihasilkan daripada tindak balas antara asid HX dan gas ammonia.
Berapakah jisim gas ammonia yang diperlukan untuk menghasilkan 17.665 g baja R?
[Jisim atom relative: H = 1, N = 14, X = 35.5]

Fertiliser R is produced from the reaction between HX acid and ammonia gas.
What is the mass of ammonia gas needed to produce 17.665 g of fertiliser R?
[Relative atomic mass: H = 1, N = 14, X = 35.5]

A 1.51 g

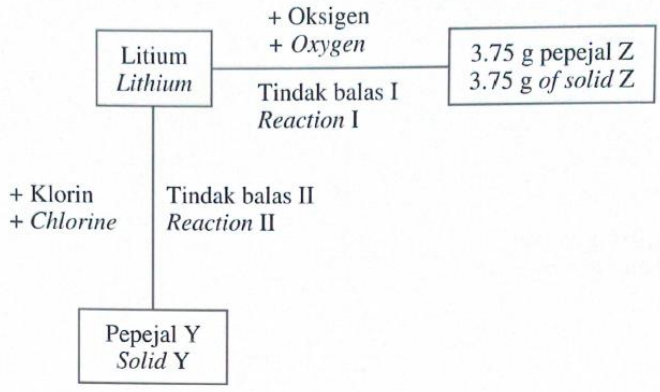
B 1.60 g

C 5.61 g

D 5.96 g

10 (Q34, SPM 2022)

Rajah 18 menunjukkan dua tindak balas berbeza bagi suatu logam.
Diagram 18 shows two different reactions of a metal.



Rajah / Diagram 18

Berapakah jisim pepejal Y yang terbentuk apabila jisim litium yang sama digunakan?
[Jisim atom relative: Li = 7, O = 16, Cl = 35.5]

What is the mass of solid Y formed when the same mass of lithium is used?
[Relative atomic mass: Li = 7, O = 16, Cl = 35.5]

A 5.312 g

B 10.625 g

C 21.250 g

D 47.600 g

11 (Q2, SPMRSM 2021)

Persamaan berikut mewakili satu tindak balas.
The following equation represents a reaction.

$$\mathbf{Na_2S_2O_3 + H_2SO_4 \longrightarrow Na_2SO_4 + H_2O + S + SO_2}$$

Apakah bahan tindak balas dalam persamaan ini?
What are the reactants in this equation

A Natrium sulfat, air, sulfur dan sulfur dioksida
Sodium sulphate, water, sulphur and sulphur dioxide

B Natrium sulfat dan asid sulfurik
Sodium sulphate and sulphuric acid

C Natrium tiosulfat dan asid sulfurik
Sodium thiosulphate and sulphuric acid

D Natrium tiosulfat dan natrium sulfat
Sodium thiosulphate and sodium sulphate

12 (Q18, SPMRSM 2021)

Klorin-35 dan klorin-37 adalah isotop bagi klorin.
Antara yang berikut, penyataan manakah yang betul?
[Nombor proton klorin = 17]
Chlorine-35 and chlorine-37 are isotopes of chlorine.
Which of the following statement is correct?
[*Proton number of chlorine* = 17

A Klorin-37 mempunyai 17 proton dan 20 neutron
Chlorine-37 has 17 protons and 20 neutrons

B Klorin-35 mempunyai 17 proton dan 18 elektron

Chlorine-35 *has* 17 *protons and* 18 *electrons*

C Klorin-35 mempunyai bilangan elektron kurang daripada klorin-37
Chlorine-35 *has less number of electrons than chlorine*-37

D Klorin-35 mempunyai bilangan neutron yang sama dengan klorin-37
Chlorine-35 *has same number of neutrons as chlorine*-37

13 (Q31, SPMRSM 2021)

Persamaan kimia berikut mewakili tindak balas untuk mengekstrak aluminium daripada aluminium oksida.
The following chemical equation represents the reaction to extract aluminium from aluminium oxide.

$$2Al_2O_3 \longrightarrow 4Al + 3O_2$$

Hitungkan jisim maksimum aluminium yang dapat diekstrak daripada 10.20 g aluminium oksida?
[Jisim atom relatif: O = 16, Al = 27]
Calculate the maximum mass of aluminium that can be extracted from 10.20 g *of aluminium oxide*?
[*Relative atomic mass:* O = 16, Al = 27]

A 2.70 g

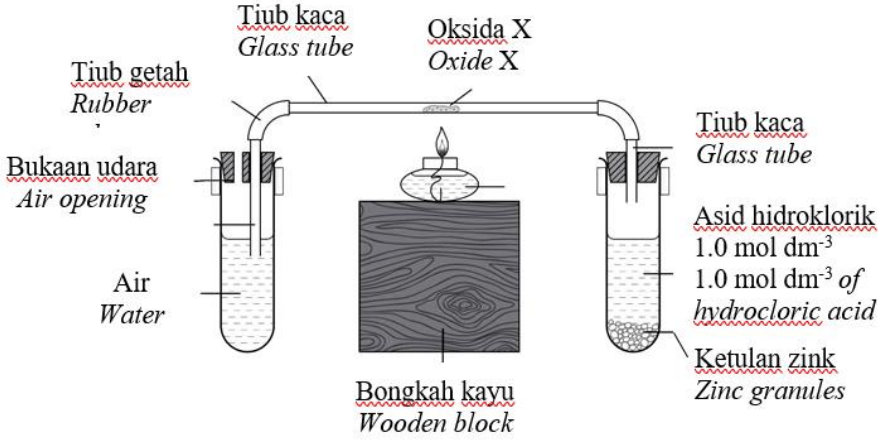
B 5.40 g

C 10.80 g

D 2160 g

14 (Q2, SPMRSM 2022)

Rajah 1 menunjukkan susunan radas bagi menentukan formula empirik bagi oksida X.
Diagram 1 *shows the apparatus set-up to determine the empirical formula of oxide* X.



Rajah / Diagram 1

Antara berikut, yang manakah logam X?
Which of the following is metal X*?*

A Zink
Zinc

B Kuprum
Copper

C Magnesium
Magnesium

15 (Q17, SPMRSM 2022)

Formula kimia kalsium nitrat dan kalium fosfat adalah masing-masing $Ca(NO_3)_2$ and K_3PO_4.
Apakah formula kimia bagi kalsium fosfat?

The chemical formulae of calcium nitrate and potassium phosphate are $Ca(NO_3)_2$ *and* K_3PO_4 *respectively.*
What is the chemical formula of calcium phosphate?

A $Ca(PO_4)_3$

B $Ca(PO_4)_2$

C Ca_3PO_4

D $Ca_3(PO_4)_2$

16 (Q30, SPMRSM 2022)

Antara berikut yang manakah mempunyai isipadu gas terbesar pada keadaan bilik?
[Jisim atom relatif: H=1, C=12, N=14, O=16, 1 mol sebarang gas menempati 24 dm^3 pada keadaan bilik]
Which of the following has the largest volume of gas at room condition?
[*Relative atomic mass:* H=1, C=12, N=14, O=16, 1 mol *of any gas occupied* 24 dm^3 *at room condition*]

A 12 g wap air, H_2O
12 g *of steam,* H_2O

B 17 g ammonia, NH_3
17 g *of ammonia,* NH_3

C 23 g nitrogen dioksida, NO_2
23 g *of nitrogen dioxide,* NO_2

D 42 g karbon monoksida, CO
42 g *of carbon monoxide,* CO

17 (Q18, SBP 2021)

Berapakah bilangan alum dalam I mol gas sulfur dioksida? [Pemalar Avogadro: NA = 6.02 x $l0^{23}$ mol^{-1}]
What is the number of atoms in I mol of sulphur dioxide gas? [Avogadro constant: NA = 6.02 x 10^{23} mol^{-1}]

A 6.02 x 10^{23}

B 1.204 x 10^{24}

C 1.806 x 10^{24}

D 2.408 x 10^{24}

18 (Q20, SBP 2021)

Jadual 20 menunjukkan maklumat bagi atom unsur Q dan R.
Table 20 shows the information of atom of elements Q and R.

Unsur Element	Nombor proton Proton number	Nombor nucleon Nucleon number
Q	5	11
R	8	16

Jadual / Table 20

Apakah formula sebatian yang terbentuk antara unsur Q dan R?
What is the formula of the compound formed between elements Q and R?

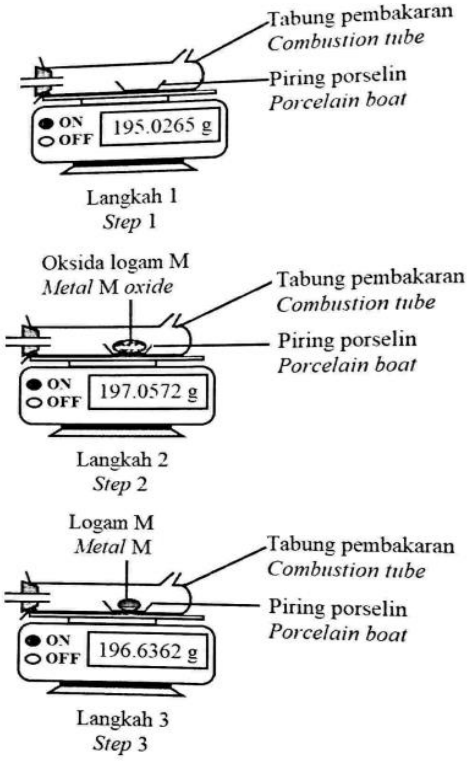
A Q_3R_2

B Q_2R_3

C Q_2R

D QR_2

19 (Q32, SBP 2021)



Rajah / Diagram 32

Rajah 32 menunjukkan langkah-langkah penimbangan untuk menentukan formula empirik bagi oksida logam M.
Diagram 32 shows the weighing steps taken to determine the empirical formula of the oxide of metal M.

Apakah formula empirik bagi oksida logam M?
[Jisim atom relatif: 0 = 16, M = 641]

What is the empirical formula of metal M oxide?
[Relative atomic mass: 0 = 16, M = 641]

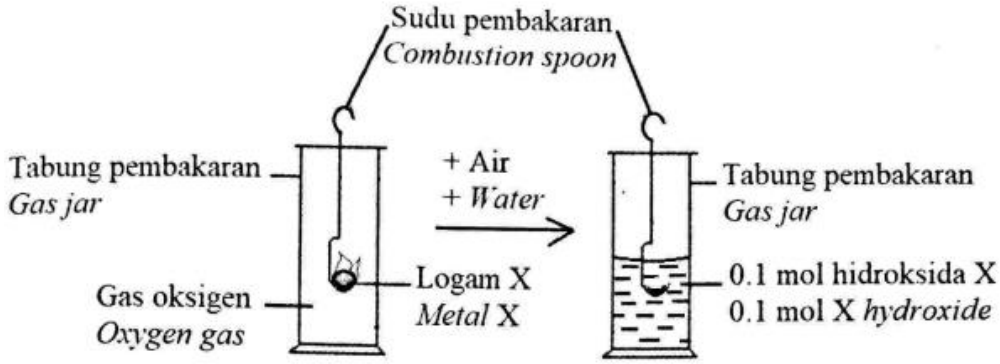
A MO

B M_2O

C MO_2

D M_2O_3

20 (Q33, SBP 2021)



Rajah/ *Diagram* 33

Rajah 33 menunjukkan langkah-langkah yang dijalankan untuk mengkaji sifat kimia unsur Kumpulan 1.
Diagram 33 shows the steps carried out to investigate the chemical properties of Group 1 element.

Apakah isi padu gas oksigen yang diperlukan untuk bertindak balas lengkap dalam tindak balas ini?
[Isi padu molar gas pada keadaan bilik = 24 dm^3 mol^{-1}]

What is the volume of oxygen gas needed to react completely in this reaction?
[Molar volume of gas at room conditions = 24 dm^3 mol^{-1}]

A 0.6 dm^3

B 0.8 dm^3

C 1.2 dm^3

D 1.4 dm^3

21 (Q34, SBP 2021)

66.0 g gas propana, C_3H_8 mengalami pembakaran lengkap dalam oksigen. Apakah isi padu gas karbon dioksida yang terhasil pada keadaan bilik?
[Jisim atom relatif: H = 1, C = 12, 0 = 16; Isi padu molar pada keadaan bilik = 24 dm^3 mol^{-1}]

66.0 g of propane, C_3H_8 gas undergoes complete combustion in oxygen.
What is the volume of carbon dioxide gas produced at room conditions?
[Relative atomic mass: H = 1, C = 12, 0 = 16; Molar volume at room conditions = 24 dm^3 mol^{-1}]

A 33.6 dm^3

B 36.0 dm^3

C 100.8 dm^3

D 108.0 dm^3

22 (Q3, SBP 2022)

Antara yang berikut, yang manakah formula ion yang betul?
Which of the following is the correct formula of an ion?

A Al^{+}

B Al^{3+}

C Ag^{2+}

D Ag^{3+}

23 (Q4, SBP 2022)

Apakah maksud pemalar Avogadro?
What is the meaning of Avogadro constant?

A Jisim bagi satu mol bahan
The mass of one mole of a substance

B Tekanan bagi satu mol bahan
The pressure of one mole of a substance

C Bilangan zarah dalam satu mol bahan
The number of particles in one mole of a substance

D Isi padu yang terkandung dalam satu mol gas
The volume occupied by one mole of gas

24 (Q17, SBP 2022)

Berapakah bilangan atom hidrogen dalam 0.2 mol propanol?
What is the number of hydrogen atoms in 0.2 mol of propanol?

A $0.2 \times 6.02 \times 10^{23}$

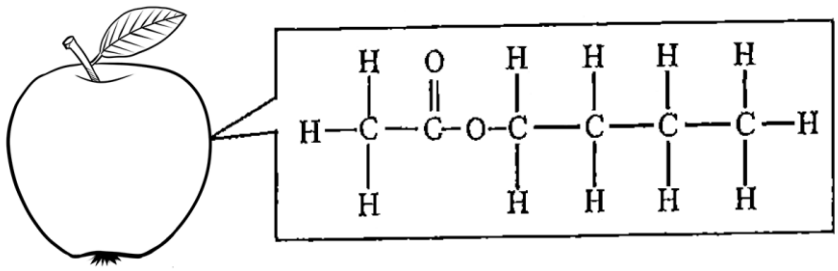
B $0.2 \times 3 \times 6.02 \times 10^{23}$

C $0.2 \times 7 \times 6.02 \times 10^{23}$

D $0.2 \times 8 \times 6.02 \times 10^{23}$

25 (Q32, SBP 2022)

Rajah 8 menunjukkan formula struktur butil etanoat yang terdapat di dalam sebiji epal.
Diagram 8 shows a structural formula of butyl ethanoate which is found in an apple



Rajah / Diagram 8

Antara yang berikut, yang manakah betul bagi butil etanoat?
[Jisim atom relatif: H = 1, C = 12, O = 16]

Which of the following is correct for butyl ethanoate?
[*Relative atomic mass:* H =1, C = 12, O = 16]

	Jisim molekul relatif *Relative molecular mass*	Formula empirik *Empirical formula*
A	58	C_3H_6O
B	58	$C_6H_{12}O_2$
C	116	C_3H_6O
D	116	$C_6H_{12}O_2$

BAB 4: JADUAL BERKALA UNSUR

1 (Q6, SPM 2021)

Jadual 1 menunjukkan nombor proton bagi dua unsur dalam Kumpulan 18 dalam Jadual Berkala Unsur.
Table 1 shows the proton number of two elements in Group 18 of The Periodic Table of Elements.

Unsur **Elements**	**Nombor proton** **Proton number**
X	2
Y	18

Jadual / Table 1

Antara yang berikut, pernyataan manakah yang betul tentang X dan Y?
Which of the following is the correct statement about X and Y?

A Saiz atom Y lebih kecil daripada X
Atomic size of Y is smaller than X

B Takat lebur Y lebih tinggi daripada X
Melting point of Y is higher than X

C Daya tarikan antara atom X lebih kuat daripada Y
Forces of attraction between atoms X are stronger than Y

D Bilangan petala berisi elektron bagi atom X lebih banyak daripada Y
The number of shells filled with electrons of atom X is more than Y

2 (Q7, SPM 2021)

Rajah 3 menunjukkan formula dua ion bagi unsur Y.
Diagram 3 shows the formulae of two ions of element Y.

$[Y(CN)_6]^{3-}$ $[Y(CN)_6]^{4-}$

Rajah / Diagram 3

Antara yang berikut, logam manakah ialah unsur Y?
Which of the following metals is element Y?

A Ferum
Iron

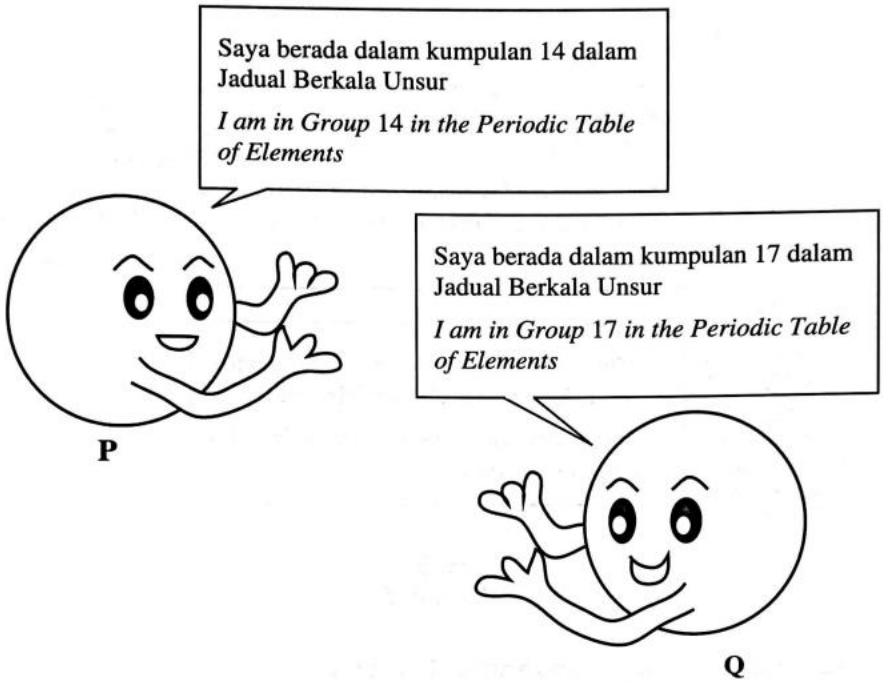
B Zink
Zinc

C Kalsium
Calcium

D Aluminium
Aluminium

3 (Q8, SPM 2021)

Rajah 4 menunjukkan satu ilustrasi perbualan antara atom P dan atom Q.
Diagram 4 shows an illustration of conversation between atom P and atom Q.



Rajan / Diagram 4

Apakah jenis ikatan kimia yang akan terbentuk antara atom P dan atom Q?
What is the type of chemical bond that will be formed between atom P and atom Q?

A Ion
Ionic

B Logam
Metallic

C Datif
Dative

D Kovalen
Covalent

4 (Q5, SPM 2022)

Pasangan manakah yang dipadankan dengan betul?
Which pair is correctly matched?

	Unsur ***Element***	**Kegunaan** ***Use***
A	Argon *Argon*	Digunakan dalam laser untuk merawat retina mata *Used in lasers to treat eye retina*
B	Kripton *Krypton*	Digunakan dalam ubat bius *Used in anaesthetics*
C	Xenon *Xenon*	Digunakan dalam lampu denyar kilat pada kamera *Used in flashlight of camera*
D	Radon *Radon*	Digunakan untuk merawat kanser *Used to treat cancer*

5 (Q7, SPM 2022)

Rajah 3 menunjukkan formula kimia bagi oksida unsur dalam kala 3 dalam Jadual Berkala Unsur.
Diagram 3 shows the chemical formulae of oxides of elements of period 3 in the Periodic Table of Elements.

Na_2O	MgO	Al_2O_3	XO_2	P_4O_{10}	SO_2	Cl_2O_7

Rajah / Diagram 3

Apakah kegunaan unsur X?
What is the use of element X?

A Sebagai bahan dalam bunga api
As a substance in fireworks

B Sebagai bahan semikonduktor
As a semiconductor substance

C Sebagai bahan dalam racun kulat
As a substance in fungicide

D Sebagai bahan dalam pembuatan tin
As a substance in making cans

6 (Q3, SPMRSM 2021)

Pernyataan berikut merujuk kepada sumbangan seorang ahli sains dalam membangunkan Jadual Berkala Unsur.
The following statements refer to the contributions of a scientist in the development of the Periodic Table of Elements.

- Unsur yang mempunyai sifat kimia yang sama terletak pada lajur menegak yang sama yang dikenali sebagai kumpulan.
  Elements with similar chemical properties were placed in the same vertical column called a group.
- Ruang diting galkan dalam Jadual Berkala Unsur ini untuk unsur yang belum ditemui.
  Gaps were left in the Periodic Table of Elements for undiscovered elements.

Siapakah ahli sains tersebut?
Who was the scientist?

A Lothar Meyer

B John Newlands

C Dmitri Mendeleev

D Johann W. Dobereiner

7 (Q19, SPMRSM 2021)

Unsur X berada di bawah bromin dalam kumpulan yang sama dalam Jadual Berkala Unsur.
Jika unsur X bertindak balas dengan ferum, bagaimanakah kereaktifan unsur X berbanding bromin dan apakah formula kimia hasil tindak balas yang terbentuk?

Element X *is located below bromine in the same group in the Periodic Table of Elements.*
If element X *reacts with iron, how does the reactivity of* X *compared to bromine and what is the chemical formula of the product formed*?

	Kereaktifan dengan ferum ***Reactivity with iron***	**Formula hasil tindak balas** ***Formula of the product***
A	Kurang reaktif *Less reactive*	FeX_3
B	Lebih reaktif *More reactive*	FeX_3
C	Kurang reaktif *Less reactive*	Fe_2X_3
D	Lebih reaktif *More reactive*	Fe_2X_3

8 (Q3, SPMRSM 2022)

Unsur Z terletak dalam kumpulan yang sama dengan neon, Ne and kripton,Kr dalam Jadual Berkala Unsur. Antara berikut, yang manakah merupakan sifat Z?

Element Z is located in the same group as neon, Ne and krpton, Kr in the Periodic Table of Elements. Which of the following is the property of Z?

A Lengai secara kimia
Chemically inert

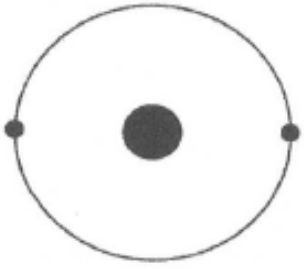
B Wujud sebagai molekul dwiatom
Exists as diatomic molecules

C Wujud sebagai cecair pada suhu bilik
Exists as liquid at room temperature

D Mengkondusikan elektrik dalam keadaan leburan dan larutan akueus
Conducts electricitity in molten and aqueous solution

9 (Q18, SPMRSM 2022)

Rajah 9 menunjukkan susunan electron bagi suatu atom dalam Jadual Berkala Unsur.
Diagram 9 shows the electron arrangement for an atom in the Periodic Table of Elements.



Rajah 9
Diagram 9

Antara pernyataan berikut, yang manakah betul tentang atom tersebut?
Which of the following statements is correct about the atom?

A Berada dalam Kumpulan 2
Located in Group 2

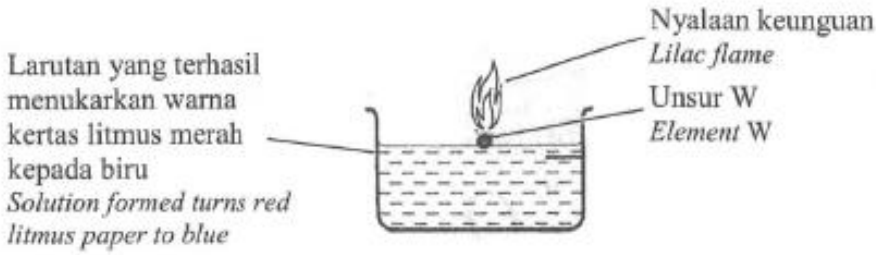
B Bertindak balas dengan oksigen untuk membentuk sebatian oksida
Reacts with oxygen to form an oxide

C Digunakan untuk mengisi belon udara
Used to fill the weather balloons

D Bertindak balas antar satu sama lain untuk membentuk molekul dwiataom
Reacts with each other to form diatomic molecule

10 (Q19, SPMRSM 2022)

Rajah 10 menunjukkan tindak balas antara unsur W dengan air, H_2O
Diagram 10 shows the reaction of an element W and water, H_2O



Rajah 10
Diagram 10

Apakah unsur W?
What is element W?

A Magnesium
Magnesium

B Kalsium
Calcium

C Kalium
Potassium

D Lithium
Lithium

11 (Q5, SBP 2021)

Antara berikut, yang manakah ciri-ciri istimewa logam peralihan?
Which of the following are the special characteristics of transition metals

I Mengkonduksi elektrik
Conduct electricity
II Bertindak sebagai mangkin
Act as catalyst
III Mempunyai takat lebur yang rendah
Has low melting point
IV Membentuk sebatian berwarna
Form coloured compound

A I dan II
I and II
B I dan III
I and III
C II dan IV
II and IV
D III dan IV
III and IV

12 (Q16, SBP 2021)

Jadual 16 menunjukkan susunan elektron bagi atom unsur W, X, Y dan Z.
Table 16 shows the electron arrangement for atom of the elements W,X,Y and Z.

Unsur Element	W	X	Y	Z
Susunan electron Electron arrangement	2.1	2.4	2.8.6	2.8.7

Jadual/ Table 16

Unsur yang manakah terletak dalarn Kala 3, Kumpulan 16 dalam Jadual Berkala Unsur?
Which element is located in Period 3, Group 16 in the Periodic Table of Elements?

A W

B X

C Y

D Z

13 (Q5, SBP 2022)

Antara yang berikut, unsur-unsur manakah yang membentuk oksida asid apabila bertindak balas dengan oksigen?
Which of the following elements form acidic oxides when react with oxygen?

I Sulfur
Sulphur
II Natrium
Sodium
III Fosforus
Phosphorus
IV Magnesium
Magnesium

A I dan III
I and III
B I dan IV
I and IV
C II dan III
II and III
D II dan IV
II and IV

14 (Q18, SBP 2022)

Unsur T terletak di bawah klorin dalam Jadual Berkala Unsur.
Antara berikut, pernyataan manakah yang menerangkan mengapa unsur T kurang reaktif berbanding klorin?

Element T is located below chlorine in the Periodic Table of Elements.
Which of the following statements explains why element T is less reactive than chlrorine?

A Takat lebur lebih tinggi
The melting point is higher

B Elektron valens semakin dekat dengan nucleus
The valence electrons are getting closer to the nucleus

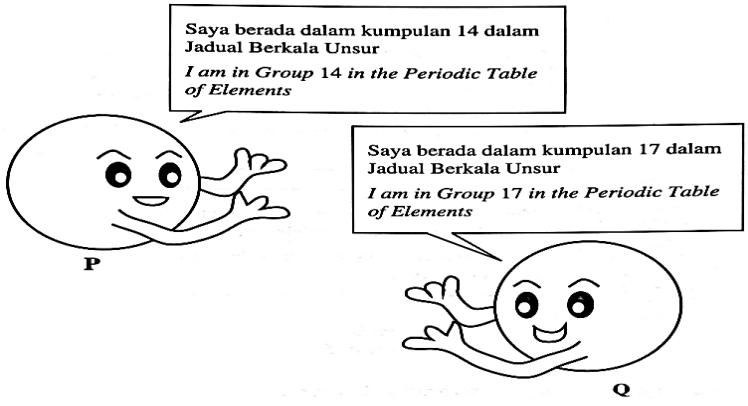
C T adalah cecair dan klorin adalah gas pada suhu bilik
T is liquid and chlorine is gas at room temperature

D Daya tarikan antara electron valens dengan nukleus lebih lemah
Attraction force between valence electrons and nucleus is weaker

BAB 5: IKATAN KIMIA

1 (Q8, SPM 2021)

Rajah 4 menunjukkan satu ilustrasi perbualan antara atom **P** dan atom **Q.**
*Diagram 4 shows an illustration of conversation between atom **P** and atom **Q.***



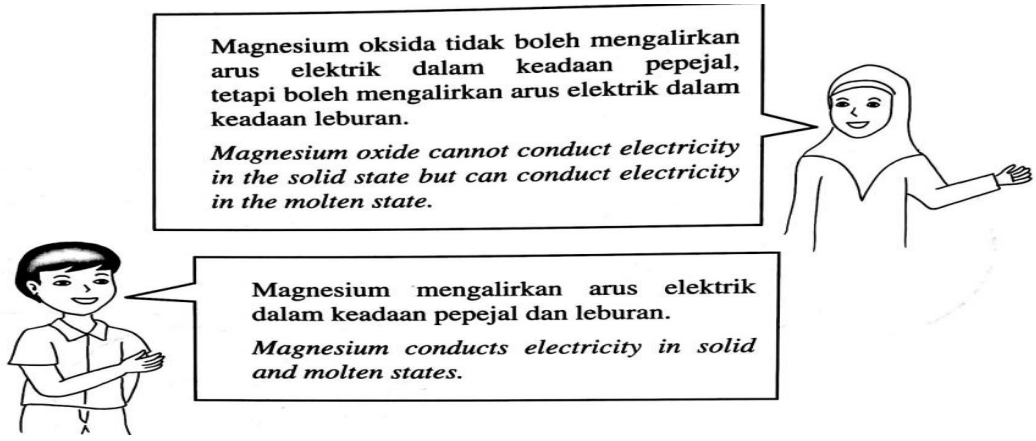
Rajah / *Diagram 4*

Apakah jenis ikatan kimia yang akan terbentuk antara atom **P** dan atom **Q**?
*What is the type of chemical bond that will be formed between atom **P** and atom **Q**?*

A Ion
Ionic
B Logam
Metallic
C Datif
Dative
D Kovalen
Covalent

2 (Q9, SPM 2021)

Rajah 5 menunjukkan perbualan antara dua orang murid.
Diagram 5 shows a conversation between two students.



Rajah / *Diagram 5*

Antara yang berikut, penerangan manakah yang betul?
Which of the following explainations are correct?

	Magnesium ***Magnesium***	**Magnesium oksida** ***Magnesium oxide***
A	Terdiri daripada atom-atom *Made up of atoms*	Terdiri daripada ion-ion *Made up of ions*
B	Mengandungi electron yang dinyah setempat dalam keadaan pepejal *Contains delocalised electrons in solid states*	Mengandungi ion yang bebas bergerak dalam keadaan leburan *Contains freely moving ions in molten state*
C	Atom-atom diikat oleh ikatan logam yang kuat *Atoms are held by strong metallic bond*	Ion-ion dipegang oleh daya elektrostatik yang kuat *Ions are held by strong electrostatic force*
D	Mempunyai struktur kekisi yang kuat *Has strong lattice structure*	Mempunyai struktur kekisi yang lemah *Has weak lattice structure*

3 (Q10, SPM 2021)

Rajah 6 menunjukkan pembentukan sejenis ikatan.
Diagram 6 shows the formation of a type of bond.

Rajah / *Diagram 6*

Antara yang berikut, pernyataan manakah yang betul tentang ikatan itu?
Which of the following statements is correct about the bond?

A Pemindahan electron antara atom logam dengan atom bukan logam.
Transfer of electrons between metal atoms and non-metal atoms.

B Perkongsian electron antara atom-atom bukan logam yang berasal daripada satu atom sahaja
Sharing of electrons between non-metal atoms that come from one atom only.

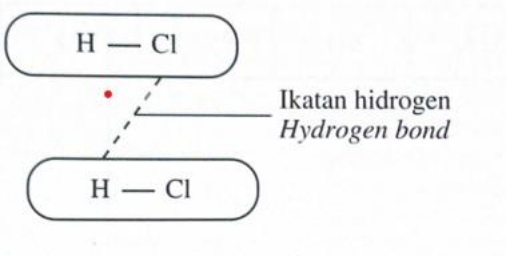
C Daya tarikan antara atom hidrogen yang terikat dengan satu atom yang lebih elektronegatif dalam molekul lain.
The forces of attraction between hydrogen atoms that have bonded with an atom of high electronegativity in another molecule.

D Daya elektrostatik antara lautan electron dengan ion logam bercas positif
The electrostatic forces between the sea of electrons and the positively-charged metal ions.

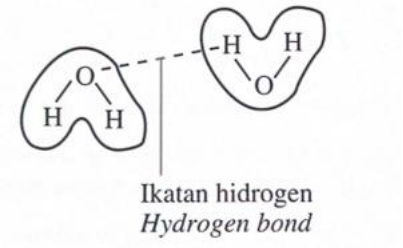
4 (Q8, SPM 2022)

Antara yang berikut, ilustrasi manakah yang menunjukkan pembentukan ikatan hidrogen antara molekul?
Which of the following illustrations shows the formation of hydrogen bond between molecules?

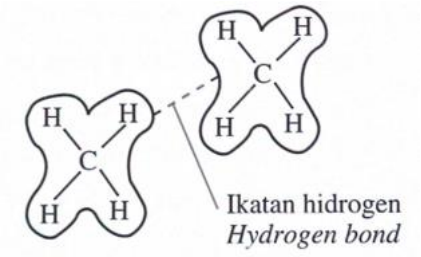
A



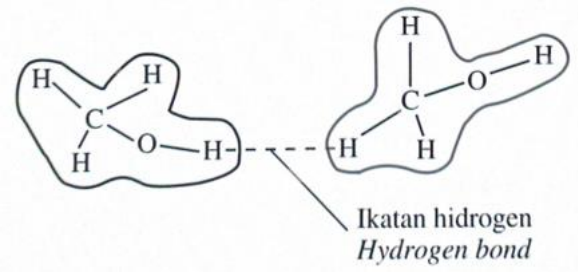
B



C



D



5 (Q9, SPM 2022)

Antara yang berikut, zarah manakah yang terbentuk daripada ikatan datif?
Which of the following particles are formed from a dative bond?

I. H_3O^+
II. NH_4^+
III. NO_3^-
IV. CH_3COO^-

A I dan II
I and II

B I dan IV
I and IV

C II dan III
II and III

D III dan IV
III and IV

6 (Q4, SPMRSM 2021)

Bagaimanakah ikatan datif boleh terbentuk?
How a dative bond can be formed?

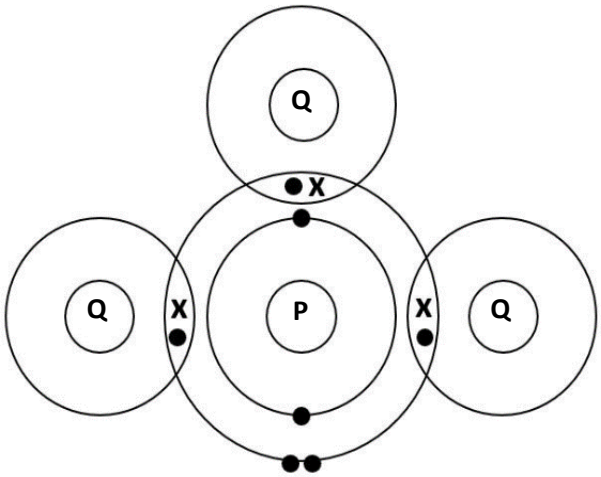
A Pasangan elektron bebas daripada atom bukan logam dikongsi dengan atom lain
Lone pair of electrons from a non-metal atom are shared with another atom

B Pasangan elektron bebas didermakan kepada atom lain untuk membentuk daya elektrostatik
Lone pair of electrons are donated to another atom to form electrostatic force

C Pasangan elektron bebas didermakan untuk memastikan hanya 6 elektron di petalaterluar
Lone pair of electrons are donated to ensure only 6 *electrons in the outermost shell*

7 (Q21, SPMRSM 2021)

Rajah 4 menunjukkan susunan elektron bagi sebatian yang terbentuk antara atom P dan atom Q.
Diagram 4 *shows the electron arrangement of a compound formed between atom* P *and atom* Q*.*



Rajah / *Diagram* 4

Penyataan manakah yang benar mengenai sebatian tersebut?
Which of the following statements is true about the compound?

A Sebatian tersebut tidak stabil.
The compound is not stable.

B Semua atom telah mencapai susunan elektron octet.
All atoms have achieved octet electron arrangement.

C Atom Q berkongsi elektron valens dengan atom P.
Q *atoms share their valence electrons with* P *atom.*

D Sebatian terbentuk melalui perpindahan electron.
The compound is formed by electron transfer.

8 (Q32, SPMRSM 2021)

Rajah 11 menunjukkan penggunaan span basah untuk mengatasi masalah kepingan kertas yang melekat bersama.
Diagram 11 *shows the uses of wet sponge to overcome the problem of turning the pieces of papers sticking together.*

Rajah / *Diagram* 11

Antara berikut, yang manakah paling baik menjelaskan keadaan ini?
Which of the following is best explained this situation?

A Molekul air membentuk ikatan kovalen dengan selulosa dalam kertas
Water molecules formed covalent bond with the cellulose in paper

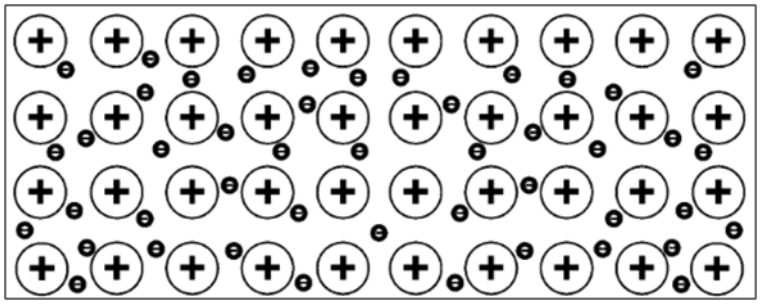
B Molekul air mempunyai daya Van der Waals yang lemah
Water molecules has weak Van der Waals force

C Molekul air membentuk ikatan hidrogen dengan selulosa dalam kertas
Water molecules formed hydrogen bond with the cellulose in paper

D Molekul air mengandungi ion H^+ dan OH^-
Water molecules contain H^+ *and* OH^- *ions*

9 (Q5, SPMRSM 2022)

Rajah 2 menunjukkan sejenis ikatan.
Diagram 2 shows a type of bond.



Rajah / *Diagram* 2

Antara berikut, yang manakah betul tentang ikatan tersebut?
Which of the following is correct about the bond?

A Wujud daya tarikan elektrostatik antara lautan elektron dan ion-ion logam bercas positif.
There is an electrostatic attraction force between the sea of electrons and the positively-charged metal ions.

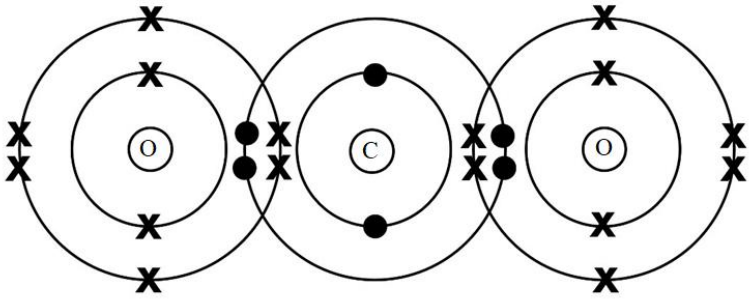
B Sejenis ikatan di mana pasangan elektron yang dikongsi berasal daripada satu atom sahaja.
A type of bond where the electron pairs shared come from one atom only.

C Ikatan yang terbentuk melalui pemindahan elektron antara atom logam dengan atom bukan logam.
A bond that is formed through the transfer of electrons between metal atoms and non-metal atoms.

D Daya tarikan antara atom hidrogen yang terikat dengan satu atom yang lebih elektronegatif dalam molekul lain.
The forces of attraction between hydrogen atoms that have bonded with an atom of high electronegativity in another molecule.

10 (Q20, SPMRSM 2022)

Rajah 11 menunjukkan susunan elektron bagi molekul karbon dioksida.
Diagram 11 *shows the electron arrangement of a carbon dioxide molecule.*



Rajah / *Diagram* 11

Manakah antara berikut adalah benar?
Which of the following is true?

A Setiap atom oksigen menyumbang satu elektron untuk dikongsi
Each oxygen atom contributes one electron for sharing

B Satu atom karbon menyumbang empat elektron untuk dikongsi dengan dua atom oksigen
One carbon atom contributes four electrons to be shared by two oxygen atoms

C Empat ikatan kovalen ganda dua terbentuk dalam molekul karbon dioksida
Four double covalent bonds are formed in a carbon dioxide molecule

D Satu atom karbon memerlukan dua elektron untuk mencapai susunan elektron oktet
One carbon atom requires two electrons to achieve the octet electron arrangement

11 (Q31, SPMRSM 2022)

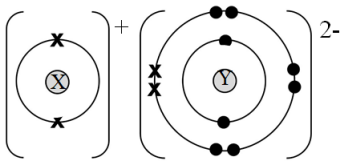
Rajah 20 menunjukkan kedudukan atom X dan Y dalam Jadual Berkala Unsur.
Diagram 20 *shows the position of* X *and* Y *atoms in the Periodic Table of Elements.*

Rajah / *Diagram 20*

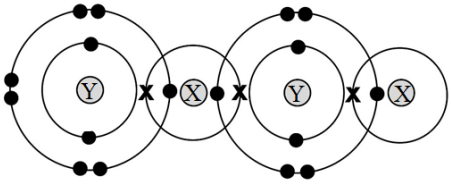
Manakah antara rajah berikut mewakili sebatian yang terbentuk apabila X bertindak balas dengan Y?

Which of the following diagrams represent the compound formed when X *reacts with* Y*?*

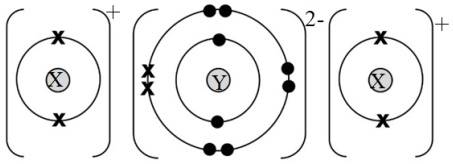
A



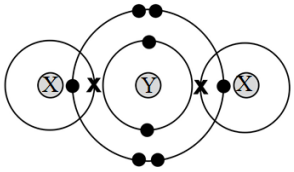
B



C



D



12 (Q6, SBP 2021)

Antara berikut, yang manakah sifat sebatian ion?
Which of the following is the property of ionic compound?

A Wujud sebagai gas.
Exists as gas

B Larut dalam pelarut organic
Dissolves in organic solvent

C Tidak boleh mengkonduksi elektrik
Cannot conduct electricity

D Mempunyai takat lebur dan takat didih yang tinggi
Has high melting point and boiling point

13 (Q19, SBP 2021)

Antara bahan berikut, yang manakah membentuk ikatan hidrogen dengan air?
Which of the following substances forms hydrogen bond with water?

A Metana
Methane

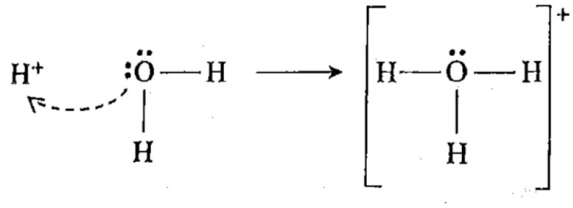
B Bromin
Bromine

C Ammonia
Ammonia

D Hidrogen klorida
Hydrogen chloride

14 (Q6, SBP 2022)

Rajah 1 menunjukkan pembentukan satu jenis ikatan dalam satu ion.
Diagram 1 shows the formation of a type of bond in an ion.



Rajah / *Diagram 1*

Apakah jenis ikatan itu?
What is the type of the bond?

A Ikatan hidrogen
Hydrogen bond

B Ikatan logam
Metallic bond

C Ikatan datif
Dative bond

D Ikatan ion
Ionic bond

15 (Q19, SBP 2022)

Jadual 1 menunjukkan susunan elektron bagi unsur Y dan unsur Z.
Table 1 shows the electron arrangement of elements Y and Z.

Unsur Y *Element Y*	Unsur Z *Element Z*
2.4	2.6

Rajah / *Diagram 1*

Apakah formula kimia dan jenis ikatan bagi sebatian yang terbentuk daripada tindak balas antara unsur Y dan unsur Z?
What is the formula and the type of bond in the compound formed from the reaction between elements Y and Z?

	Formula *Formula*	Jenis ikatan *Type of bond*
A	YZ_2	Kovalen *Covalent*
B	Y_2Z	Kovalen *Covalent*
C	Y_2Z	Ion *Ionic*
D	YZ_2	Ion *Ionic*

16 (Q20, SBP 2022)

Antara berikut, sebatian manakah yang mempunyai ikatan ion?
Which of the following compounds has an ionic bond?

A Sulfur dioksida
Sulphur dioxide

B Hidrogen klorida
Hydrogen chloride

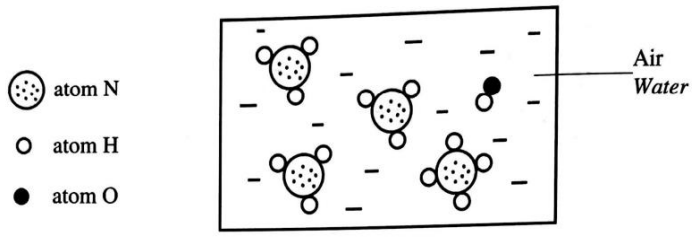
C Magnesium oksida
Magnesium oxide

D Karbon tetraklorida
Carbon tetrachloride

BAB 6: ASID, BES DAN GARAM

1 (Q11, SPM 2021)

Rajah 7 menunjukkan pengionan bagi suatu bahan dalam air.
Diagram 7 shows the ionisation of a substance in water.



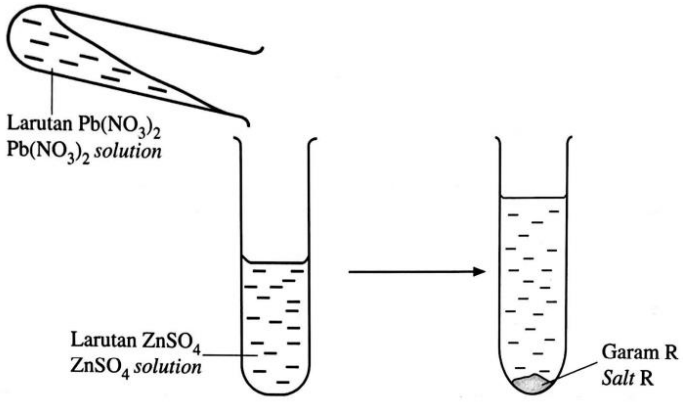
Rajah / *Diagram 7*

Antara yang berikut , pernyataan manakah yang betul tentang bahan tersebut?
Which of the following statements is correct about the substance?

A Nilai pH kurang daripada 7
pH value is less than 7
B Pengionan lengkap dalam air
Complete ionization in water
C Kepekatan ion hidroksida yang rendah
Low concentration of hydroxide ions
D Bilangan mol ion hidrogen yang tinggi
High number of moles of hydrogen ions

2 (Q13, SPM 2021)

Rajah 9 menunjukkan suatu eksperimen untuk menghasilkan garam R.
Diagram 9 *shows an experiment to produce salt R.*



Rajah / *Diagram 9*

Apakah larutan garam yang boleh digunakan utuk menggantikan larutan $Pb(NO_3)_2$ untuk menghasilkan garam yang mempunyai keterlarutan yang sama seperti garam R?
What salt solution can be used to replace $Pb(NO_3)_2$ solution to produce salts that has the same solubility as salt R?

A $Cu(NO_3)_2$

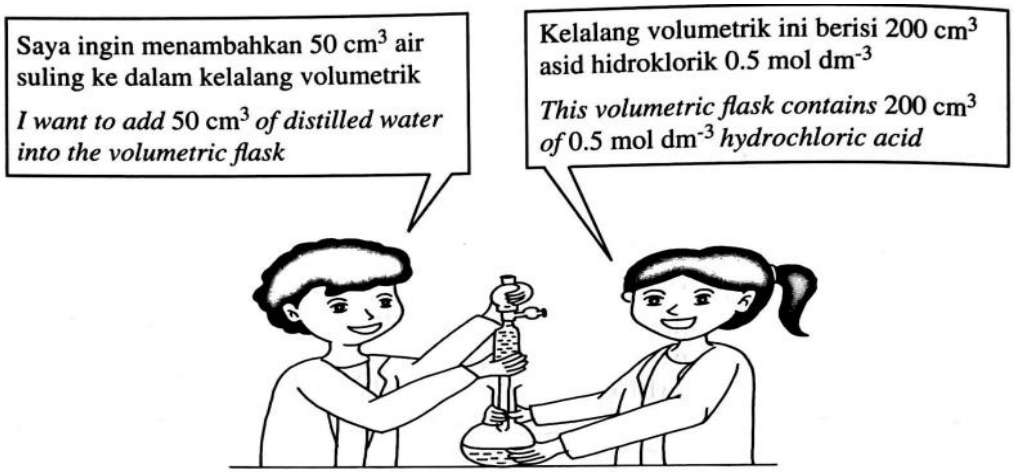
B $Ca(NO_3)_2$

C $Fe(NO_3)_2$

D $Mg(NO_3)_2$

3 (Q32, SPM 2021)

Rajah 17 menunjukkan perbualan dua murid.
Diagram 17 *shows a conversation between two students.*



Rajah / *Diagram 17*

Apakah nilai pH akhir?
What is the final pH value?

A 0.20

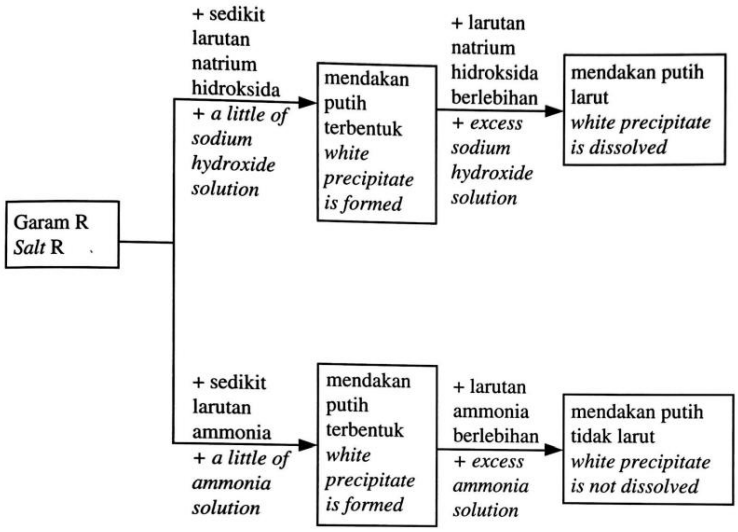
B 0.30

C 0.40

D 0.50

4 (Q32, SPM 2021)

Rajah 21 menunjukkan proses bagi mengesahkan kehadiran kation dalam larutan garam R.
Diagram 21 shows a process to confirm the presence of the cation in salt solution R.



Rajah 21
Diagram 21

Antara yang berikut, kation manakah yang hadir dalam larutan garam R?
Which of the following cations is present in salt solution R?

A Al^{3+}

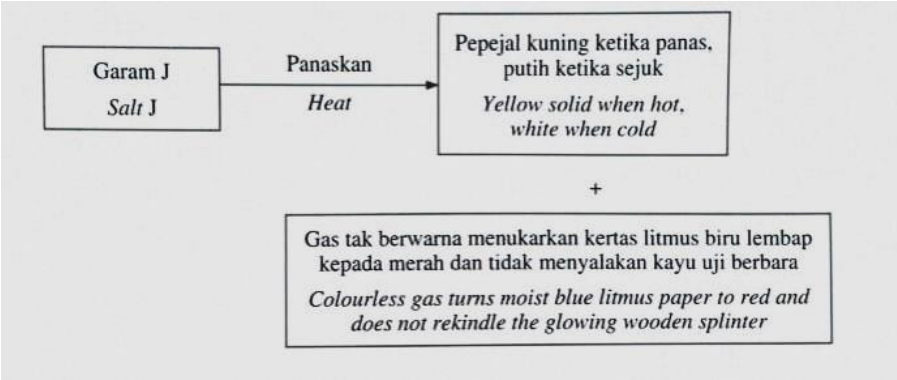
B Ca^{2+}

C Mg^{2+}

D Zn^{2+}

5 (Q10, SPM 2022)

Rajah 4 menunjukkan satu tindak balas yang berlaku ke atas garam J.
Diagram 4 shows a reaction that occurs on salt J.



Rajah / *Diagram 4*

Antara yang berikut, persamaan kimia yang manakah yang betul bagi mewakili kesan haba ke atas garam J?
Which of the following chemical equations is correct to represent the effect of heat on salt J?

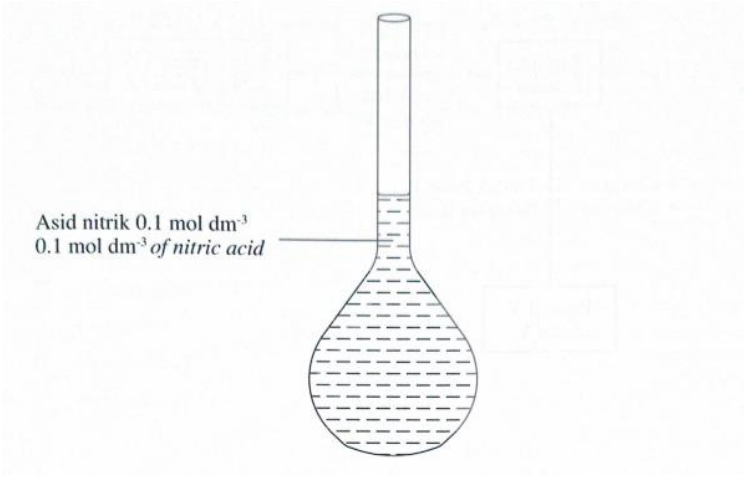
A $ZnSO_4 \rightarrow ZnO + SO_3$

B $PbCO_3 \rightarrow PbO + CO_2$

C $NH_4 \rightarrow NH_3 + HCl$

6 (Q33, SPM 2022)

Rajah 17 menunjukkan suatu larutan piawai di dalam kelalang kon volumetric 100 cm^3.
Diagram 17 shows a standard solution in a 100 cm^3 volumetrik flask.



Rajah / *Diagram 17*

Berapakah nilai pH larutan itu?
What is the pH value of the solution?

A 1

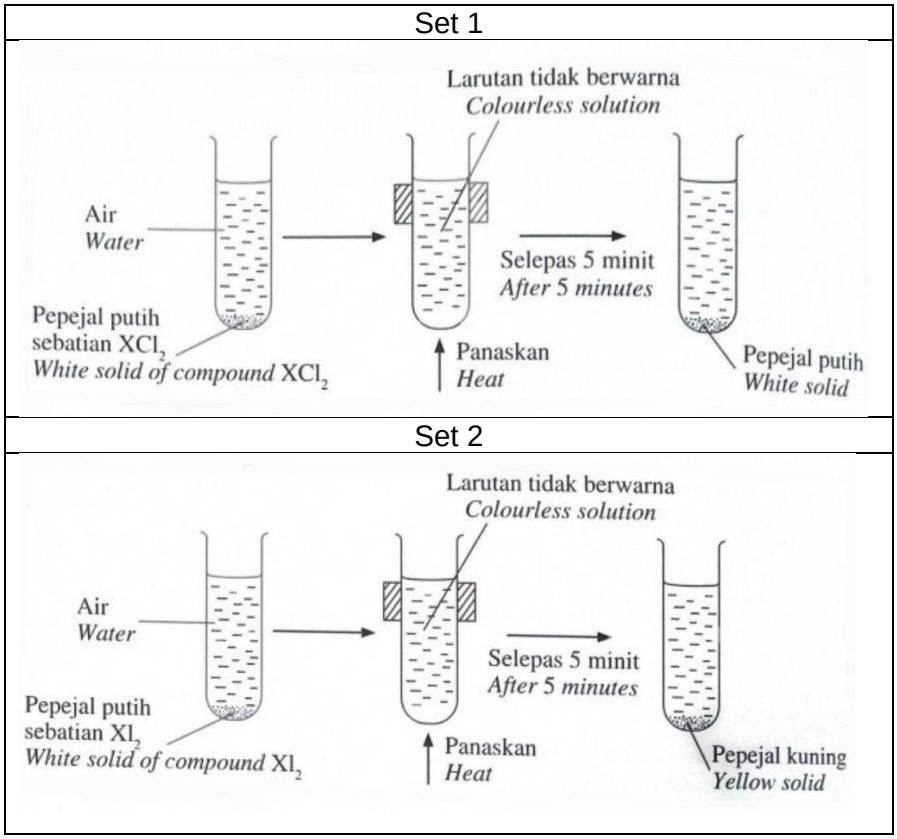
B 2

C 12

D 13

7 (Q40, SPM 2022)

Rajah 21 menunjukkan dua set eksperimen yang telah dijalankan ke atas dua jenis garam.
Diagram 21 shows two sets of experiments that were carried out on two types of salts.



Rajah / *Diagram 21*

Apakah X?
What is X?

A Barium
Barium
B Magnesium
Magnesium
C Plumbum
Lead
D Zink
Zinc

8 (Q5, SPMRSM 2021)

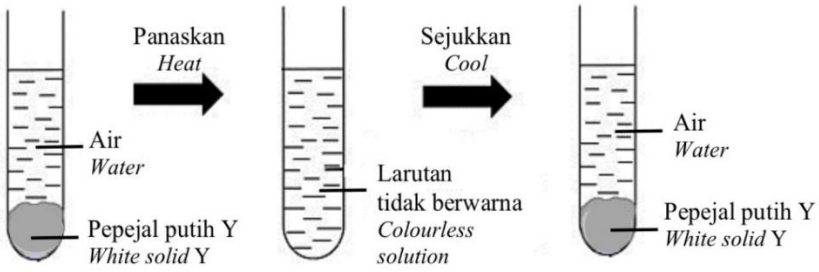
Seorang pelajar menambahkan 2 cm^3 asid nitrik 0.1 mol dm^{-3} ke dalam sebuah tabung uji yang mengandungi 2 cm^3 larutan kalium hidroksida 0.1 mol dm^{-3}. Kenalpasti garam yang terhasil dan keterlarutannya dalam air.

A student added 2 cm^3 of 0.1 mol dm^{-3} nitric acid into a test tube containing 2 cm^3 of 0.1 mol dm^{-3} potassium hydroxide solution.
Identify the salt produced and its solubility in water.

	Formula kimia bagi hasil tindak balas. *Chemical formula of product formed.*	Keterlarutan dalam air. *Solubility in water.*
A	KNO_2	Tak larut *Insoluble*
B	KNO_3	Tak larut *Insoluble*
C	KNO_2	Larut *Soluble*
D	KNO_3	Larut *Soluble*

9 (Q6, SPMRSM 2021)

Rajah 1 menunjukkan salah satu daripada sifat fizik garam Y.
Diagram 1 shows one of the physical properties of salt Y.



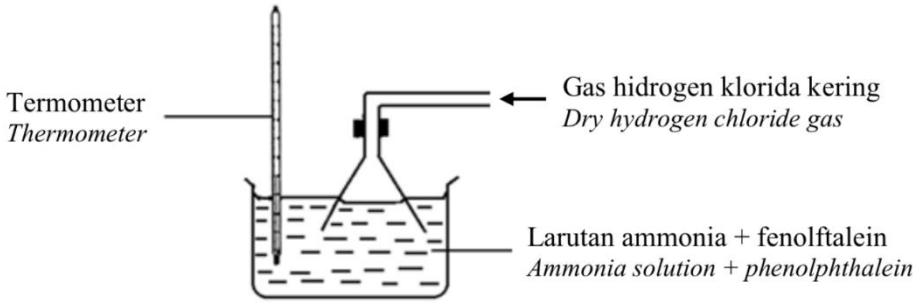
Rajah 1
Diagram 1

Apakah garam Y?
What is salt Y?

A Plumbum(II) iodida
Lead(II) *iodide*
B Plumbum(II) klorida
Lead(II) *chloride*
C Barium kromat(VI)
Barium chromate(VI)
D Kalium iodida
Potassium iodide

10 (Q22, SPRMRSM 2021)

Rajah 5 menunjukkan gas hidrogen klorida kering dialirkan melalui larutan ammonia yang telah ditambah dengan beberapa titis fenolftalein.
Diagram 5 *shows dry hydrogen chloride gas is passed through an ammonia solution which was added with a few drops of phenolphthalein.*



Rajah 5
Diagram 5

Antara berikut yang manakah benar?
Which of the following is true?

A Larutan merah jambu menjadi tidak berwarna
The pink solution turns colourless

B Mendakan putih terbentuk
White precipitate formed

C Suhu larutan berkurang
Temperature of solution decreases

D pH larutan bertambah
pH of solution increases

11 (Q33, SPMRSM 2021)

Satu larutan natrium hidroksida mempunyai kepekatan 4 g dm^{-3}.
Apakah pH larutan itu?
[Jisim molar NaOH = 40 g mol^{-1}]

A solution of sodium hydroxide has a concentration of 4 g dm^{-3}.
What is the pH *of the solution?*
[Molar mass of NaOH = 40 g mol^{-1}*]*

A 0.6

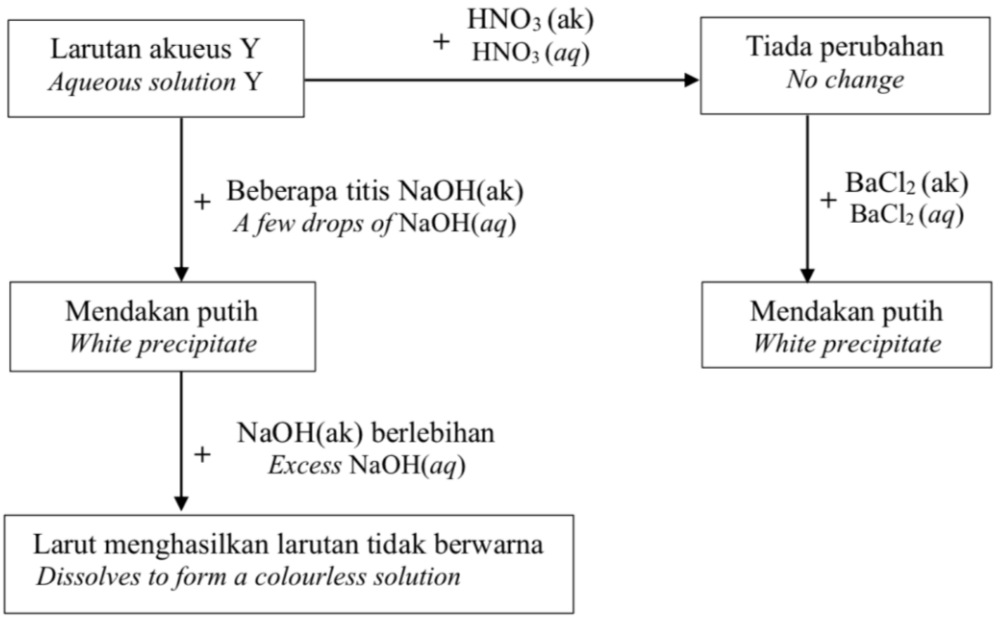
B 1.0

C 13.0

D 13.4

12 (Q39, SPMRSM 2021)

Rajah 17 menunjukkan pemerhatian yang diperoleh apabila larutan akueus Y bertindak balas dengan beberapa reagen.
Diagram 17 *shows the observations obtained when aqueous solution* Y *reacts with a few reagents.*



Rajah 17
Diagram 17

Apakah garam Y?
What is salt Y*?*

A Zink karbonat
Zinc carbonate

B Kalsium klorida
Calcium chloride

C Aluminium sulfat
Aluminium sulphate

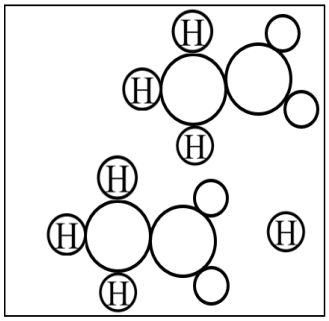
D Magnesium sulfat
Magnesium sulphate

13 (Q4, SPMRSM 2022)

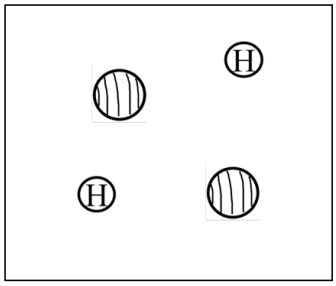
Pengionan asid dalam air akan mempengaruhi nilai pH.
Antara yang berikut, manakah memberikan nilai pH tertinggi?

Ionisation of acid in water affects the pH *value.*
Which of the following gives the highest pH *value?*

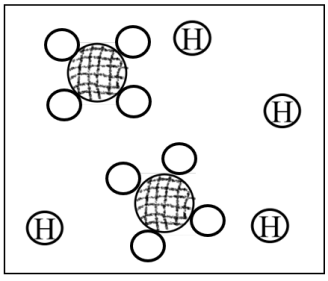
A



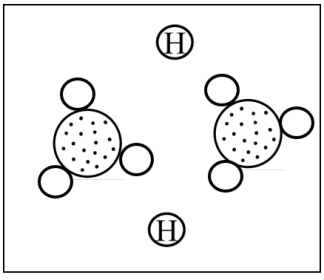
B



C

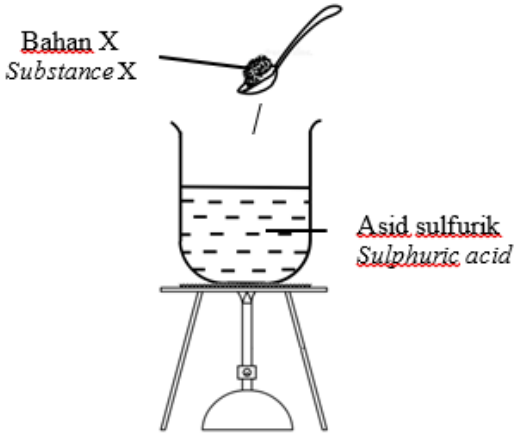


D



14 (Q21, SPMRSM 2022)

Rajah 12 menunjukkan satu langkah dalam penyediaan garam sulfat terlarutkan.
Diagram 12 *shows a step in the preparation of a soluble sulphate salt.*



Rajah / *Diagram 12*

Apakah bahan X?
What is substance X?

A Plumbum(ll) oksida
Lead(II) *oxide*

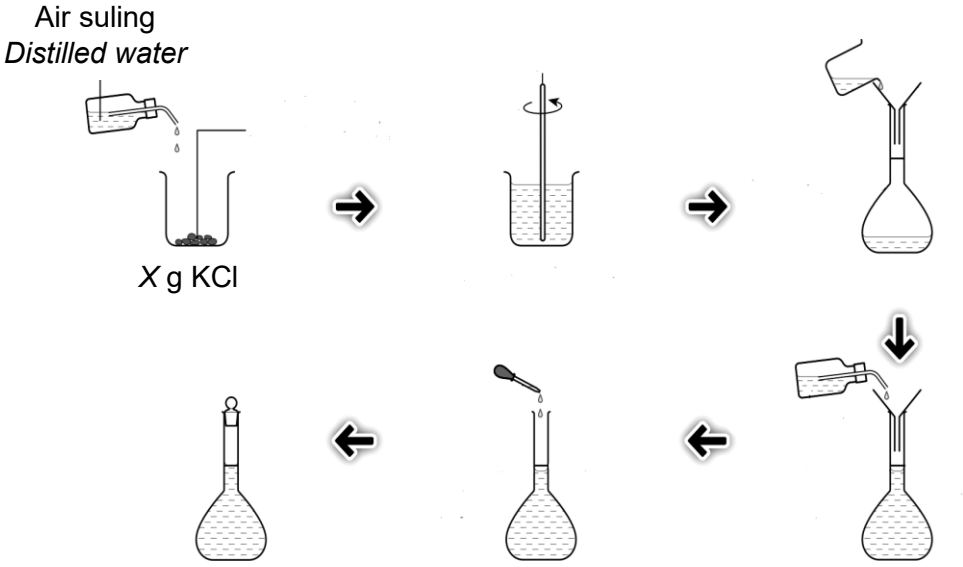
B Zink oksida
Zinc oxide

C Barium hidroksida
Barium hydroxide

D Kalsium hidroksida
Calcium hydroxide

15 (Q32, SPMRSM 2022)

Rajah 21 menunjukkan langkah-langkah penyediaan larutan kalium klorida.
Diagram 21 *shows the preparation of potassium chloride solution.*



500 cm^3 larutan KCl
0.4 mol dm^{-3}

500 cm^3 *of* 0.4 mol dm^{-3}
of KCl *solution*

Rajah / *Diagram* 21

Apakah nilai X?
[*Jisim atom relatif:* K=39, Cl=35.5]

What is the value of X?
[*Relative atomic mass:* K=39, Cl=35.5]

A 59.6 g

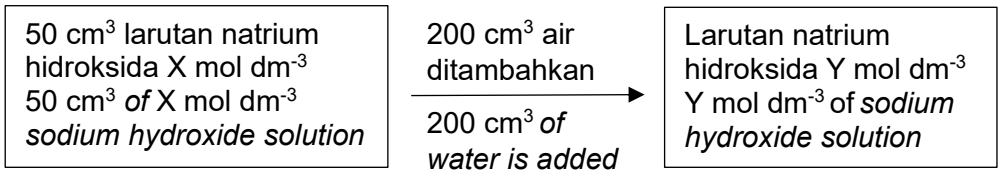
B 37.3 g

C 29.4 g

D 14.9 g

16 (Q34, SPMRSM 2022)

Rajah 22 menunjukkan penyediaan larutan natrium hidroksida Y mol dm^{-3} dengan nilai pH 13.
Diagram 22 *shows a preparation of* Y mol dm^{-3} *of sodium hydroxide solution with a* pH *value of* 13*.*



Rajah / *Diagram* 22

Apakah nilai X?
What is the value of X*?*

A 0.02 mol dm^{-3}

B 0.1 mol dm^{-3}

C 0.4 mol dm^{-3}

D 0.5 mol dm^{-3}

17 (Q38, SPMRSM 2022)

Jadual 3 menunjukkan pemerhatian yang direkodkan apabila satu siri ujian dijalankan untuk mengesahkan kehadiran kation dan anion sebatian T.
Table 3 *shows the observations recorded when a series of tests were conducted to verify the cation and anion of compound* T*.*

Ujian ***Test***	**Pemerhatian** ***Observation***
Tambah beberapa titis larutan natrium hidroksida sehingga berlebihan kepada larutan T. *Add a few drops of sodium hydroxide solution until excess to solution of* T*.*	Mendakan putih terbentuk dan larut dalam larutan natrium hidroksida berlebihan. *White precipitate is formed and dissolves in excess sodium hydroxide solution.*
Tambah beberapa titis larutan ammonia sehingga berlebihan kepada larutan T. *Add a few drops of ammonia solution until excess to solution of* T*.*	Mendakan putih terbentuk dan larut dalam larutan ammonia berlebihan. *White precipitate is formed and dissolves in excess ammonia solution.*
Tambah larutan T kepada larutan barium nitrat. *Add solution of* T *to barium nitrate solution.*	Mendakan putih terbentuk. *White precipitate is formed.*

Jadual / *Table* 3

Apakah kation dan anion yang hadir dalam sebatian T?
What are the cation and anion present in compound T*?*

	Kation ***Cation***	**Anion** ***Anion***
A	Pb^{2+}	Cl^-
B	Zn^{2+}	SO_4^{2-}
C	Pb^{2+}	SO_4^{2-}
D	Zn^{2+}	Cl^-

18 (Q21, SBP 2021)

Dalam satu eksperimenkertas penunjuk semesta lembap bertukar daripada hijau kepada ungu apabila gas X dialirkan kepadanya.
Antara pernyataan berikut, yang manakah betul tentang X?

In an experiment, damp universal indicator paper changes from green to purple when gas X is delivered to it.
Which of the following statements is correct about X?

A Nilai pH kurang daripada 7
pH value is less than 7

B X mengion dalam air menghasilkan ion hidroksida
X ionizes in water produces hydroxide ion

C X mempunyai kepekatan ion hidrogen yang tinggi
X has high concentration of hydrogen ion.

D X terhasil daripada tindak balas antara asid dan alkali
X is produced from the reaction between acid and alkali

19 (Q22, SBP 2021)

Larutan barium klorida telah dicampurkan dengan larutan ammonium sulfat di dalam bikar.
Antara berikut, ion yang manakah hadir dalam mendakan garam yang terbentuk?

Barium chloride solution is mixed with ammonium sulphate solution in a beaker.

Which of the following ions present in the precipitate formed?

I. Ion sulfat
Sulphate ion

II. Ion Barium
Barium ion

III. Ion Klorida
Chloride ion

IV. Ion Ammonium
Ammonium ion

A I dan II
I and II
B I dan III
I and III
C II dan III
II and III
D III dan IV
III and IV

20 (Q35, SBP 2021)

Pengeluaran hasil tanaman di Ladang ANZ berkurangan akibat daripada masalah tanah. Sampel tanah ini dilarutkan dalam air suling dan beberapa ujian dijalanakn ke atas larutan itu. Didapati tanah tersebut telah dicemari dengan asid monoprotik X. Asid itu dititratkan dengan 25 cm^3 larutan kalsium hidroksida 0.001 $moldm^{-3}$ yang telah ditambahkan dengan titik fenolftalein.
Jadual 35 menunjukkan keputusan daripada ujian yang telah dijalankan.

The crop production at ANZ Farm is decreasing due to a soil problem. The soil sample is dissolved in distilled water and a few tests are carried out on the solution. It is found that the soil is polluted by monoprotic acid X. The acid is titrated with 25cm^3 *of 0.001* $moldm^{-3}$ *of calcium hydroxide solution that is added with three drops of phenolphthalein.*
Table 35 shows the results of the test carried out.

Isi padu asid X (cm^3) Volume of acid X (cm^3)	49.50	49.60	49.70	49.80	49.90
Warna fenolftalein dalam campuran larutan *Colour of phenolphthalein in solution mixture*	Merah jambu Pink	Merah jambu	Merah jambu	Tidak berwarna colourless	Tidak berwarna colourless

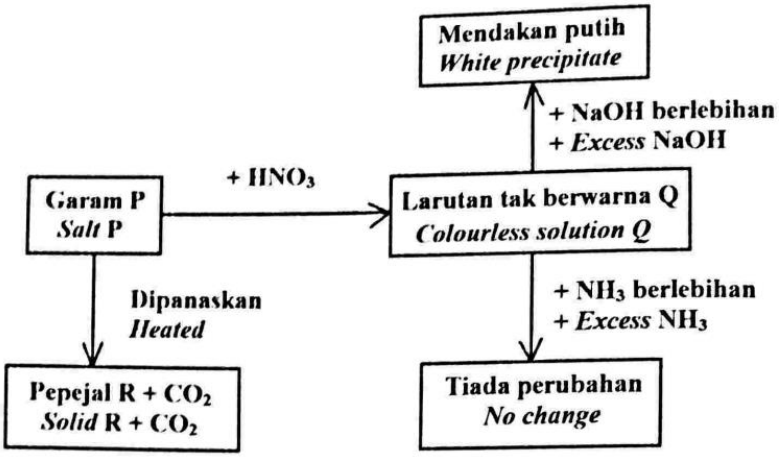
Jadual / Table 35

Apakah nilai pH asid X?
What is the pH value of acid X?

A 3.0
B 3.3
C 3.6
D 4.6

21 (Q39, SBP 2021)

Rajah 39 menunjukkan carta alir satu siri tindak balas ke atas garam P.
Diagram 39 shows a flow chart for a series for a series of reaction on salt P.



Rajah / *Diagram* 39

Apakah bahan tindak balas yang digunakan untuk menyediakan garam P?
What are the reactants used to prepare salt P?

A Asid dan alkali
Acid and alkali

B Alkali dan ion logam
Alkali and metal ion

C Logam karbonat dan asid
Carbonate metal and acid

D Dua larutan garam terlarutkan
Two soluble salt solutions

22 (Q7, SBP 2022)

Antara yang berikut, garam manakah yang disediakan melalui tindak balas penguraian ganda dua?
Which of the following salts is prepared through double decomposition reaction?

A Ammonium karbonat
Ammonium carbonate

B Magnesium klorida
Magnesium chloride

C Kalsium nitrat
Calcium nitrate

D Barium sulfat
Barium sulphate

23 (Q21, SBP 2022)

Serbuk natrium klorida telah tercampur dengan serbuk plumbum(II) iodida.
Antara yang berikut, urutan manakah yang betul untuk mendapatkan hablur natrium klorida daripada campuran itu?

Sodium chloride powder mixed with lead(II) iodide powder.
Which of the following is the correct sequence to obtain the sodium chloride crystal from the mixture?

A Tambahkan air, turas, panaskan hasil turasan, sejukkan
Add water, filter, heat the filtrate, cool

B Tambahkan air, panaskan campuran, turas, sejukkan
Add water, heat the mixture, filter, cool

C Panaskan campuran, tambah air, sejukkan, turas
Heat the mixture, add water, cool, filter

D Panaskan campuran, tambah air, turas, sejukkan
Heat the mixture, add water, filter, cool

24 (Q22, SBP 2022)

Jadual 2 menunjukkan pemerhatian bagi dua ujian yang dijalankan untuk mengesahkan kation yang hadir dalam larutan garam W.
Table 2 shows the observations for two tests conducted to confirm the cation presents in salt W solution.

Ujian *Test*	**Pemerhatian** *Observation*
Tambahkan larutan Na_2CO_3 *Add* Na_2CO_3 *solution*	Mendakan putih terhasil *White precipitate produced*
Tambahkan larutan Na_2SO_4 *Add* Na_2SO_4 *solution*	Tiada perubahan *No change*

Jadual/ *Table* 2

Apakah kation yang hadir dalam garam W?
What is the cation presents in salt W?

A Ion zink
Zinc ion

B Ion barium
Barium ion

C Ion kuprum(II)
Copper(II) ion

D Ion plumbum(II)
Lead(II) ion

25 (Q35, SBP 2022)

Berapakah nilai pH bagi larutan litium hidroksida dengan kepekatan 0.2 moldm^{-3}?
What is the pH value of lithium hydroxide solution with the concentration of 0.2 mol dm^{-3}?

A 0.2

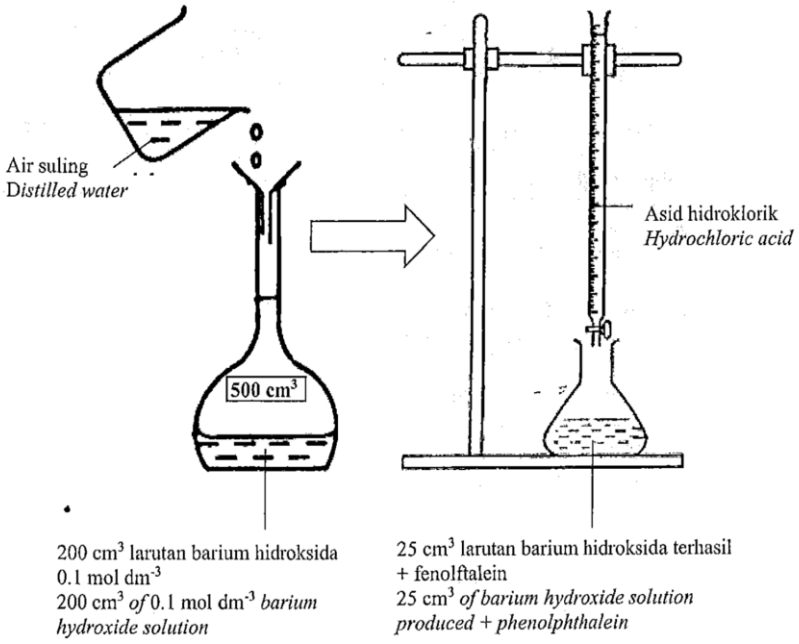
B 0.7

C 13.3

D 13.8

26 (Q39, SBP 2022)

Rajah 11 menunjukkan susunan radas untuk menyediakan larutan barium hidroksida daripada suatu larutan piawai. Larutan yang terhasil digunakan untuk menentukan takat akhir pentitratan dengan asid hidroklorik yang mempunyai nilai pH 1.
Diagram 11 *shows the apparatus set-up to prepare barium hydroxide solution from a standard solution. The solution produced is used to determine the end point of titration with hydrochloric acid that has the* pH *value of* 1*.*



Rajah / *Diagram* 11

Berapakah isi padu hidroklorik yang diperlukan untuk mencapai takat akhir pentitratan?
What is the volume of hydrochloric acid needed to achieve the end point of titration?

A 10.0 cm^3

B 20.0 cm^3

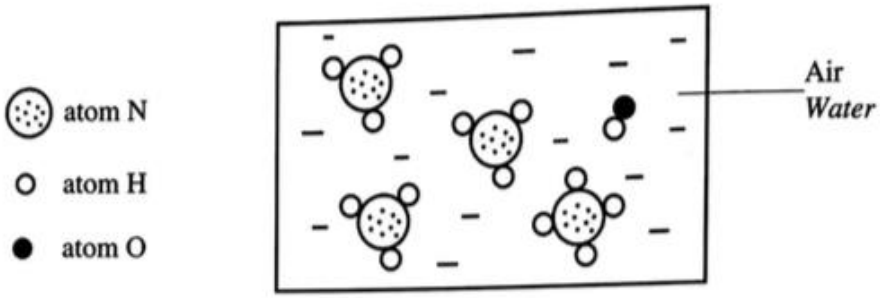
C 33.3 cm^3

D 75.0 cm^3

BAB 7: KADAR TINDAK BALAS

1 (Q11, SPM 2021)

Rajah 7 menunjukkan pengionan bagi suatu bahan, dalam air.
Diagram 7 shows the ionisation of a substance, in water.



Rajah / *Diagram* 7

Antara yang berikut, penyataan manakah yang betul tentang bahan tersebut?
Which of the following statements is correct about the substance?

A Nilai pH kurang daripada 7
PH value is less than 7

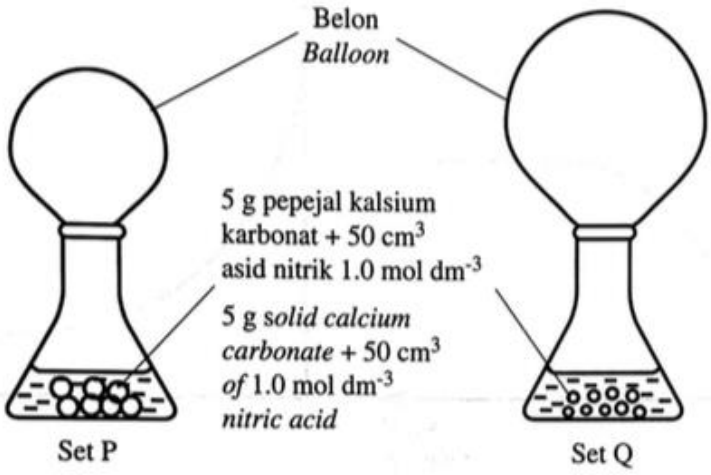
B Pengionan lengkap dalam air
Complete ionisation in water

C Kepekatan ion hidroksida yang rendah
Low concentration of hydroxide ions

D Bilangan mol ion hidrogen yang tinggi
High number of moles of hydrogen ions

2 (Q14, SPM 2021)

Rajah 10 menunjukkan keadaan belon dalam set P dan set Q selepas beberapa minit tindak balas berlaku.
Diagram 10 shows the condition of ballons in set P and set Q a few minutes after a reaction occurred.



Rajah / *Diagram* 10

Antara yang berikut, peenyataan manakah yang menerangkan pemerhatian itu?
Which of the following statements explains the observation?

A Zarah bahan tindak balas dalam set P bergerak lebih cepat
Reacting particles in set P move faster

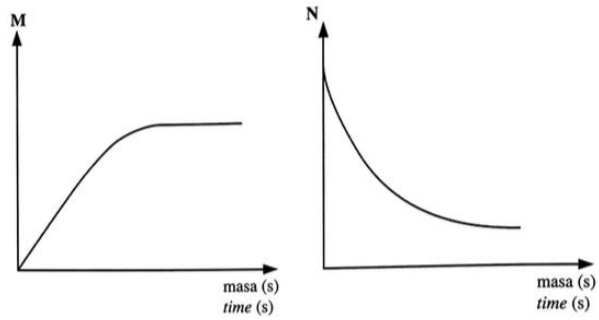
B Lebih banyak zarah kalsium karbonat hadir dalam set Q
More particles of calcium carbonate are present in set Q

C Jumlah luas permukaan kalsium karbonat dalam set Q adalah lebih besar
Total surface area of calcium carbonate in set Q is larger.

D Lebih banyak zarah bahan tindak balas mencapau tenaga pengaktifan yang rendah dalam set P
More reacting particles achieve low activation energy in set P

3 (Q15, SPM 2021)

Rajah menunjukkan dua graf yang diperoleh daripada tindak balas antara asid sulfurik dengan pita magnesium.
Diagram 11 shows two graphs obtained from a reaction between sulfuric acid and magnesium ribbon.



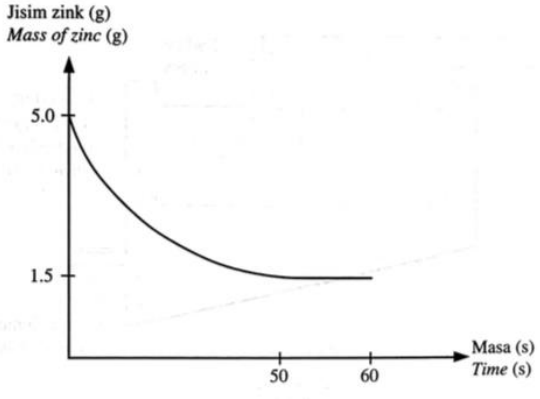
Rajah / *Diagram* 11

Apakah M dan N?
What are M and N?

	M	N
A	Jisim pita magnesium *Mass of magnesium ribbon*	Kepekatan asid sulfuric *Concentration of sulphuric acid*
B	Kepekatan asid sulfurik *Concentration of sulphuric acid*	Isi padu gas hidrogen *Volume of hydrogen gas*
C	Kepekatan asid sulfurik *Concentration of sulphuric acid*	Jisim pita magnesium *Mass of magnesium ribbon*
D	Isipadu gas hidrogen *Volume of hydrogen gas*	Kepekatan asid sulfurik *Concentration of sulphuric acid*

4 (Q33, SPM 2021)

Rajah 18 menunjukkan suatu graf bagi tindak balas antara zink dan larutan kuprum (II) sulfat.
Diagram 18 shows a graph for the reaction between zinc and copper (II) sulphate solution.



Rajah / *Diagram* 18

Apakah kadar tindak balas purata?
What is the average rate of reaction?

A 0.025 g s^{-1}

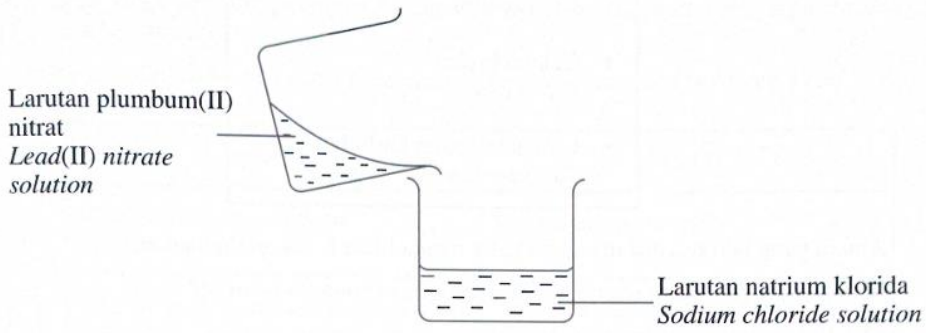
B 0.030 g s^{-1}

C 0.058 g s^{-1}

D 0.070 g s^{-1}

5 (Q11, SPM 2022)

Rajah 5 menunjukkan susunan radas bagi suatu eksperimen yang telah dijalankan oleh Ahmad.
Diagram 5 shows an apparatus set-up of an experiment that has been carried out by Ahmad.



Rajah / *Diagram* 5

Apakah perubahan yang paling sesuai yang boleh diukur oleh Ahmad untuk menentukan kadar tindak balas dalam eksperimen itu?
What is the most suitable change that can be measured by Ahmad to determine the rate of reaction in the experiment?

A Penambahan isi padu larutan natrium nitrat
Increase of the volume of sodium nitrate solution

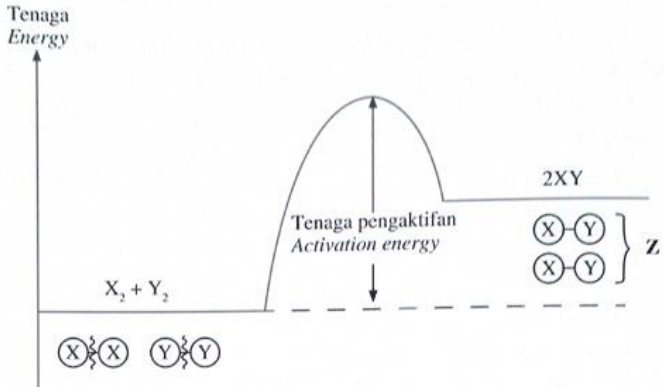
B Pembentukan plumbum (II) klorida
Formation of lead (II) chloride

C Perubahan warna pada campuran
Change in colour of the mixture

D Pengurangan kepekatan larutan natrium klorida
Decrease of the concentration of sodium chloride solution

6 (Q36, SPM 2022)

Rajah 19 menunjukkan gambar rajah pemutusan dan pembentukan ikatan dalam suatu tindak balas.
Diagram 19 shows the diagram of the breakage and formation of bonds in a reaction.



Rajah / *Diagram* 19

Jadual 3 menunjukkan tenaga ikatan kimia bagi tiga ikatan.
Table 3 shows the chemical bond energy for three bonds.

Ikatan *Bond*	Tenaga ikatan (kJ mol^{-1}) *Bond energy (kJ mol^{-1})*
X - X	160
X – Y	201
Y - Y	204

Jadual / *Table* 3

Apakah nilai Z?
What is the value of Z?

A -38 kJ mol^{-1}

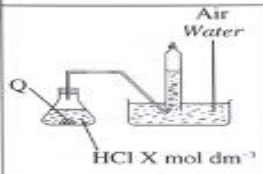
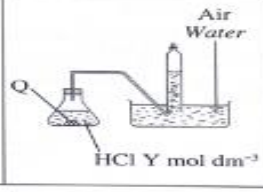
B +38 kJ mol^{-1}

C -163 kJ mol^{-1}

D +163 kJ mol^{-1}

7 (Q39, SPM 2022)

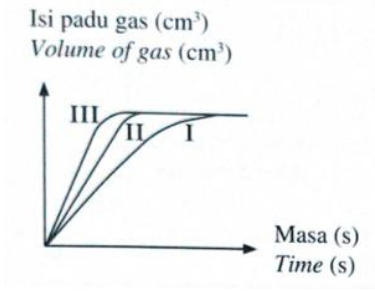
Rajah 20 menunjukkan susunan radas dan pemerhatian bagi dua eksperimen yang telah dijalankan di makmal.
Diagram 20 shows the apparatus set-up and the observations of two experiments that had been carried out in a laboratory.

Eksperimen *Experiment*	Susunan radas *Apparatus set-up*	Suhu (°C) *Temperature* (°C)	Bacaan jam randik untuk mengumpul 50 cm³ gas R (s) *Stopwatch reading to collect 50 cm³ of gas R (s)*	
			Sebelum *Before*	Selepas *After*
I		30		
II		30		

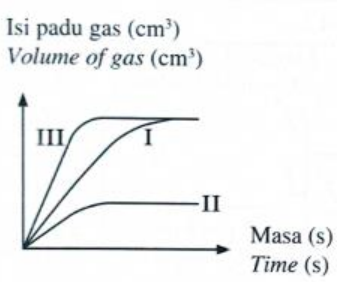
Rajah / *Diagram* 20

Eksperimen III dijalankan dengan mengulangi eksperimen I dengan pepejal Q yang dihancurkan dan suhu ditingkatkan sebanyak dua kali ganda.
Antara yang berikut, lakaran graf manakah yang mewakili ketiga-tiga eksperimen itu?
Experiment III is carried out by repeating the experiment I with solid Q that is crushed and the temperature is doubled.
Which of the following graph sketches represents the three experiments?

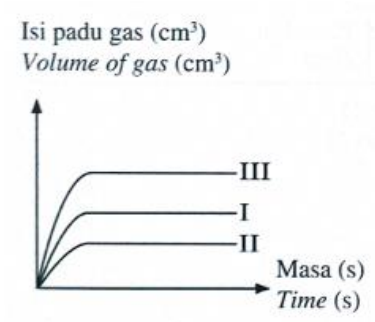
A



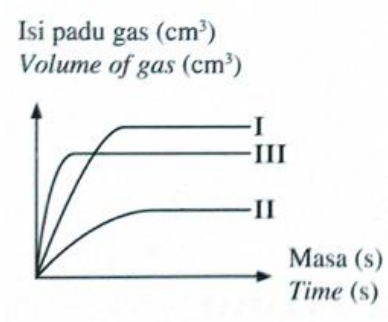
B



C



D



8 (Q7, SPMRSM 2021)

Antara berikut, pasangan manakah betul tentang kadar tindak balas?
Which of the following pair is correct about the rate of reaction?

	Kadar tindak balas rendah *Low rate of reaction*	**Kadar tindak balas tinggi** *High rate of reaction*
A	Peneutralan antara asid dan alkali *Neutralisation between acid and alkali*	Kakisan logam *Corrosion of metals*
B	Penguraian ganda dua antara larutan plumbum(II) nitrat dan larutan natrium iodida *Double decomposition between lead(II) nitrate solution and sodium iodide solution*	Peneutralan antara asid dan alkali *Neutralisation between acid and alkali*
C	Kakisan logam *Corrosion of metals*	Penapaian larutan glukosa *Fermentation of glucose solution*
D	Penapaian larutan glukosa *Fermentation of glucose solution*	Penguraian ganda dua antara larutan plumbum(II) nitrat dan larutan natrium iodide *Double decomposition between lead(II) nitrate solution and sodium iodide solution*

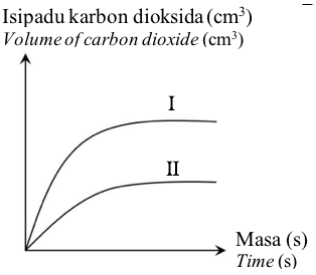
9 (Q23, SPMRSM 2021)

Penguraian ganda dua antara larutan plumbum(II) nitrat dan larutan natrium iodida.
Double decomposition between lead(II) nitrate solution and sodium iodide solution

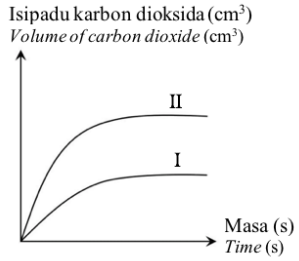
Set ***Set***	**Bahan** ***Substance***
I	Marmar berlebihan dan 50.0 cm^3 asid hidroklorik 2.0 mol dm^{-3} *Excess marble and* 50.0 cm^3 *of* 2.0 mol dm^{-3} *hydrochloric acid*
II	Marmar berlebihan dan 50.0 cm^3 asid hidroklorik 1.0 mol dm^{-3} *Excess marble and* 50.0 cm^3 *of* 1.0 mol dm^{-3} *hydrochloric acid*

Antara berikut, graf yang manakah mewakili eksperimen tersebut?
Which of the following graph represents the experiments?

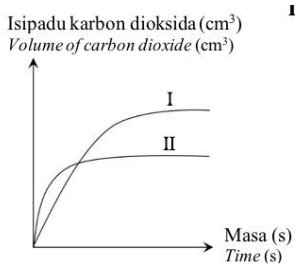
A



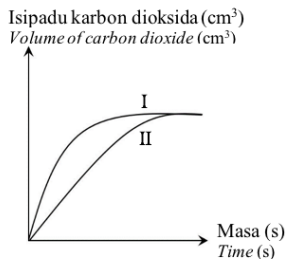
B



C



D



10 (Q6, SPMRSM 2022)

Bagaimanakah suhu meningkatkan kadar tindak balas?
How does temperature increase the rate of reaction?

A Meningkatkan jumlah bilangan zarah-zarah bahan tindak balas
Increase the total number of reactant particles

B Meningkatkan tenaga kinetic zarah-zarah bahan tindak balas
Increase the kinetic energy of reactant particles

C Meningkatkan tenaga pengaktifan tindak balas
Increase the activation energy of the reaction

D Meningkatkan bilangan perlanggaran berkesan
Increase the number of effective collisions

11 (Q22, SPMRSM 2022)

Persamaan berikut menunjukkan tindak balas antara serbuk magnesium, Mg dengan 50.0 cm^3 asid hidroklorik, HCl 1.0 mol dm^{-3}
The following equation shows the reaction between magnesium powder and 50.0 cm^3 of 1.0 mol dm^{-3} of hydrochloric acid, HCl.

$$Mg + 2HCl \longrightarrow MgCl_2 + H_2$$

Bagaimanakah kadar penghasilan gas hydrogen boleh ditingkatkan?
How can the rate of production of hydrogen gas be increased?

A Menggantikan serbuk magnesium dengan ketulan magnesium
Replace magnesium powder with magnesium granules

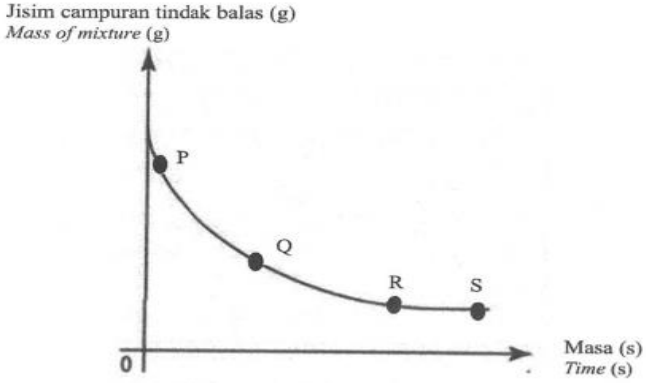
B Mengurangkan isipadu asid hidroklorik
Decrease the volume of hydrochloric acid

C Menambahkan air suling
Add distilled water

D Menambahkan larutan kuprum (II) sulfat
Add copper (II) sulphate solution

12 (Q23, SPMRSM 2022)

Rajah 13 menunjukkan satu graf jisim campuran tindak balas melawan masa bagi tindakbalas antara zink karbonat dan asid nitric.
Diagram 13 shows a graph of mass of a reaction mixture against time for the reaction between zinc carbonate and nitric acid.



Rajah / *Diagram* 13

Titik manakah yang menunjukkan kadar tindak balas paling tinggi?
Which point shows the highest rate of reaction?

A P

B Q

C R

D S

13 (Q33, SPMRSM 2022)

Jadual 2 menunjukkan isipadu gas hidrogen terkumpul dalam satu eksperimen apabila sserbuk magnesium bertindak balas dengan asid nitric cair berlebihan.
Table 2 shows the volume of hydrogen gas collected in an experiment when magnesium powder reacts with excess dilute nitric acid.

Masa (min) *Time (min)*	1.0	2.0	3.0	4.0	5.0
Isipadu gas hidrogen (cm^3) *Volume of hydrogen gas (cm^3)*	0.00	30.00	36.00	45.00	45.00

Jadual / *Table* 2

Berapakah kadar tindak balas purata?
What is the average rate of reaction?

A 0.089 cm^3s^{-1}

B 0.188 cm^3s^{-1}

C 9.000 cm^3s^{-1}

D 11.250 cm^3s^{-1}

14 (Q8, SBP 2021)

Apakah mangkin yang digunakan untuk meningkatkan kadar tindak balas antara zink dan asid hidroklorik?

What is the catalyst used to increase the rate of reaction between zinc and hydrochloric acid?

A Nikel
Nickel

B Ferum
Iron

C Kuprum (II) sulfat
Copper (II) sulphate

D Mangan (IV) oksida
Manganese (IV) oxide

15 (Q24, SBP 2021)

Persamaan ion berikut mewakili tindak balas antara larutan natrium tiosulfat dan asid sulfurik.
The following ionic equation represents the reaction between sodim thiosulphate solution and sulphuric acid.

$$2H^+ + S_2O_3^{2-} \longrightarrow S + SO_2 + H_2O$$

Antara pernyataan berikut, yang manakah menerangkan kesan peningkatan suhu larutan natrium tiosulfat ke atas kadar tindak balas?
Which of the following statements explains the effect of the increasing temperature of sodium thiosulphate solution on the rate of reaction?

A Tenaga kinetik ion tiosulfat bertambah
Kinetic energy of thiosulphate ions increases

B Tenaga pengaktifan tindak balas bertambah
Activation energy of the reaction increases

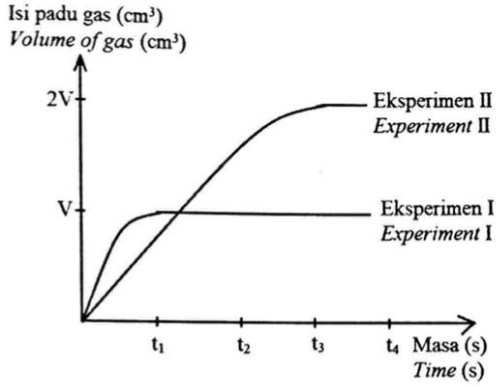
C Bilangan ion tiosulfat per unit isi padu bertambah
Concentration of thiosulphate ions per unit volume increases

D Masa pelanggaran antara ion hidrogen dan ion thiosulfat bertambah
The time of collision between hydrogen ions and thiosulphate ions increases

16 (Q40, SBP 2021)

Rajah 40 menunjukkan isi padu gas melawan masa bagi dua set eksperimen untuk mengkaji faktor yang mempengaruhi kadar tindak balas.
Lengkung 1 mewakili tindak balas antara 40 cm^3 asid nitrik 0.05 mol dm^{-3} dan serbuk stanum berlebihan

Diagram 40 shows a graph of volume of gas against time for two sets of experiments to study the factor that affects the rate of reaction.
Curve 1 represents the reaction between 40 cm^3 of 0.05 mol dm^{-3} nitric acid and excess tin powder.



Rajah/ *Diagram* 40

Jika eksperimen diulang dengan menggunakan larutan asid nitrik yang lain, keadaan manakah menghasilkan lengkung II?
If the experiment is repeated using another solution of nitric acid, which conditions produce curve II?

	Kepekatan asid nitrik (mol dm^{-3}) *Concentration of nitric acid (mol dm-3)*	**Isi padu asid (cm^3)** *Volume of acid (cm^3)*
A	0.03	200
B	0.04	100
C	0.05	80
D	0.10	40

17 (Q8, SBP 2022)

Apakah mangkin yang digunakan untuk meningkatkan kadar tindak balas antara zink dan asid hidroklorik?

What is the catalyst used to increase the rate of reaction between zinc and hydrochloric acid?

A Nikel
Nickel
B Ferum
Iron
C Kuprum (II) sulfat
Copper (II) sulphate
D Mangan (IV) oksida
Manganese (IV) oxide

18 (Q23, SBP 2022)

Antara berikut, pernyataan manakah yang betul apabila suatu bahan tindak balas dipanaskan dalm satu tindak balas?

Which of the following statements is correct when a reactant is heated in a reaction?

A Meningkatkan hasil tindak balas
Increase the yield of the reaction

B Meningkatkan tenaga kinetic zarah bahan tindak balas
Increase the kinetic energy of the reacting particles

C Meningkatkan junlah luas permukaan bahan tindak balas
Increase the total surface area of the reacting particles

D Merendahkan tenaga pengaktifan dengan menyediakan satu laluan alternatif
Lower the activation energy by providing an alternative pathway

19 (Q40, SBP 2022)

Sekumpulan pelajar telah menjalankan satu eksperimen untuk mengkaji factor-faktor yang mempengaruhi kadar tindak balas. Ketulan magnesium karbonat berlebihan telah ditambah kepa 40 cm^3 asid nitrik 0.1 mol dm^{-3} dalam sebuah kelalang kon. Gas yang terbebas dikumpulkan di dalam sebuah buret.

Jika eksperimen itu diulang dengan asid yang berbeza, keadaan asid yang manakah yang akan meningkatkan kadar tindak balas dan meningkatkan isi padu gas yang terbebas sebanyak dua kali ganda? [Isi padu molar gas = 24 dm^3 mol^{-1} pada keadaan bilik]

A group of students carried out an experiment to investigate factors that affect the rate of reaction. Excess of magnesium carbonate granules was added to 40 cm^3 of 0.1 mol dm^{-3} of nitric acid in a conical flask. The gas released is collected in a burette.
If the experiment is repeated with different acids, which conditions of acids will increase the rate of reaction and doubled the volume of the gas released?
[Molar volume of gas = 24 dm^3 mol^{-1} *at room conditions]*

A 20 cm^3 HCl 0.2 mol dm^{-3}
20 cm^3 of 0.2 mol dm^{-3} HCl

B 40 cm^3 H_2SO_4 0.1 mol dm^{-3}
40 cm^3 of 0.1 mol dm^{-3} H_2SO_4

C 40 cm^3 HCl 0.1 mol dm^{-3}
40 cm^3 of 0.1 mol dm^{-3} HCl

D 20 cm^3 H_2SO_4 0.1 mol dm^{-3}
20 cm^3 of 0.1 mol dm^{-3} H_2SO_4

BAB 8: BAHAN BUATAN DALAM INDUSTRI

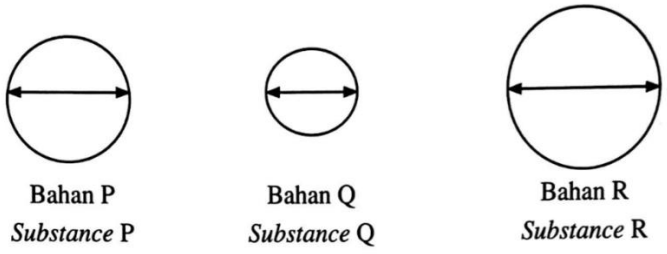
1 (Q16, SPM 2021)

Piuter ialah campuran antara R, kuprum dan antimoni. Apakah R?
Pewter is a mixture of R, copper and antimony. What is R?

A Plumbum
Lead
B Stanum
Tin
C Argentum
Silver
D Karbon
Carbon

2 (Q17, SPM 2021)

Rajah 12 menunjukkan diameter lekuk yang terhasil dalam eksperimen untuk mengkaji kekerasan bagi tiga bahan P, Q dan R.
Diagram 12 shows the diameters of the dents which are produced in an experiment to investigate the hardness of three different substances P, Q and R.



Rajah / *Diagram* 12

Apakah P, Q dan R serta susunan kekerasan bahan dalam tertib menaik yang betul?
What are P, Q, R and the correct arrangement of hardness of the substances in ascending order?

	P	**Q**	**R**	**Susunan** ***Arrangement***
A	Keluli *Steel*	Kuprum *Copper*	Loyang *Brass*	R, P, Q
B	Loyang *Brass*	Keluli *Steel*	Kuprum *Copper*	R, P, Q
C	Keluli *Steel*	Loyang *Brass*	Kuprum *Copper*	Q, P, R
D	Loyang *Brass*	Kuprum *Copper*	Keluli *Steel*	Q, P, R

3 (Q12, SPM 2022)

Maklumat berikut adalah mengenai kegunaan bahan L.
The following information is about the uses of substance L.

- Cakera pemotong
  Cutting disc
- Cakera brake
  Brake disc
- Cincin tungsten karbida
  Tungsten carbide ring

Antara yang berikut, ciri manakah yang menjadikan L sesuai digunakan?
Which of the following characteristics make L suitable to be used?

I. Kekuatan mampatan yang rendah
Low compression strength

II. Kekonduksian elektrik yang rendah
Low electrical conductivity

III. Lelahan lebih tinggi
Higher abrasion

IV. Lengai secara kimia
Chemically inert

A I dan II
I and II

B I dan IV
I and IV

C II dan III
II and III

D III dan IV
III and IV

4 (Q8, SPMRSM 2021)

Aloi Z mempunyai komposisi seperti berikut:
Alloy Z has the following composition:

74% Ferum *74% Iron* 18% Kromium *18% Chromium* 8% Nikel *8% Nickel*

Apakah aloi Z?
What is alloy Z?

A Keluli nirkanat
Stainless steel

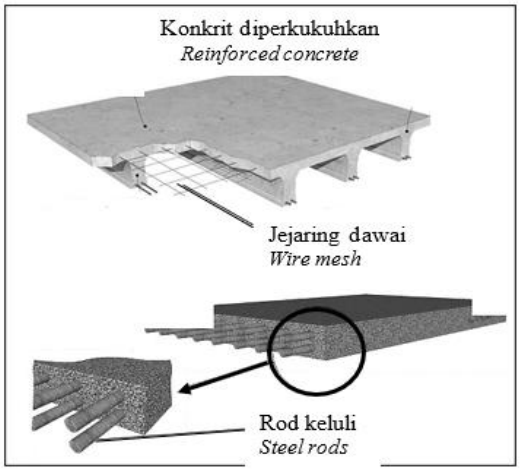
B Duralumin
Duralumin

C Loyang
Brass

D Piuter
Pewter

5 (Q25, SPMRSM 2021

Rajah 6 menunjukkan konkrit yang diperkukuhkan. Penambahan rod keluli atau jejaring dawai akan menambah baik sifat konkrit tersebut.
Diagram 6 shows reinforced concrete. Adding steel rods or wire mesh will improve the properties of the concrete.



Rajah / *Diagram* 6

Antara berikut, sifat manakah yang akan ditambah baik?
Which of the following properties will be improved?

A Tahan kakisan
Resistant to corrosion

B Kekuatan regangan
Stretching strength

C Kekuatan mampatan
Compression strength

D Kekonduksian haba dan elektrik
Heat and electrical conductivity

6 (Q7, SPMRSM 2022)

Kaca dihasilkan dari silikon dioksida dan kalsium karbonat.
Rajah 3 menunjukkan alatan memasak yang diperbuat daripada kaca.
Glass is made up of silicon dioxide and calcium carbonate.
Diagram 3 *shows a cookware made from glass.*

Rajah / *Diagram* 3

Apakah bahan yang ditambah dan ciri baharu kaca tersebut?
What is the substance added and the new property of the glass?

	Bahan tambah ***Substance added***	**Ciri baharu** ***New property***
A	Natrium karbonat dan plumbum(II) oksida *Sodium carbonate and lead*(II) *oxide*	Pekali pengembangan yang rendah *Low expansion coefficient*
B	Natrium karbonat dan plumbum(II) oksida *Sodium carbonate and lead*(II) *oxide*	Pekali pengembangan yang tinggi *High expansion coefficient*
C	Boron oksida dan aluminium oksida *Boron oxide and aluminium oxide*	Pekali pengembangan yang rendah *Low expansion coefficient*
D	Boron oksida dan aluminium oksida *Boron oxide and aluminium oxide*	Pekali pengembangan yang tinggi *High expansion coefficient*

7 (Q10, SBP 2021)

Duralumin digunakan dalam pembuatan badan kapal terbang.
Antara unsur-unsur berikut, yang manakah terdapat dalam duralumin?

Duralumin is used in manufacturing of the body of aeroplane.
Which of the following elements contains in duralumin?

I. Zink
Zink
II. Karbon
Carbon
III. Magnesium
Magnesium
IV. Aluminium
Aluminium

A I dan II
I and II
B I dan III
I and III
C II dan IV
II and IV
D III dan IV
III and IV

8 (Q12, SBP 2021)

Rajah 12 menunjukkan sebuah teleskop.
Diagram 12 shows a telescope.

Rajah / *Diagram* 12

Antara berikut, yang manakah digunakan untuk membuat bahagian X?
Which of the following is used to make part X?

A Kaca plumbum
Lead crystal glass
B Kaca borosilikat
Borosilicate glass
C Kaca soda kapur
Soda lime glass
D Kaca silika terlakur
Fused silica glass

9 (Q9, SBP 2022)

Kaca fotokromik adalah bahan komposit yang digunakan dalam pembuatan tingkap kereta dan tingkap bangunan. Antara yang berikut, yang manakah adalah bahan pengukuhan dalam kaca fotokromik?
Photochromic glass is a composite material that is used in manufacture of car windows and building windows. Which of the following are the strengthening substances in photochromic glass?

I. Kuprum(I) klorida
Copper(1) chloride

II. Ferum(II) klorida
Iron(II) chloride

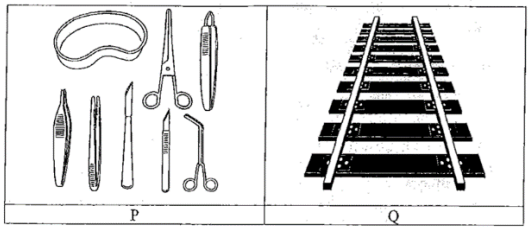
III. Argentum klorida
Silver chloride

IV. Barium klorida
Barium chloride

A I dan III
I and III
B I dan IV
I and IV
C II dan III
II and III
D II dan IV
II and IV

10 (Q10, SBP 2022)

Rajah 2 menunjukkan kegunaan dua bahan yang berbeza, P dan Q.
Diagram 2 shows uses of two different materials, P and Q.



Rajah / *Diagram* 12

Apakah unsur utama yang terdapat dalam bahan P dan Q?
What is the main element in materials P and Q?

A Ferum
Iron
B Karbon
Carbon
C Stanum
Tin
D Kuprum
Copper

11 (Q24, SBP 2022)

Komponen enjin dalam kapal terbang jet diperbuat daripada seramik. Antara yang berikut, sifat wanakah yang menyebabkan seramik sesuai untuk kegunaan tersebut?
Engine component in jet planes are made from ceramics. Which of the following properties that makes ceramics suitable for the usage?

A Keras dan kuat
Hard and strong

B Ketumpatan yang tinggi
High density

C Lengai terhadap bahan kimia
Inert towards chemicals

D Tahan terhadap snhu yang tinggi
Withstand high temperature

12 (Q37, SBP 2022)

Seorang pengilang perlu tnenghasilkan peralatan memasak iaitu senduk yang tahan suhu yang tinggi dart bersifat lengai terhadap bahan kimia. Antara berikut, bahan manakah yang sesuai untuk menghasilkan peralatan memasak itu?

A manufacturer needs to produce cooking utensils which are ladles that withstand high temperature and inert towards chemical. Which of the following materials is suitable to produce the cooking utensils?

A Tiokol
Thiokol

B Neoprena
Neoprene

C Getah nitril
Nitrite rubber

D Getah silikon
Silicone rubber

BAB 2: JIRIM DAN STRUKTUR ATOM

1 (Q1, SPM 2021)

Jadual 1 menunjukkan nombor proton dan nombor nukleon bagi atom X dan atom Y. Huruf X dan Y bukan symbol sebenar bagi atom tersebut.
Table 1 shows the proton number and nucleon number of atoms X and Y. The letters X and Y are not the actual symbol of the atoms.

Atom	**Nombor proton** ***Proton number***	**Nombor nukleon** ***Nucleon number***
X	**8**	**16**
Y	**6**	**12**

Jadual / *Table* 1

Berdasarkan Jadual 1,
Based on Table 1,

(a) Apakah yang dimaksudkan dengan nombor nukleon?
What is meant by nucleon number?

……....[1]

(b) Nyatakan bilangan proton dalam atom X.
State the number of protons in atom X.

……...……....[1]

(c) Tulis perwakilan piawai bagi atom Y dalam bentuk $^{\mathrm{A}}_{\mathrm{Z}}\mathrm{Y}$
Write the standard representation for atom Y in the form of $^{A}_{Z}Y$

…….[1]

(d) X bertindak balas dengan Y membentuk sebatian YX_2. Sebatian YX_2 mengalami proses pemejalwapan pada - 78°*C*.
X reacts with Y to form compound YX_2*. Compound Y undergoes sublimation process at - 78°C.*

(i) Lengkapkan kotak berikut bagi menunjukkan perubahan keadaan fizik YX_2 ketika pemejalwapan.
Complete the following boxes to show the change in physical state of compound YX_2 *during sublimation.*

[1]

(ii) Nyatakan pergerakan zarah dalam YX_2 pada suhu bilik.
Stare the movement of particles in YX_2 at room temperature.

.....[1]

2. (Q4, SPM 2022)

Jadual 1 menunjukkan maklumat bagi zarah P, Q, R dan S.
Table 1 shows the information of particles P, Q, R and S.

Zarah *Particle*	**Bilangan proton** *Number of proton*	**Bilangan elektron** *Number of electron*	**Bilangan neutron** *Number of neutron*
L	6	6	6
M	6	6	8
Q	8	10	8
R	12	10	12

Jadual / *Table* 1

(a) Nyatakan maksud isotop.
State the meaning of isotope.

……..…..…[1]

(b) Pilih dua zarah yang merupakan isotop.
Choose two particles which are isotopes.

……[1]

(c) Tulis perwakilan piawai bagi zarah M dalam bentuk $^{\mathrm{A}}_{\mathrm{Z}}\mathrm{X}$.
Write the standard representation for particle M in the form of $^{A}_{Z}X$.

……..……[1]

(d) Kelimpahan semula jadi $^{24}_{12}\mathrm{R}$ ialah 79.0 % manakala $^{25}_{12}\mathrm{R}$ ialah 10.0 % dan $^{26}_{12}\mathrm{R}$ ialah 11.0 %. Hitung jisim atom relatif bagi R.

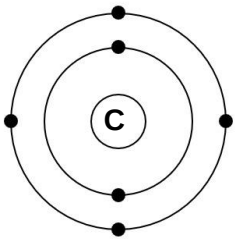
Natural abundance of $^{24}_{12}R$ is 79.0 % whereas $^{25}_{12}R$ is 10.0 % and $^{26}_{12}R$ is 11.0 %. Calculate the relative atomic mass of R.

[2]

(e) Lukis susunan elektron bagi zarah Q.
Draw the electron arrangement of particle Q.

[2]

3 (Q1, SPMRSM 2021)
Rajah 1 menunjukkan struktur atom karbon-12.
Diagram 1 shows the atomic structure of carbon-12 atom.



Berdasarkan Rajah 1,
Based on Diagram 1,

(a) (i) Namakan zarah subatom yang bercas positif dalam atom.
Name the positively charged subatomic particle in the atom.

……..[1]

(ii) Nyatakan bilangan neutron yang terdapat dalam nukleus atom karbon-12.
State the number of neutrons found in the nucleus of carbon-12 atom.

……..[1]

(iii) Isotop lain bagi karbon adalah karbon-14.
Apakah perbezaan antara atom karbon-14 dan karbon-12?
Another isotope of carbon is carbon-14.
What is the difference between carbon-14 and carbon-12 atoms?

……..…[1]

(b) Atom Z mengandungi 4 proton dan 5 neutron.
Z atom has 4 protons and 5 neutrons.

(i) Tuliskan perwakilan piawai untuk atom Z.
Write the standard representation of Z atom.

……..[1]

(ii) Atom Z boleh membentuk ion.
Tuliskan susunan elektron ion Z.
Z atom can form an ion.
Write the electron arrangement of Z ion.

……..[1]

4 (Q3, SPMRSM 2022)

Rajah 3 menunjukkan perwakilan piawai untuk atom-atom silikon, Si.
Diagram 3 shows the standard representation of silicon atoms, Si.

$^{28}_{14}Si$ $^{29}_{14}Si$ $^{30}_{14}Si$

Rajah / *Diagram* 3

(a) Apakah maksud isotop?
What is the meaning of isotopes?

……...[1]

(b) Lukiskan struktur atom bagi Si-28.
Draw the atomic structure of Si-28.

[2]

(c) Peratus kelimpahan semula jadi bagi $^{28}_{14}Si$, $^{29}_{14}Si$ dan $^{30}_{14}Si$ ialah 92%, 5% dan 3%. Kirakan jisim atom relatif bagi silikon, Si.
The percentage of natural abundance of $^{28}_{14}Si$, $^{29}_{14}Si$ and $^{30}_{14}Si$ *is* 92%, 5% *and* 3% *respectively. Calculate the relative atomic mass of silicon,* Si.

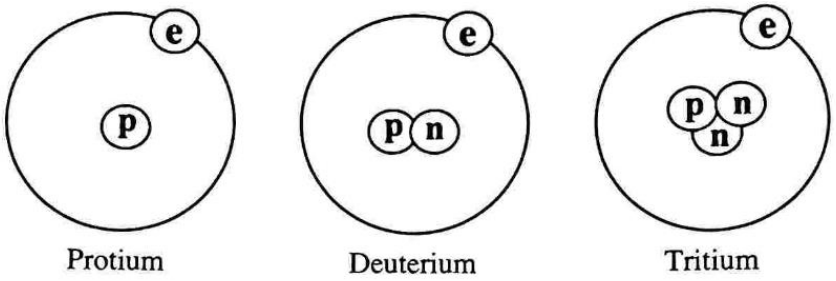
[2]

(d) Isotop digunakan secara meluas dalam pelbagai bidang.
Nyatakan satu contoh isotop yang digunakan dalam bidang perubatan.
Isotopes are widely used in various field.
State one example of isotopes used in medicine field.

……[1]

5 (Q1, SBP 2021)

Protium, deuterium and tritium merupakan isotop bagi undsur hydrogen.
Rajah 1 menunjukkan struktur atom bagi ketiga-tiga atom hydrogen tersebut.
Protium, deuterium and tritium are isotopes of the hydrogen element.
Diagram 1 shows the atomic structure for these three atoms of hydrogen.



Rajah / *Diagram* 1

(a) Apakah maksud isotop?
What is the meaning of isotopes?

……...[1]

(b) Nyatakan nama semua zarah subatom yang terdapat di dalam nucleus.
State the name of all subatomic paticles inside the nucleus.

……...[1]

(c) Namakan zarah subatom yang bercas negative.
Name subatomic particle that is negatively charged.

……...[1]

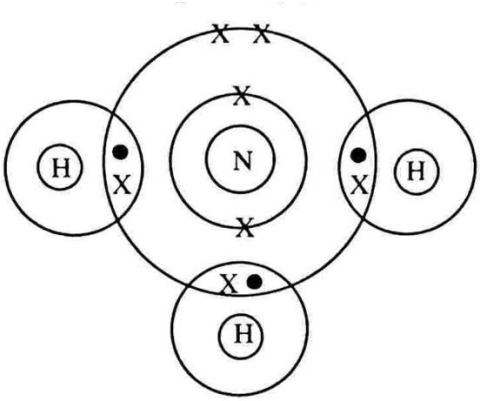
(d) Adakah ketiga-tiga atom hydrogen dalam Rajah 1 mempunyai sifat kimia yang sama? Terangkan jawapan anda.
Do the three hydrogen atoms in Diagram 1 have the same chemical properties? Explain your answer.

……...

……...[2]

6 (Q2, SBP 2021)

Rajah 2 menunjukkan susunan elektron bagi gas A.
Diagram 2 shows the electron arrangement of gas A.



Rajah / *Diagram* 2

(a) Nyatakan jenis zarah dalam gas A.
State thype of particles in gas A.

……[1]

7 (Q3, SBP 2021)

Rajah 3 menunjukkan symbol atom bagi unsur X. Huruf yang digunakan adalah bukan symbol sebenar unsur itu.
Diagram 3 shows the symbol of the atom of element X. The letter used is not the actual symbol of the element.

$$^{35.5}_{17}X$$

Rajah / *Diagram* 3

(a) Apakah yang diwakili oleh nombor 17 dalam Rajah 3?
What is represented by the number 17 in Diagram 3?

……[1]

8 (Q5, SBP 2022)

Jadual 5 menunjukkan nombor proton dan nombor nucleon bagi atom V, atom W dan atom X.
Table 5 shows the proton number and nucleon number for atoms V, W and X

Atom	Nombor proton *Proton number*	Nombor nukelon *Nucleon number*
V	*6*	*12*
W	*11*	*23*
X	*17*	*35*

Jadual / *Table* 5

(a) Apakah yang dimasudan dengan nombor nukelon?
What is meant by nuelon number?

……

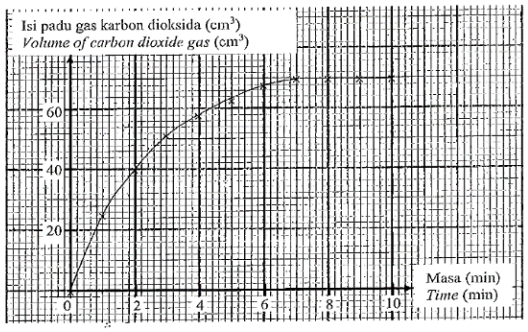
…….. [2]

(b) Atom Z-14 merupakan isotop kepada atom V.
Tentukan bilangan neutron dalam atom Z
Atom Z-14 is an isotope of atom V.
Determine the number of neutrons in atom Z.

……..… [1]

9 (Q6, SBP 2022)

Rajah 6 menunjukkan graf isi padu gas karbon dioksida melawan masa bagi tindak balas antara serbuk magnesium karbonat berlebihan dengan 50 cm^3 asid sulfurik 1.0 mol dm^{-3}
Diagram 6 shows a graph of volume of carbon dioxide gas against time for a reaction between excess magnesium carbonate powder and 50 cm^3 of 1.0 mol dm^{-3} sulphuric acid.



Rajah / *Diagram* 6

(a) Nyatakan jenis zarah dalam magnesium karbonat.
State the type of particle in magnesium carbonate

……..[1]

BAB 3: KONSEP MOL, FORMULA DAN PERSAMAAN KIMIA

1 (Q3, SPM 2021)

(a) 0.5 mol unsur Y terbakar dalam oksigen seperti yang ditunjukan dalam Tindak balas I.
Hitung jisim oksida Y yang terbentuk.
0.5 mol *of element Y is burnt in oxygen as shown in Reaction 1.Calculate the mass of Y oxide formed.*
[Jisim molar oksida Y = 62 $gmol^{-1}$] [*Molar mass of oxide* Y = 62 $gmol^{-1}$]

[2 markah]
[2 *marks*]

2 (Q4, SPM 2021)

(b) Natrium bertindak balas dengan klorin membentuk sebatian Q
Sodium reacts with chlorine to form compound Q.

(iii) Tulis persamaan kimia bagi pembentukan sebatian Q.
Write the chemical equation for the formation of compound Q.

……..

……..

[2 markah]
[2 *marks*]

(iv) 2.3 g natrium bertindak balas dengan klorin berlebihan. Hitung jisim bagi sebatian Q yang terhasil

2.3 g of sodium reacts with excess chlorine.
Calculate the mass of compound Q produced.

[2 markah]
[2 *marks*]

3 (Q6, SPM 2021)

Jadual 3 menunjukkan persamaan perkataan bagi dua tindak balas melibatkan logam X dan oksida logam Y. Formula empirik bagi oksida X dan oksida Y ditentukan melalui Kaedah I dan Kaedah II.

Table 3 shows the word equations for two reactions involving metal X and metal oxide Y. The empirical formulae of X oxide and Y oxide are determined through Method I and Method II.

Kaedah *Method*	Persamaan perkataan *Word equation*
I	X + Oksigen → Oksida X X + *Oxygen* → X *Oxide*
II	Hidrogen + Oksida Y → Y + Air *Hydrogen* + *Oxide* Y → Y + *Water*

Jadual / *Table* 3

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

.....

[1 markah]
[1 *mark*]

(b) Cadangkan logam X dan logam Y.
Terangkan mengapa anda memilih logam tersebut.

Suggest metal X and metal Y. Explain why you choose the metal.

Logam X:
Metal X:

Penerangan:
Explanation:

Logam Y:
Metal Y:

Penerangan:
Explanation:

[4 markah]
[4 *marks*]

(c) (i) 1.08g X bertindak balas dengan 0.96 g oksigen. Apakah formula empirik bagi oksida X?
1.08 g of X reacts with 0.96 g oxygen. What is the empirical formula of X oxide?
[Jisim atom relatif : X = 27, O=16]
[Relative atomic : X =27, O=16]

[3 markah]
[3 *marks*]

(ii) Kaedah yang manakah lebih sesuai digunakan untuk menentukan formula empiric bagi oksida plumbum?
Which method is suitable to be used to determine the empirical formula for lead oxide?

……...

……...

[2 markah]
[2 *marks*]

4 (Q4, SPM 2022)

(a) Jadual 4 menunjukkan maklumat bagi dua set eksperimen yang telah dijalankan untuk menyiasat faktor yang mempengaruhi kadar tindak balas.
Table 4 shows the information of two sets of experiments that were conducted to investigate the factor that affects the rate of reaction.

Set	Bahan tindak balas *Reactant*	Suhu (°C) *Temperature* (°C)
I	Serbuk zink berlebihan + 50 cm^3 asid hidroklorik 0.1 mol dm^{-3} *Excess zinc powder* + 50 cm^3 *of* 0.1 mol dm^{-3} *hydrochloric acid*	40
II	Serbuk zink berlebihan + 50 cm^3 asid hidroklorik 0.1 mol dm^{-3} *Excess zinc powder* + 50 cm^3 *of* 0.1 mol dm^{-3} *hydrochloric acid*	50

Berdasarkan Jadual 4,
Based on Table 4,

(i) kenal pasti faktor yang mempengaruhi kadar tindak balas.
Identify the factor that affects the rate of reaction.

.....
..

[1 markah]
[1 *mark*]

(ii) Berikut merupakan persamaan kimia bagi tindak balas dalam eksperimen tersebut.
The following is the chemical equation for the reaction in the experiment.

$$Zn + 2HCl \longrightarrow ZnCl_2 + H_2$$

Hitung isi padu maksimum gas hidrogen yang terhasil dalam Set I pada keadaan bilik.
[1 mol sebarang gas menempati 24 dm^3 pada keadaan bilik]
Calculate the maximum volume of hydrogen gas produced in Set I at room condition.
[I mol of any gas occupies 24 dm^3 at room conditions]

[3 markah]
[3 *marks*]

5 (Q9, SPM 2022)

(a) Rajah 7.1 menunjukkan penggunaan beg udara dalam kereta yang mengembang secara automatik untuk melindungi pemandu ketika kemalangan.
Diagram 7.1 shows the usage of air bag in a car which is automatically inflated to protect the driver during accident.

Rajah 7.1
Diagram 7.1

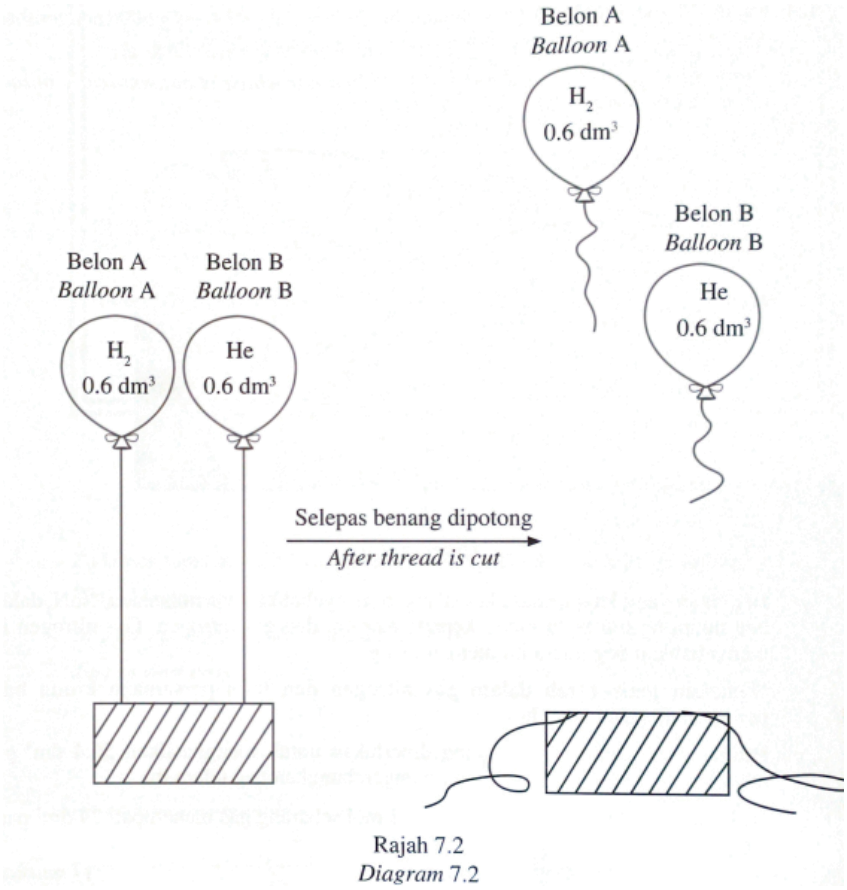
Hentakan yang kuat semasa kemalangan menyebabkan natrium azida, NaN_3 dalam beg udara terurai serta merta kepada natrium dan gas nitrogen. Gas nitrogen ini menyebabkan beg udara itu mengembang.
Nyatakan jenis zarah dalam gas nitrogen dan tulis persamaan kimia bagi penguraian natrium azida.
Hitung jisim natrium azida yang diperlukan untuk menghasilkan 56.4 dm^3 gas nitrogen pada keadaan bilik untuk mengembangkan beg udara itu.
[Jisim atom relatif: N = 14, Na = 23; 1 mol sebarang gas menempati 24 dm^3 pada keadaan bilik]

[7 markah]

Strong impact during accident causes sodium azide, NaN_3 in the air bags decomposes immediately to sodium and nitrogen gas. This nitrogen gas causes the air bag to inflate.
State the type of particles in nitrogen gas and write the chemical equation for the decomposition of sodium azide..
Calculate the mass of sodium azide required to produce 56.4 dm^3 of nitrogen gas at room conditions to inflate the air bag.
[Relative atomic mass: N = 14, Na = 23; I mol of any gas occupies 24 dm^3 at room conditions]

[7 marks]

(b) Rajah 7.2 menunjukkan dua biji belon yang diisi dengan dua jenis gas yang berbeza pada keadaan bilik.
Diagram 7.2 shows two balloons that are filled with two different types of gas at room conditions.



Rajah 7.2
Diagram 7.2

Terangkan mengapa terdapat perbezaan dalam pemerhatian bagi Belon A dan Belon B selepas benang dipotong.
[Jisim atom relatif: H = 1, He = 4 ; 1 mol sebarang gas menempati 24 dm^3 pada keadaan bilik]

[5 markah]

Explain why there is a difference in the observation for Balloon A and Balloon B after the thread is cut.
[Relative atomic mass: H = 1, He = 4; 1 mol of any gas occupies 24 dm^3 at room condition]

[5 marks]

6 (Q10, SPM 2022)

(a) Jadual 5 menunjukkan maklumat bagi kedudukan unsur X, Y dan Z dalam Jadual Berkala Unsur.
Table 5 shows the information for the positions of elements X, Y and Z in the Periodic Table of Elements.

Unsur *Element* / **Kedudukan** *Position*	X	Y	Z
Kala *Period*	2	3	3
Kumpulan *Group*	14	2	17

Jadual / *Table* 5

(ii) Unsur Y bertindak balas dengan 120 cm^3 gas oksigen untuk membentuk sebatian T. Tulis persamaan kimia bagi tindak balas itu dan hitung jisim sebatian T yang terbentuk.
[Jisim atom relatif: O = 16, Y = 24 ; 1 mol sebarang gas menempati 24 dm^3 pada keadaan bilik]
Element Y reacts with 120 cm^3 of oxygen gas to form compound T. Write the chemical equation for the reaction and calculate the mass of compound T formed.
[Relative atomic mass: O = 16, Y = 24 ; 1 mol of any gas occupies 24 dm^3 at room conditions]

[6 markah]

7 (Q4, SPMRSM 2021)

(a) (iii) 0.1 mol of ferum bertindak balas dengan gas klorin.
Hitungkan jisim hasil tindak balas yang terbentuk apabila
[Jisim atom relatif: Cl = 35.5, Fe = 56]
0.1 *mol of iron wool reacts with excess chlorine* gas
Calculate the mass of the product formed.
[*Relative atomic mass:* Cl = 35.5, Fe = 56]

[2 markah]

8 (Q6, SPMRSM 2021)

(b) 50 cm^3 asid hidroklorik 0.5 mol dm^{-3} dan serbuk magnesium karbonat berlebihan digunakan dalam tindak balas Set III.
Hitung isi padu maksimum gas karbon dioksida yang dibebaskan.
[Isipadu molar pada suhu bilik: 24 dm^3 mol^{-1}]

50 cm^3 *of* 0.5 mol dm^{-3} *hydrochloric acid and excess magnesium carbonate powder is used in the reaction of Set* III.
Calculate the maximum volume of carbon dioxide gas released at room condition.
[*Molar volume of gas at room condition:* 24 dm^3 mol^{-1}]

[3 markah]

9 (Q2, SPMRSM 2022)

(b) Persamaan kimia berikut mewakili pembakaran aluminium dengan oksigen.
The following chemical equation represents the burning of aluminium with oxygen

$$4Al + 3\,O_2 \longrightarrow 2\,Al_2O_3$$

Berikan dua maklumat yang boleh ditafsirkan daripada persamaan kimia di atas.
Give two information that can be interpreted from the chemical equation above.

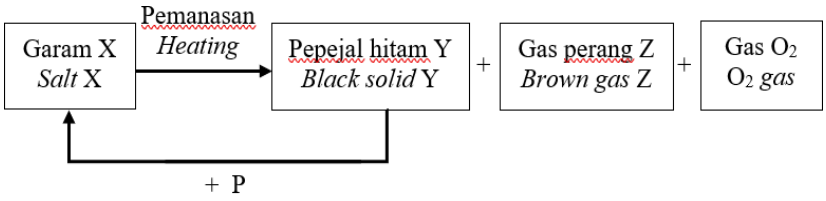
……

……

[2 markah]

10 (Q11, SPMRSM 2022)

(b) (ii) Rajah 11.3 menunjukkan satu carta alir tindak balas yang berlaku ke atas garam X.
Diagram 11.3 *shows a flow chart of reaction that occurs on salt* X.



Rajah 11.3
Diagram 11.3

9.4 g garam X dipanaskan dan menghasilkan bahan Y, gas Z dan gas oksigen. Tuliskan persamaan kimia bagi tindak balas tersebut dan kira isipadu gas Z yang terhasil pada keadaan bilik.
[Jisim molar X=188 g mol^{-1}; 1 mol gas menempati 24 dm^3 pada keadaan bilik]

9.4 g *of* X *salt is heated and produced substance* Y, Z *gas and oxygen gas. Write the chemical equation for the reaction and calculate the volume of* Z *gas produced at room condition.*
[*Molar mass of* X=188 g mol^{-1}; 1 mol *of gas occupies* 24 dm^3 *at room conditions*]

[5 markah]
[5 *marks*]

11 (Q3, SBP 2021)

Rajah 3 menunjukkan symbol atom bagi unsur X. Huruf yang digunakan adalah bukan simbol sebenar unsur itu.
Diagram 3 shows the symbol of the atom of element X*. The letter used is not the actual symbol of the element.*

$$^{35.5}_{17}X$$

Rajah / *Diagram* 3

(c) X bertindak balas dengan wul besi yang panas untuk membentuk pepejal perang.
X *reacts with hot iron wool to form a brown solid.*

(i) Tulis persamaan kimia bagi tindak balas yang berlaku.
Write the chemical equation for the reaction occurs.

……

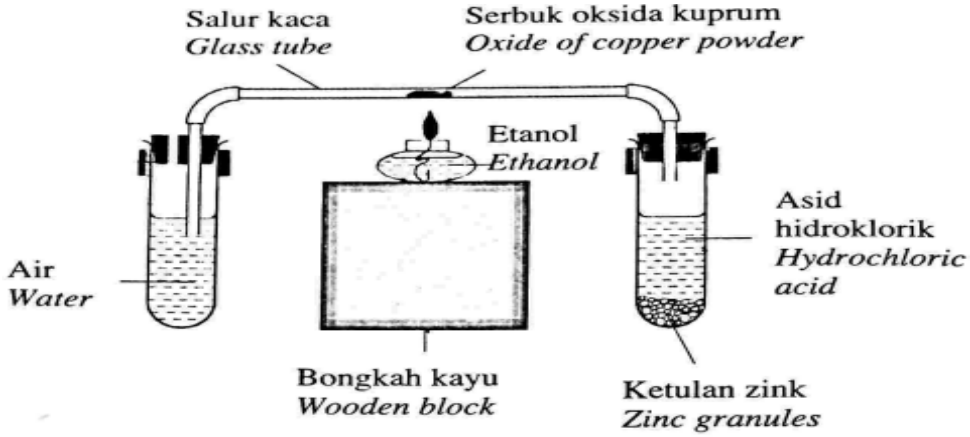
[2 markah]

(ii) Hitung jisim pepejal perang yang terbentuk apabila 0.3 mol X bertindak balas dengan wul besi yang panas.
[Jisim atom relatif: Fe = 56, X = 35.5]
Calculate the mass of the brown solid formed when 0.3 mol X *reacts with hot iron wool.*
[Relative atomic mass: Fe = *56,* X = *35.5]*

[2 markah]
[2 *marks*]

12 (Q4, SBP 2021)

Rajah 4 menunjukkan susunan radas eksperimen untuk menentukan formula empiric bagi oksida kuprum.
Diagram 4 shows the apparatus set-up of an experiment to determine the empirical formula for oxide of copper.



Rajah/ *Diagram* 4

(a) Apakah maksud formula empirik?
What is the meaning of empirical formula?

……..…...
[1 markah]

(b) Apakah peranan ketulan zink dan asid hidroklorik dalam eksperimen ini?
What is the role of zinc granules and hydrochloric acid in this experiment?

……...
[1 markah]

(c) Namakan satu oksida logam lain yang formula empiriknya boleh ditentukan dengan menggunakan kaedah seperti yang ditunjukkan dalam Rajah 4.
Name another oxide of metal which the empirical formula can be determined by using the same method as shown in Diagram 4.

……..……...
[1 markah]

(d) Jadual 4 menunjukkan keputusan eksperimen yang diperolehi oleh seorang pelajar.

Penerangan *Description*	Jisim *Mass*
Jisim salur kaca *Mass of glass tube*	9.25
Jisim salur kaca + oksida kuprum Mass of glass tube + oxide of copper	9.35
Jisim salur kaca + kuprum Mass of glass tube + copper	9.33

Jadual / *Table* 4

Table 4 shows the results of an experiment obtained by a student.
Berdasarkan Jadual 4,
Based on Table 4,

(i) Hitung jisim bagi:
Calculate the mass of:

Kuprum:
……
Copper:
……

Oksigen:
……
Oxygen:
……

[1 markah]

(ii) Hitungkan bilangan mol bagi atom kuprum dan atom oksigen dan seterusnya tentukan formula empirik bagi oksida kuprum itu. [Jisim atom relatif: Cu = 64, O = 16]
Calculate the number of moles of copper atom and oxygen atom and then determine the empirical formula for the oxide of copper.
[*Relative atomic mass:* Cu = 64, O = 16]

[3 markah]

13 (Q3, SBP 2022)

Rajah 3 menunjukkan persamaan bagi tindak balas respirasi sel yang berlaku dalam badan manusia.
Diagram 3 *shows the equation for cellular respiration reaction that occurs in the human body.*

Glukosa *Glucose*	+	Oksigen *Oxygen*	⟶	Karbon dioksida *Carbon dioxide*	+	Air *Water*

Rajah / *Diagram* 3

(a) Formula molekul bagi glukosa ialah $C_6H_{12}O_6$ Tuliskan formula empirik bagi glukosa.
The molecular formula of glucose is $C_6H_{12}O_6$,
Write the empirical formula of glucose.

…….
[1 markah]

(b) Berdasarkan Rajah 3,
Based on Diagram 3*,*

(i) tuliskan persamaan kimia bagi mewakili tindak balas respirasi sel itu.
write the chemical equation to represent the cellular respiration reaction.

……..
[2 markah]

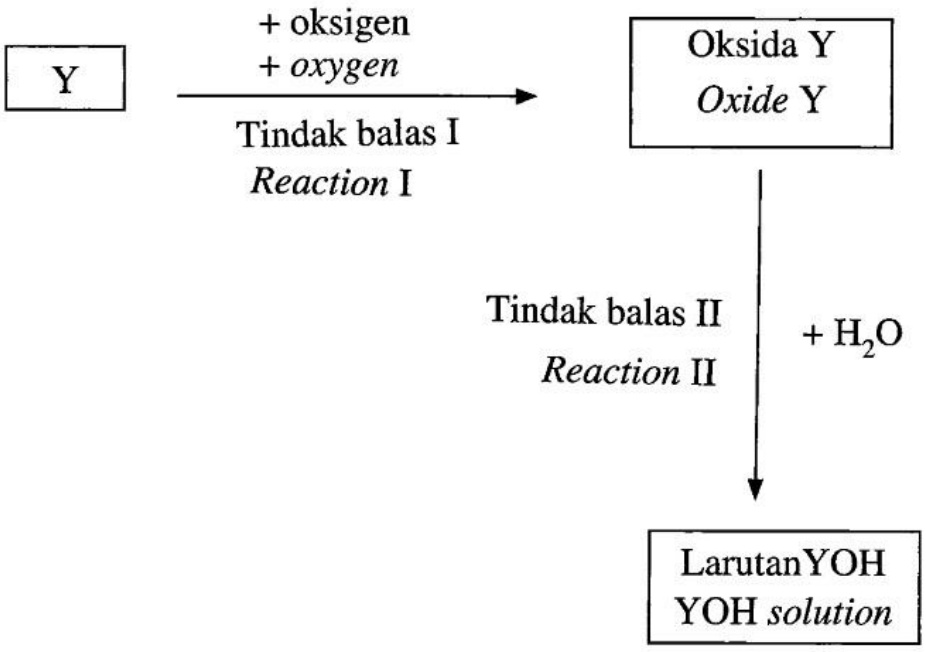
(ii) hitungkan isi padu gas karbon dioksida yang terhasil pada keadaan bilik jika 360 g glukosa digunakan dalam tindak balas itu.
calculate the volume of carbon dioxide gas produced at room conditions if 360 g of glucose is used in the reaction.
[Jisim molar glukosa = 180 g mol^{-1};
Isipadu molar gas pada keadaan bilik = 24 dm^3 mol^{-1}] [*Molar mass glucose*= 180 g mol^{-1};
Molar volume of gas at room conditions= 24 dm^3 mol^{-1}]

[3 markah]

BAB 4: JADUAL BERKALA UNSUR

3 **(**Q3, SPM 2021)

Rajah 2 menunjukkan carta alir bagi tindak balas bermula dengan unsur Y. Unsur Y terletak dalam Kumpulan 1 Jadual Berkala Unsur.
Diagram 2 shows the flow chart for the reaction starting with element Y. Element Y is located in Group 1 of the Periodic Table of Elements.

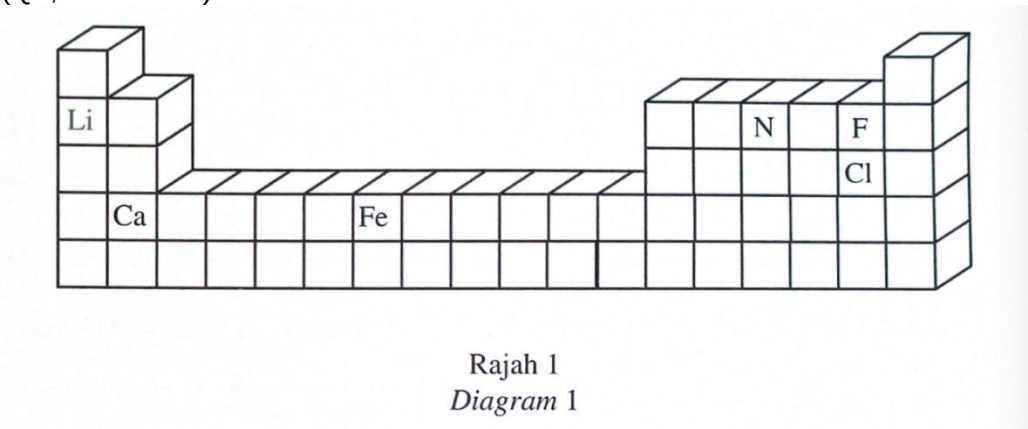


Rajah 2
Diagram 2

(a) Nyatakan bilangan elektron valens bagi unsur Kumpulan I.
State the number of valence electron of Group I elements.

.....[1]

1 (Q1, SPM 2022)



Rajah 1
Diagram 1

Berdasarkan Rajah 1,
Based on Diagram 1,

(a) Apakah prinsip asas yang digunakan dalam penyusunan unsur dalam Jadual Berkala Unsur?

What is the basic principle used in the arrangement of elements in Periodic Table of Elements?

.....[1]

(b) Nyatakan nama bagi unsur yang diwakili oleh simbol Ca.

State the name of the element represented by the symbol Ca.

.....[1]

(c) Susun unsur Li, N dan F mengikut saiz atom dalam tertib menaik.

Arrange the elements of Li, N and F according to atomic size in ascending order.

……[1]

(d) Tuliskan susunan electron bagi atom Cl.
Write the electron arrangement for atom Cl.

.....[1]

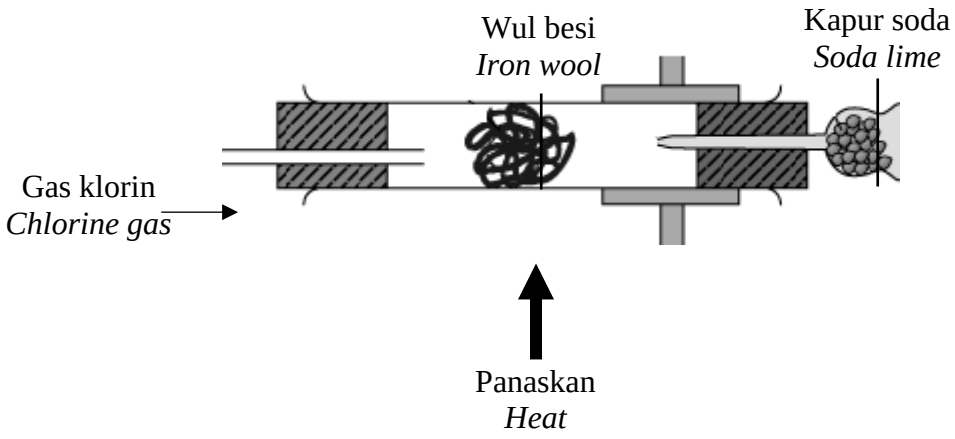
(e) Fe adalah logam peralihan.
Nyatakan satu sifat istimewa bagi logam peralihan.

Fe is a transition metal.
State one special characteristics of transition metal.

.....[1]

4 **(**Q4, SPMRSM 2021)

Rajah 4 menunjukkan susunan radas untuk mengkaji kereaktifan halogen terhadap wul besi panas.
Diagram 4 *shows the apparatus set-up to investigate the reactivity of halogens towards hot iron wool.*



Rajah 4
Diagram 4

(a) (i) Apakah warna gas klorin?
What is the colour of chlorine gas?

.....[1]

(ii) Tuliskan persamaan kimia bagi tindak balas antara gas klorin dan wul besi.
Write a chemical equation for the reaction between chlorine gas and iron wool.

.....[2]

(b) Bromin juga bertindak balas dengan wul besi panas tetapi kurang reaktif berbanding klorin. Terangkan.
Bromine also reacts with hot iron wool but less reactive than chlorine. Explain.

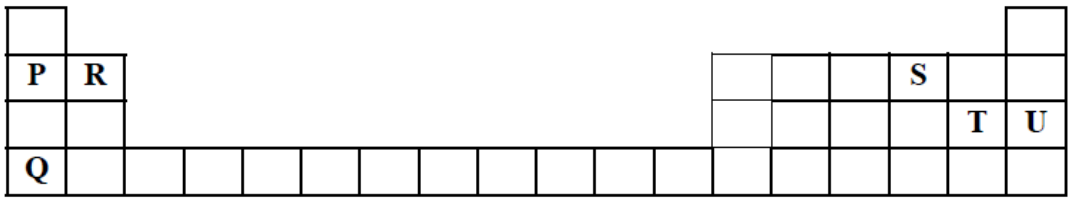
.....

.....

.....[3]

4 **(**Q4, SPMRSM 2022)

Rajah 4 menunjukkan sebahagian daripada Jadual Berkala Unsur.
Diagram 4 shows part of Periodic Table of Elements.



Rajah 4
Diagram 4

P, Q, R, S, T dan U tidak mewakili symbol sebenar unsur.
P, Q, R, S, T and U do not represent the actual symbols of the elements.

(a) Tuliskan susunan electron bagi ion T.
Write the electron arrangement of ion T.

.....[1]

(b) Nyatakan kedudukan unsur S dalam Jadual Berkala Unsur.
State the position of element S in the Periodic Table of Elements.

.....[1]

(c) Susun saiz atom bagi unsur-unsur diatas mengikut tertib menurun.
Arrange the atomic size of the elements in descending order.

.....[1]

(d) (i) Unsur manakah wujud sebagai gas monoatom?
Which element exists as monoatomic gas?

.....[1]

(ii) Terangkan jawapan anda di (d) (i).
Explain your answer in (d) (i).

.....[1]

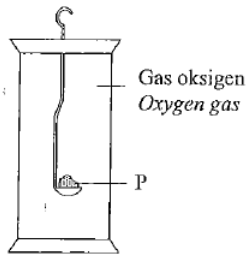
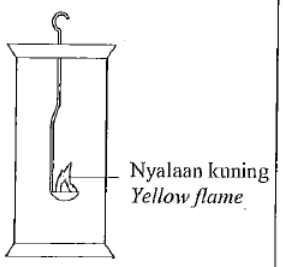
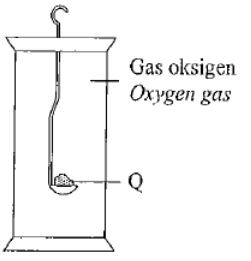
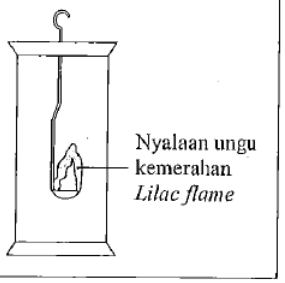
(e) Unsur P dan Q berada dalam kumpulan yang sama tetapi mempunyai kereaktifan yang berbeza apabila bertindakbalas dengan oksigen. Terangkan mengapa terdapat perbezaan kereaktifan antara kedua-dua unsur tersebut.
Elements P and Q located in the same group but have different reactivity when react with oxygen. Explain why there is a difference in reactivity between these elements.

.....

.....[2]

9 (Q9 (b), SBP 2022)

Jadual 9.1 menunjukkan pemerhatian apabila unsur P dan Q bertindak balas dengan oksigen untuk membentuk sebatian berbeza.
Table 9.1 shows the observations when elements P and Q react with oxygen gas to form different compounds.

Tindak balas *Reaction*	Susunan radas *Apparatus set-up*	Pemerhatian *Observation*
I		
II		

Jadual/ *Table* 9.1

(ii) Berdasarkan pemerhatian dalam Jadual 9.1, bandingkan kereaktifan unsur P dan unsur Q terhadap oksigen. Terangkan jawapan anda.
Based on the observation in Table 9.1, compare the reactivity of elent P dan Q towards oxygen. Explain your answer.

[5]

BAB 5 : IKATAN KIMIA

4 (Q4, SPM 2021)

Rajah 3 menunjukkan perwakilan piawai bagi atom natrium dan atom klorin.
Diagram 3 shows the standard representation for sodium atom and chlorine atom.

$^{23}_{11}Na$ $^{35}_{17}Cl$

Rajah 3
Diagram 3

(b) Natrium bertindak balas dengan klorin membentuk sebatian Q.
Sodium reacts with chlorine to form compound Q.

(i) Nyatakan jenis ikatan bagi sebatian Q.
State the type of bond in compound Q.

.....[1]

(ii) Nyatakan bagaimana ikatan di **4(b)(i)** terbentuk.
*State how is the bondin **4(b)(i)** formed.*

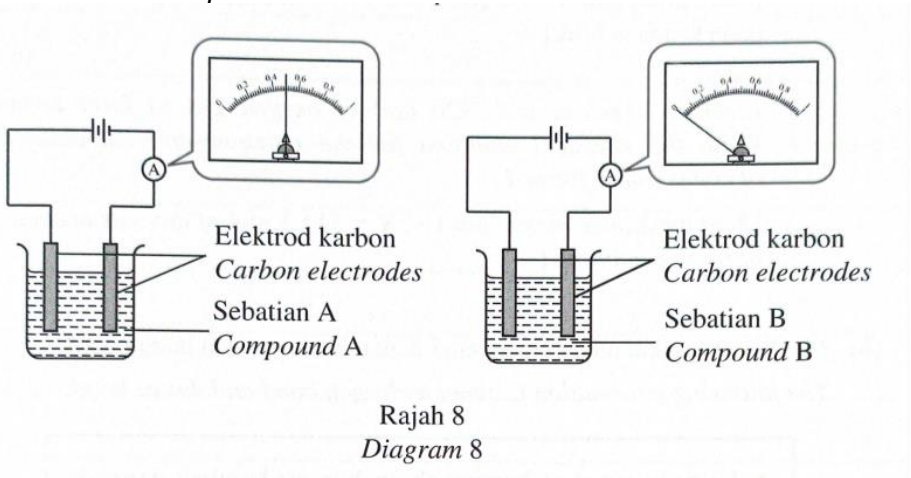
.....[1]

(iii) Tulis persamaan kimia bagi pembentukan sebatian Q.
Write the chemical equation for mation of compound Q.

.....[1]

10 (a) (Q10, SPM 2022)

Rajah 8 menunjukkan susunan radas dan pemerhatian bagi kekonduksian sebatian A dan sebatian B.
Diagram 8 shows the apparatus set up and observations for the conductivity of compound A and compound B.



Rajah 8
Diagram 8

(i) Jadual 5 menunjukkan maklumat bagi kedudukan unsur X, Y dan Z dalam Jadual Berkala Unsur.
Table 5 shows the information for the positions of elements X, Y and Z in the Periodic Table of Elements.

Kedudukan *Position* / **Unsur** *Element*	X	Y	Z
Kala *Period*	2	3	3
Kumpulan *Group*	14	2	17

Berdasarkan Rajah 8 dan Jadual 5, pilih unsur yang boleh bertindak balas untuk membentuk sebatian A dan sebatian B. Kenal pasti jenis ikatan dalam sebatian A dan sebatian B. Terangkan pembentukan ikatan dalam sebatian B dan tulis formula sebatian B.

[10 markah]

Based on Diagram 8 and Table 5, choose the elements that can react to form compound A and compound B. Identify the types of bond in compound A and compound B. Explain the formation of bond in compound B and write the formula of compound B.

[10 marks]

(b) Maklumat berikut adalah mengenai ikatan hydrogen dan ikatan datif.
The following information is about hydrogen bond and dative bond.

- Isi padu air akan bertambah apabila air berubah daripada keadaan cecair kepada pepejal kerana mengandungi ikatan hidrogen.

  Volume of water increases when water changes from liquid to solid due to the presence of hydrogen bond.

- Ion hidrogen daripada asid berpadu dengan molekul air untuk membentuk ion hidroksonium melalui ikatan datif.

  Hydrogen ion from the acid combines with water molecule to form hydroxonium ion via dative bond.

Berdasarkan pernyataan itu,
Based on the statement,

(i) Apakah yang dimaksudkan dengan ikatan hydrogen dan ikatan datif?
What is meant by hydrogen bond and dative bond?

……

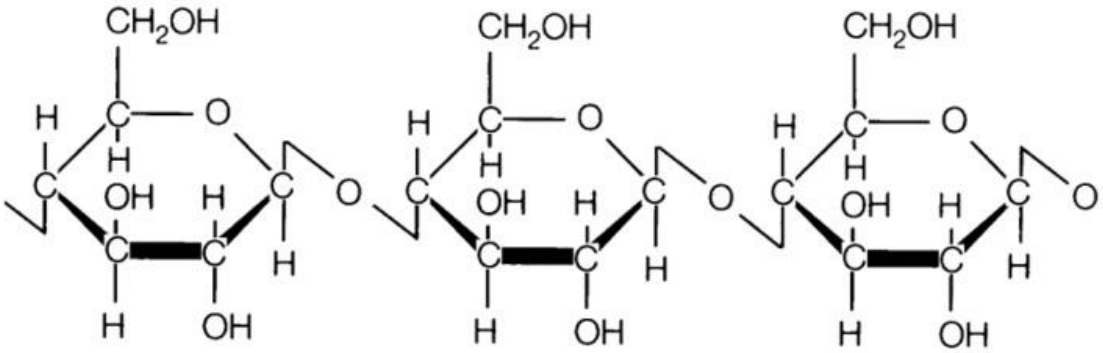
……...[2]

(ii) Lukis dan label
Draw and label

- Ikatan hydrogen antara molekul air, H_2O
  Hydrogen bond between water molecule, H_2O
- Struktur Lewis untuk menunjukkan ikatan datif dalam ion hidroksonium, H_3O^+
  Lewis structure to show dative bond in hydroxonium ion, H_3O^+

[4]

5 (Q5, SPMRSM 2021)
Jadual 5 menunjukkan nombor proton dan nombor nukleon bagi atom V, atom W dan atom X.
Table 5 shows the proton number and nucleon number of atoms V, W and X.



Rajah 5
Diagram 5

(a) (i) Selulosa boleh membentuk ikatan hidrogen dengan molekul air.
Apakah yang dimaksudkan dengan ikatan hidrogen?
Cellulose can form hydrogen bond with water molecules.
What is meant by hydrogen bond?

.....[1]

(ii) Namakan satu unsur di dalam selulosa yang boleh menghasilkan ikatan hidrogen dengan molekul air.
*Name **one** element in cellulose that can form hydrogen bond with water molecules.*

.....[1]

(b) Pakaian berasaskan kain kapas mengambil masa lebih lama untuk kering berbanding pakaian berasaskan gentian sintetik. Terangkan mengapa?

Cotton clothes take longer time to dry compared to synthetic fibre. Explain why?

.....

.....[2]

(c) Jadual 5 menunjukkan takat didih etanol, C_2H_5OH dan etana, C_2H_6.
Table 5 *shows the boiling point for ethanol,* C_2H_5OH *and ethane,* C_2H_6.

Sebatian ***Compound***	**Takat didih (ºC)** ***Boiling point* (ºC)**
Etanol, C_2H_5OH *Ethanol,* C_2H_5OH	78
Etana, C_2H_6 *Ethane,* C_2H_6	- 89

Jadual 5
Table 5

Etanol, C_2H_5OH dan etana, C_2H_6 merupakan sebatian kovalen.
Terangkan mengapa terdapat perbezaan takat didih kedua-dua sebatian tersebut.

Ethanol, C_2H_5OH *and ethane,* C_2H_6 *are covalent compounds.*
Explain the difference in their boiling point.

.....

.....[2]

(d) Pernyataan berikut adalah tentang ammonium klorida, NH_4Cl.

The following statements are about ammonium chloride, NH_4Cl*.*

- Ammonium klorida, NH_4Cl mengandungi ion ammonium, NH_4^+ dan ion klorida, Cl^-.
  Ammonium chloride, NH_4Cl *consists of ammonium ion,* NH_4^+ *and chloride ion,* Cl^-
- Ion ammonium mengandungi ikatan datif
  Ammonium ion consists of a dative bond.

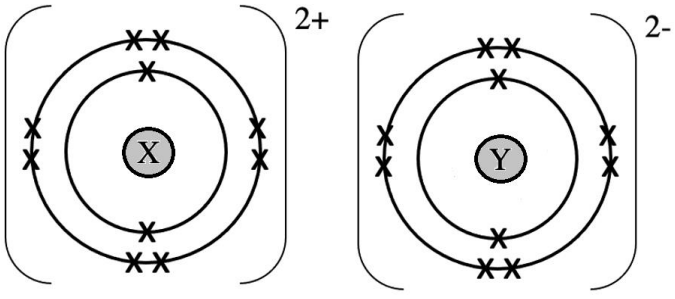
Berdasarkan pernyataan di atas, lukiskan ikatan datif dalam ion ammonium, NH_4^+.
[Nombor proton: H = 1; N =7]
Based on the statements above, draw the dative bond in the ammonium ion, NH_4^+.
[*Proton number*: H = 1; N =7]

[2]

6 (Q6, SPMRSM 2022)

Rajah 6 menunjukkan susunan elektron sebatian yang terbentuk daripada tindak balas bahan X dan Y.

Diagram 6 *shows an electron arrangement of compound formed from the reaction between substance* X *and* Y*.*



Rajah 6
Diagram 6

(a) (ii) Nyatakan jenis daya tarikan antara zarah-zarah dalam sebatian tersebut.
State the type of forces of attraction between particles in the compound.

.....[1]

(b) Puan Juriah meletakkan pepejal putih ke dalam almari untuk menghalau lipas. Sifat fizik pepejal putih itu adalah seperti berikut:
Puan Juriah puts a white solid in a cupboard to keep the cockroach away. The physical properties of the white solid are as follows:

- Tidak boleh mengalirkan arus elektrik dalam semua keadaan.
  Cannot conduct electricity in any states.
- Takat lebur dan takat didih yang rendah
  Low melting point and boiling point.

Berdasarkan maklumat tersebut, kenalpasti jenis sebatian pepejal putih itu dan terangkan ciri-ciri setiap satunya.

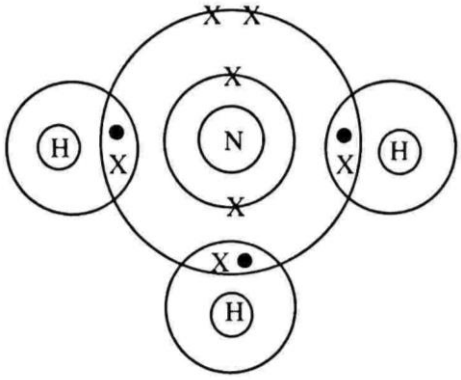
Based on the information, identify the type of compound of the white solid and explain each property.

.....

.....

.....[3]

2 (SBP 2021)
Rajah 2 menunjukkan susunan electron bagi gas A.
Diagram 2 shows the electron arrangement of gas A.



Rajah 2
Diagram 2

(b) Apakah tujuan pembentukan ikatan kimia?
What is the purpose of chemical bond of formation?

.....[1]

(c) Berdasarkan Rajah 2,
Based on Diagram 2,
(i) Nyatakan jenis ikatan kimia dalam gas A.
State the type of chemical bond in gas A.

.....[1]
(ii) Terangkan bagaimana ikatan kimia itu terbentuk.

Explain how the chemical bond is formed.

.....

..... [2]

5 (Q5, SBP 2022)
Jadual 5 menunjukkan nombor proton dan nombor nukleon bagi atom V, atom W dan atom X.
Table 5 shows the proton number and nucleon number of atoms V, W and X.

Atom	Nombor proton *Proton number*	Nombor nucleon *Nucleon number*
V	6	12
W	11	23
X	17	35

Jadual 5
Table 5

(c) Unsur W dan unsur X boleh bertindak balas untuk menghasilkan pepejal putih yang mempunyai takat lebur yang tinggi.
Element W and X can react to produce a while solid that has high melting point.

(i) Tuliskan persamaan kimia bagi tindak balas itu.
Write the chemical reaction for the reaction.

.....[2]

(d) Unsur V dan unsur X bertindak balas menghasilkan sebatian VX_4 yang mempunyai takat lebur yang rendah.
Terangkan perbezaan takat lebur bagi sebatian VX_4 dengan pepejal putih yang terbentuk dalam 5(c).
Element V and X react to produce compound VX_4 which has low melting point. Explain the difference in the melting point of compound VX_4 with the white solid produced in 5(c).

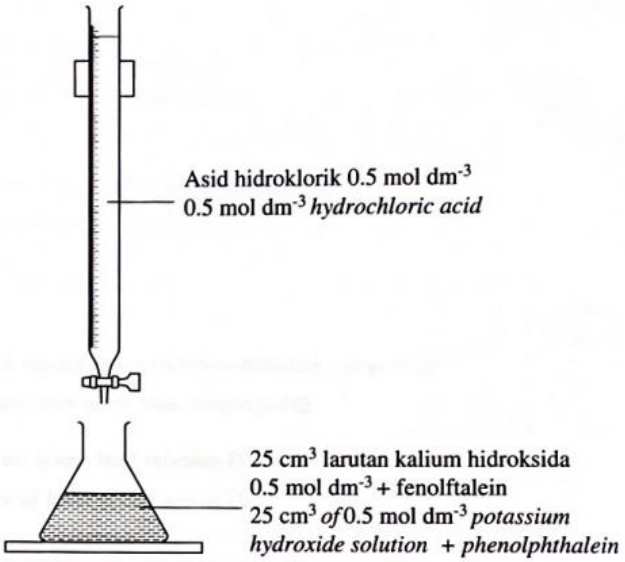
.....[2]

BAB 6 : ASID, BES DAN GARAM

1 (Q5, SPM 2021)

(a) Rajah 4.1 menunjukkan satu susunan radas untuk menentukan takat akhir pentitratan antara asid hidroklorik dan larutan kalium hidroksida dengan menggunakan fenolftalein sebagai penunjuk.

Diagram 4.1 shows an apparatus set-up to determine the end-point of titration between hydrochloric acid and potassium hydroxide solution by using phenolphthalein as an indicator



Rajah / *Diagram* 4.1

(i) Nyatakan maksud asid.
State the meaning of acid.

……...…[1]

(ii) Tuliskan persamaan kimia bagi tindak balas itu.
Write the chemical equation for the reaction.

…….[1]

(iii) Hitung isi padu asid yang diperlukan untuk meneutralkan larutan kalium hidroksida.
Calculate the volume of acid needed to neutralise the potassium hydroxide solution.

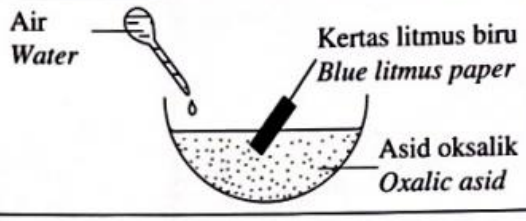
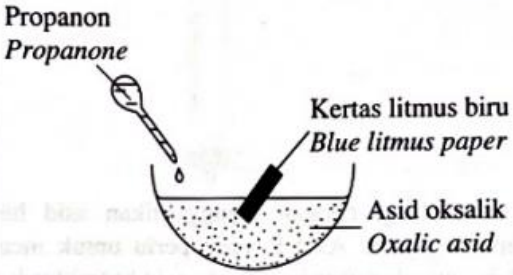
[2]

(iv) Eksperimen itu diulangi dengan menggantikan asid hidroklorik dengan asid P. Didapati isi padu asid P yang perlu untuk meneutralkan kalium hidroksida ialah separuh daripada isi padu asid hidroklorik yang digunakan.
Kenal pasti asid P.

The experiment is repeated by replacing hydrochloric acid with acid P. It was found that the volume of acid P needed to neutralise potassium hydroxide solution is half the volume of the hydrochloric acid used.
Identify acid P.

……..…….[1]

(b) Rajah 4.2 menunjukkan susunan radas yang digunakan dalam eksperimen untuk mengkaji sifat keasidan asid oksalik.
Diagram 4.2 shows the apparatus set-up used in experiment to study the acidic properties of oxalic acid.

Eksperimen *Experiment*	**Susunan radas** *Apparatus set-up*	**Pemerhatian** *Observation*
I		Kertas litmus biru bertukar merah *Blue litmus paper turns red*
II		Tiada perubahan *No change*

Rajah 4/ *Diagram* 4.2

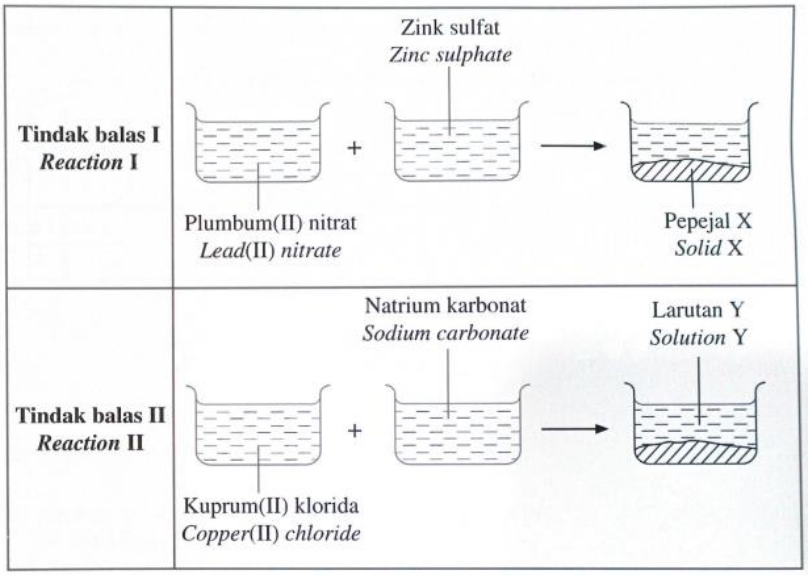
Terangkan perbezaan bagi pemerhatian antara Eksperimen I dengan Eksperimen II.
Explain the difference in the observation between Experiment I and Experiment II.

……

……..
[2]

2 (Q2, SPM 2022)

Rajah 2 menunjukkan maklumat berkaitan Tindak Balas I dan Tindak Balas II. Kedua-dua tindak balas menggunakan dua jenis garam terlarutkan untuk menghasilkan sejenis garam tak terlarutkan.
Diagram 2 shows information related to Reaction I and Reaction II. Both reactions use two types of soluble to form a type of insoluble salt.



Rajah / *Diagram* 2

(a) Nyatakan nama tindak balas bagi menyediakan garam tak terlarutkan itu.
State the name of reaction to prepare the insoluble salt.

……..
[1 markah]

(b) Tulis formula bagi kation dan anion dalam plumbum(II) nitrat, $Pb(NO_3)_2$.
Write the formula of the cation and anion in lead(II) *nitrate*, $Pb(NO_3)_2$.

Kation:
Cation ……..

Anion:
Anion ……..
[2 markah]

(b) Berdasarkan Rajah 2, kenal pasti;
Based on Diagram 2, identify;

Pepejal X:
Solid X ……..

Larutan Y:
Solution Y ……..
[2 markah]

3 (Q5, SBP 2021)

Jadual 5 menunjukkan larutan natrium hidroksida yang mempunyai kepekatan berbeza.
Table 5 *shows sodium hydroxide solution with different concentration.*

Larutan natrium hidroksida ***Sodium Hydroxide solution***	**Kepekatan (moldm^{-3})** ***Concentration*** **(moldm^{-3})**	**Nilai pH** ***pH value***
R	0.100	……
S	0.001	11.0

(a) Apakah pH?
What is pH value?

……...

[1 markah]

(b) Hitungkan nilai pH bagi larutan R.
Calculate the pH value for R.

[2 Markah/*marks*]

(c) (i) Bandingkan nilai pH bagi larutan R dan S.
Compare the pH value of R and S solutions.

.....

[1markah]

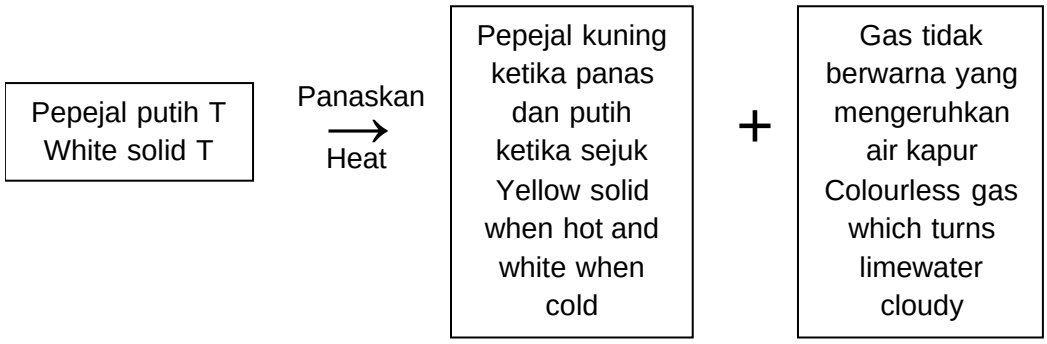
(ii) Terangkan jawapan anda di 5 (c)(i)
Explain your answer in 5 (c)(i)

……

……

[2 markah]

(c) Rajah 5 menunjukkan pemanasan pepejal T.
Diagram 5 *shows the heating of solid T.*



Rajah / *Diagram* 5

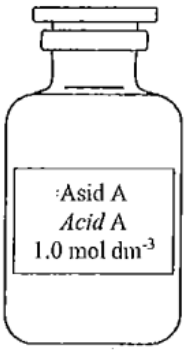
Tulis persamaan kimia bagi pemansan pepejal T.
Write the chemical equation for the heating of solid T.

……..
[2 markah]

4 (Q10, SBP 2022)

(a) Jadual 10.1 menunjukkan kepekatan dan nilai pH bagi dua jenis asid dengan kebesan yang sama.

Table 10.1 *shows the concentration and* pH *value for two types of acid with the same basicity.*

	
Nilai pH antara 3 hingga 7 pH *value between* 3 *to* 7	Nilai pH kurang daripada 3 pH *value less than* 3

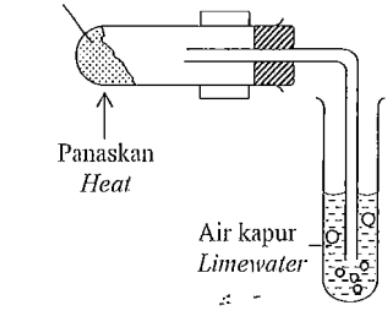
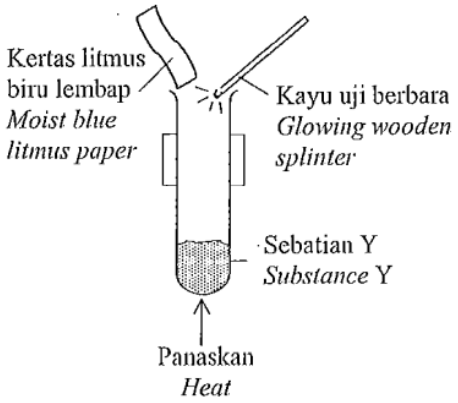
Jadual / *Table* 10.1

Apakah yang dimaksudkan dengan asid? Berdasarkan jadual 10.1, cadangkan asid A dan asid B dan terangkan perbezaan nilai pH bagi kedua-dua asid.
What is meant by acid? Based on Table 10.1*, suggest acid* A *and acid* B *and explain the difference in* pH *values of these two acids.*

[6 markah]

(b) Jadual 10.2 menunjukkan kesan pemanasan ke atas dua sebatian ion yang berbeza iaitu sebatian X dan Y. Sebatian-sebatian tersebut terdiri daripada kation yang sama. Pemanasan sebatian-sebatian tersebut menghasilkan pepejal yang berwarna kuning apabila panas dan bertukar putih apabila sejuk.

Table 10.2 *shows the effect of heat on two different ionic compound ionic compounds which are compound* X *and* Y. *The compounds consist of the same cation. Heating of the compounds produces yellow solid when hot and white solid when cold.*

Tindak balas I *Reaction* **I**	**Tindak balas II** *Reaction* **II**
Sebatian X *Compound* X  	
Gas tidak berwarna P terbebas *Colourless gas* P *is released*	Gas tidak berwarna Q dan gas berwarna perang R terbebas *Colourless gas* Q *and brown gas* R *are released*

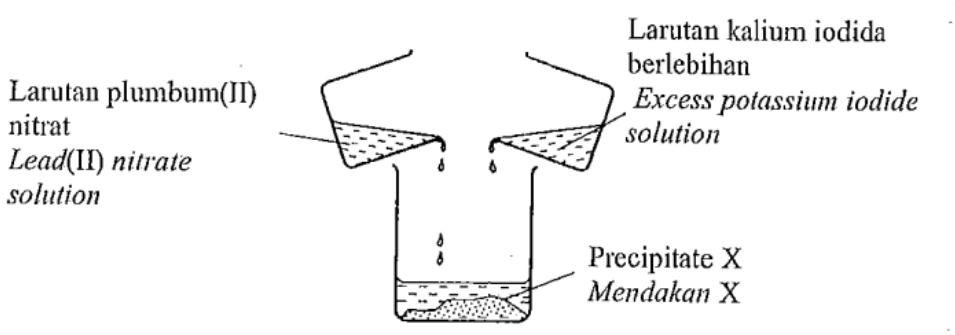
Jadual / *Table* 10.2

Tulis formula kimia bagi sebatian X dan sebatian Y. Nyatakan nama bagi gas P, gas Q dan gas R yang dibebaskan dengan Tindak balas I dan II. Cadangkan bahan tindak balas untuk menghasilkan sebatian X. Tulis persamaan kimia bagi Tindak balas II.

Write chemical formula for compound X *and* Y. *State the name of gas* P, Q *and* R *released in Reaction* I *and* II. *Suggest reactants to produce compound* X. *Write a chemical equation for Reaction* II.

[9 markah]

(c) Rajah 10 menunjukkan susunan radas untuk menghasilkan garam tak terlarutkan.
Diagram 10 shows the apparatus set-up to produce an insoluble salt.



Rajah / *Diagram* 10

Namakan tindak balas bagi menghasilkan garam tak terlarutkan.
Berdasarkan Rajah 10, tuliskan persamaan ion untuk menunjukkan pembentukan mendakan X.
Jika 0.05 mol plumbum(II) nitrat bertindak balas dengan larutan kalium iodide berlebihan, hitungkan jisim mendakan X.

Name the reaction to produce insoluble salt.
Based on Diagram 10*, write an ionic equation to show the formation of precipitate* X*.*
If 0.05 mol of lead(II) nitrate reacts with excess potassium iodide solution, calculate the mass of precipitate X.
[Jisim atom relative: I = 127, Pb = 207]
[*Relative atomic mass*: I = 127, Pb = 207]

[5 markah]

5 (Q9, SPMRSM 2021)

(a) Akif ditugaskan oleh gurunya untuk menyediakan suatu hablur garam.
Rajah 9.1 menunjukkan maklumat tentang tugasan yang perlu diselesaikan.

Akif was assigned by his teacher to prepare a salt crystal.
Diagram 9.1 *shows the information about the assignment that need to be completed.*

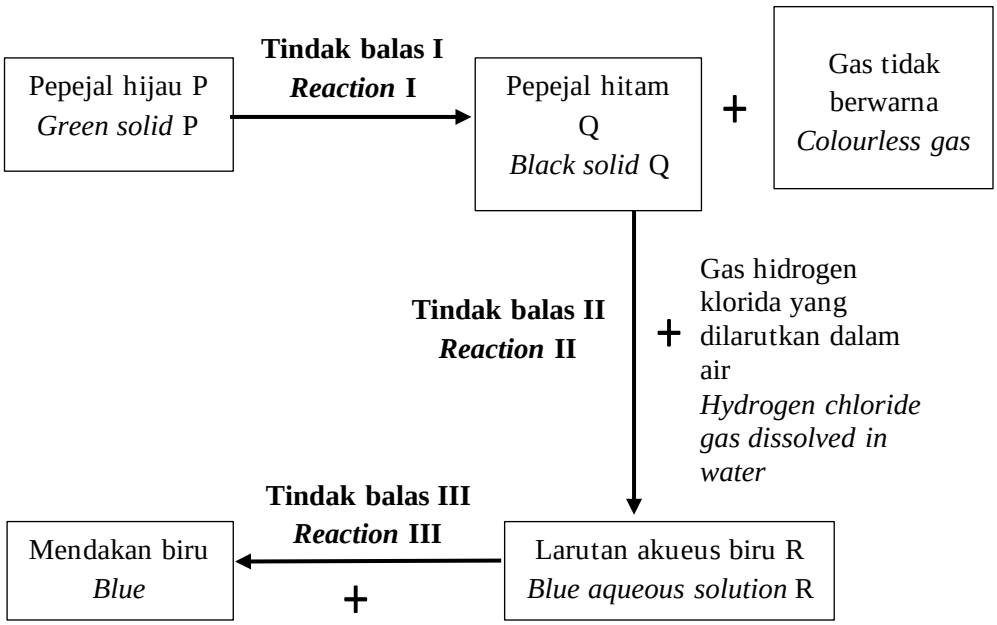
Rajah / *Diagram* 9.1

Cadangkan bahan yang sesuai digunakan untuk menyediakan garam Y. Tuliskan persamaan kimia bagi penguraian garam tersebut apabila dipanaskan.

Suggest suitable substances that can be used to prepare salt Y*.*
Write the chemical equation for the decomposition of the salt when heated.

[4 markah]

(b) Rajah 9.2 menunjukkan satu siri tindak balas yang melibatkan garam P.
Diagram 9.2 *shows a series of reactions involving salt* P.



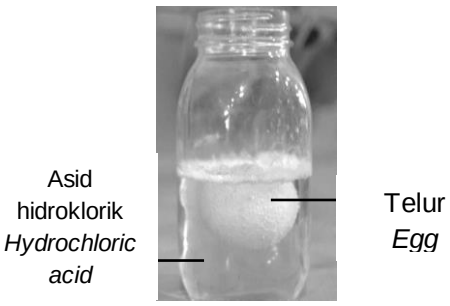
Beberapa titis larutan natrium hidroksida sehingga berlebihan
A few drops of sodium hydroxide solution until excess

Rajah / *Diagram* 9.2

Berdasarkan Rajah 9.2, nyatakan nama bagi pepejal P dan larutan akueus R. Huraikan secara ringkas bagaimana untuk mengesahkan kehadiran anion dalam larutan akueus R.
Based on Diagram 9.2*, state the name of solid* P *and aqueous solution* R*. Describe briefly how to confirm the presence of anion in aqueous solution* R.

[5 markah]

(c) Rajah 9.3 menunjukkan sebiji telur yang dimasukkan ke dalam sebuah bekas mengandungi asid hidroklorik.
Diagram 9.3 *shows an egg that has been put into a container containing hydrochloric acid.*



Rajah / *Diagram* 9.3

J merupakan sebatian utama dalam kulit telur yang bertindak balas dengan asid hidroklorik untuk menghasilkan air, sebatian L dan gas M. Namakan tindak balas kimia bagi penghasilan sebatian J. Kenal pasti sebatian L dan gas M.

J is the main compound in the eggshell which react with hydrochloric acid to produce water, compound L *and gas* M*. Name the chemical reaction for the formation of compound* J*. Identify compound* L *and gas* M*.* [3 markah]

(d) Rajah 9.4 menunjukkan pepejal natrium hidroksida, NaOH.
Diagram 9.4 *shows sodium hydroxide,* NaOH *pellet.*

Rajah / *Diagram* 9.4

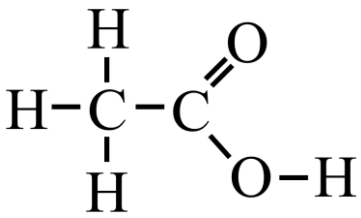
X g pepejal natrium hidroksida, NaOH dilarutkan dalam air suling untuk menyediakan 50 cm^3 larutan berkepekatan 0.5 mol dm^{-3} dengan nilai pH 13.7. Hitungkan nilai X dan isipadu air suling yang perlu ditambahkan ke dalam larutan tersebut bagi menghasilkan larutan baharu yang berkepekatan 0.1 mol dm^{-3}. Apakah nilai pH larutan natrium hidroksida, NaOH yang telah dicairkan dan terangkan perbezaan nilai pH kedua-dua larutan? [Jisim molar NaOH = 40 g mol^{-1}]

X g *of solid sodium hydroxide,* NaOH *is dissolved in distilled water to prepare* 50 cm^3 *of* 0.5 mol dm^{-3} *solution with the* pH *value of* 13.7. *Calculate the value of* X *and the volume of distilled water need to be added into the solution to form a new solution with the concentration of* 0.1 mol dm^{-3}*. What is the* pH *value of the diluted sodium hydroxide,* NaOH *solution and explain the difference in the* pH *value for both solutions?* [*Molar mass of* NaOH = 40 g mol^{-1}]

[8 marks]

6 (Q11, SPMRSM 2022)

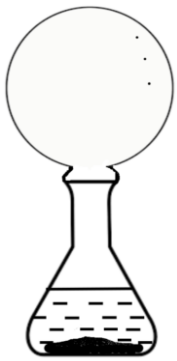
Rajah 11.1 menunjukkan formula struktur bagi asid etanoik.
Diagram 11.1 shows *the structural formula of ethanoic acid.*



Rajah / *Diagram* 11.1

(a) (i) Nyatakan kebesan asid etanoik dan terangkan.
State the basicity of ethanoic acid and explain.

[2 markah]

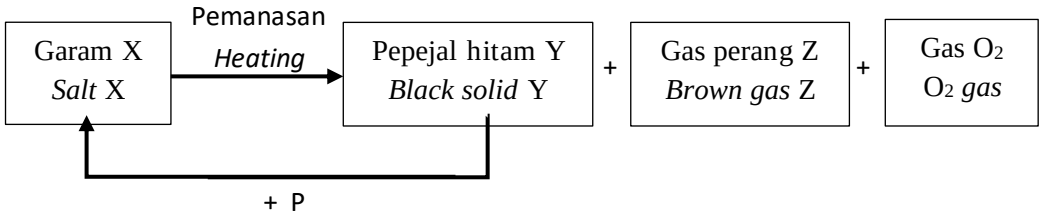
Eksperimen I ***Experiment* I**	**Eksperimen II** ***Experiment* II**
 Asid etanoik glasial, CH_3COOH + Kalsium karbonat, $CaCO_3$ *Glacial ethanoic acid,* CH_3COOH + *Calcium carbonate,* $CaCO_3$	 Larutan asid etanoik, CH_3COOH + Kalsium karbonat, $CaCO_3$ *Ethanoic acid solution,* CH_3COOH + *Calcium carbonate,* $CaCO_3$

Rajah / *Diagram* 11.2

(ii) Berdasarkan Rajah 11.2, terangkan perbezaan pemerhatian antara eksperimen I dan II.
Based on Diagram 11.2*, explain the differences in the observation between experiment* I *and* II*.*

[3 marks]

(b) Rajah 11.3 menunjukkan satu carta alir tindak balas yang berlaku ke atas garam X.
Diagram 11.3 *shows a flow chart of reaction that occurs on salt* X.



Rajah 11.3
Diagram 11.3

(i) Berdasarkan Rajah 11.3, garam X boleh disediakan daripada tindak balas antara pepejal hitam Y dan bahan P. Kenalpasti garam X, pepejal hitam Y, gas perang Z dan namakan bahan P.

Based on Diagram 11.3*, salt* X *can be prepared by the reaction between black solid* Y *and substance* P. *Identify salt* X*, black solid* Y, *brown gas* Z *and name substance* P*.*

[4 marks]

(ii) 9.4 g garam X dipanaskan dan menghasilkan bahan Y, gas Z dan gas oksigen. Tuliskan persamaan kimia bagi tindak balas tersebut dan kira isipadu gas Z yang terhasil pada keadaan bilik.
[Jisim molar X=188 g mol^{-1}; 1 mol gas menempati 24 dm^3 pada keadaan bilik]

9.4 g *of* X *salt is heated and produced substance* Y, Z *gas and oxygen gas. Write the chemical equation for the reaction and calculate the volume of* Z *gas produced at room condition.*
[*Molar mass of* X=188 g mol^{-1}; 1 mol *of gas occupies* 24 dm^3 *at room conditions*]

[5 marks]

(c) Rajah 11.4 menunjukkan artikel mengenai penggunaan asid sulfurik dalam proses perlombongan logam.

Diagram 11.4 *shows an article about the usage of sulphuric acid in the process of metal mining.*

> Dalam perlombongan logam, asid sulfurik digunakan untuk melarutkan mineral kuprum(II) oksida. Kuprum akan diekstrak daripada kuprum(II) sulfat. Asid sulfurik yang berlebihan perlu dirawat sebelum dilepaskan sebagai sisa buangan kilang.
>
> *In metal mining, sulphuric acid is used to leach copper*(II) *oxide minerals. Copper will be extracted from copper*(II) *sulphate. Excess sulphuric acid needs to be treated before it is discharged as the waste from the factory.*

Rajah / *Diagram* 11.4

Dengan menggunakan pengetahuan anda tentang sifat kimia asid, cadangkan bahan kimia yang digunakan untuk merawat sisa bahan buangan tersebut dan namakan tindak balas yang terlibat.
Tuliskan persamaan ion untuk mewakili tindak balas yang berlaku dan huraikan satu ujian kimia untuk menentusahkan ketidakhadiran asid di dalam sisa buangan.

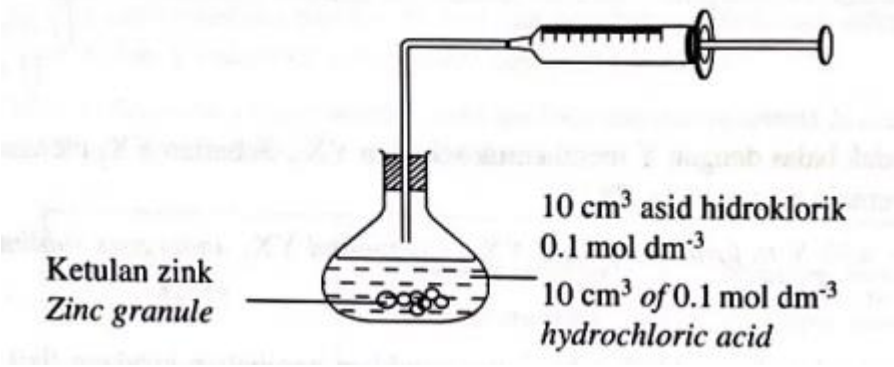
By using your knowledge on chemical properties of acid, suggest a chemical substance used to treat the waste and name the reaction involved.
Include an ionic equation to represent the reaction occurred and describe a chemical test to verify the absence of acid in the waste.

[6 marks]

BAB 7: KADAR TINDK BALAS

1 (Q2, SPM 2021)

Rajah 1.1 menunjukkan susunan radas bagi sate eksperimen untuk mengkaji kadar tindak balas antara 10 cm^3 acid hidroklorik 0.1 mol dm^{-3} dengan ketulan zink berlebihan.
Diagram 1.1 shows the apparatus set-up for an experiment to study the rate of reaction between 10 cm^3 of 0.1 mol dm^{-3} hydrochloric acid with excess zinc granules.



Rajah / *Diagram 1.1*

Jadual 2 menunjukkan isi padu gas yang terkumpul pada setiap sela masa 1 minit apabila 1 cm^3 larutan kuprum(11) sulfat 0.1 mol dm^{-3} ditambah dalam eksperimen ini. *Table 2 shows the volume of gas collected at 1 minute intervals when 1 cm^3 of 0.1 mol dm^{-3} copper(II) sulphate solution is added in this experiment.*

Masa (min) *Time (min)*	0.0	1.0	2.0	3.0	4.0	5.0
Isi padu gas (cm^3) Volume of gas (cm^3)	0.0	11.2	15.8	18.0	18.0	18.0

Jadual / *Table 2*

(a) Apakah fungsi kuprum(II) sulfat dalam eksperimen ini?
What is the function of copper(II) sulphate in this experiment?

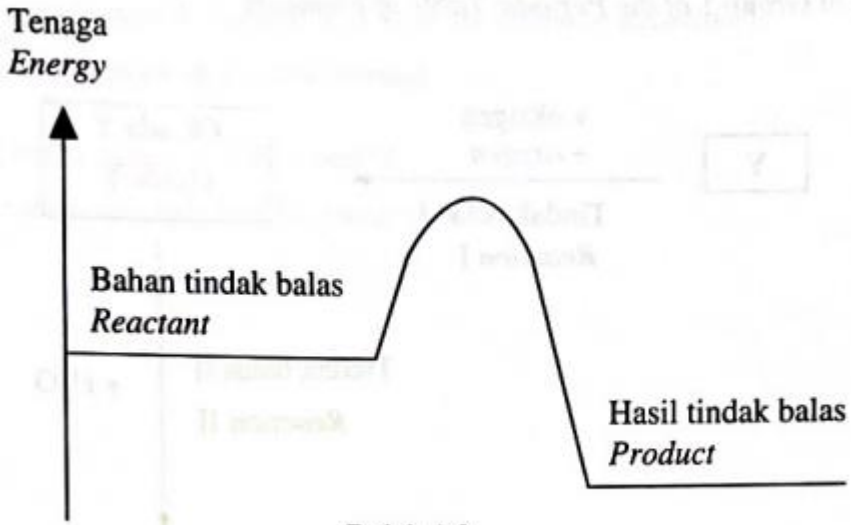
……
[1 markah/1 marks]

(b) Nyatakan isi padu gas yang terkumpul apabila kepekatan kuprum(II) sulfat 0.1 mol dm^{-3} yang digunakan dalam eksperimen ini digantikan dengan larutan kuprum (II) sulfat 0.5 mol dm^{-3}
State the volume of gas collected when the concentration of 0.1 mol dm^{-3} copper(II) sulphate solution used in this experiment is replaced by 0.5 mol dm^{-3} copper (II) sulphate

……
[1 markah/1 marks]

(c) Rajah 1.2 menunjukkan gambar rajah profil tenaga bagi tindak balas dalam eksperimen ini

Diagram 1.2 shows the energy profile diagram for the reaction in this experiment.



Rajah 1.2
Diagram 1.2

Menggunakan paksi yang sama dalam Rajah 1.2, lakarkan lengkungan profil tenaga apabila kuprum (II) sulfat tidak ditambah dalam eksperimen itu.
By using the same axis in Diagram 1.2, sketch the curve of energy profile when copper(II)sulphate is not added in the experiment.

……
…….....

[1 markah/1 marks]

(d) Tindakbalas antara zink dengan asid hidroklorik berlaku apabila zarah bahan tindak balas berlanggar antara satu sama lain. Hanya perlanggaran berkesan akan menghasilkan hasil tindak balas

Reaction between zinc and hydrochloric acid occurred when the particles of reactant collide with each other. Only effective collision will produce products.

Nyatakan dua keadaan yang diperlukan untuk perlanggaran berkesan berlaku.
State two conditions needed for an effective to occur.

1. ……

2. ……

[2 markah/*2 markah*]

2 (a) (Q8, SPM 2022)

Jadual 4 menunjukkan maklumat bagi dua set eksperimen yang telah dijalankan untuk menyiasat faktor yang mempengaruhi kadar tindak balas.
Table 4 shows the information of two sets of experiments that were conducted to investigate the factor that affects the rate of reaction.

Set	Bahan tindak balas *Reactant*	Suhu (°C) *Temperature (°C)*
I	Serbuk zink berlebihan + 50 cm^3 asid hidroklorik 0.1 mol dm^{-3} *Excess zinc powder + 50 cm^3 of 0.1 mol dm^{-3} hydrochloric acid*	40
II	Serbuk zink berlebihan + 50 cm^3 asid hidroklorik 0.1 mol dm^{-3} *Excess zinc powder + 50 cm^3 of 0.1 mol dm^{-3} hydrochloric acid*	50

Jadual /*Table 4*

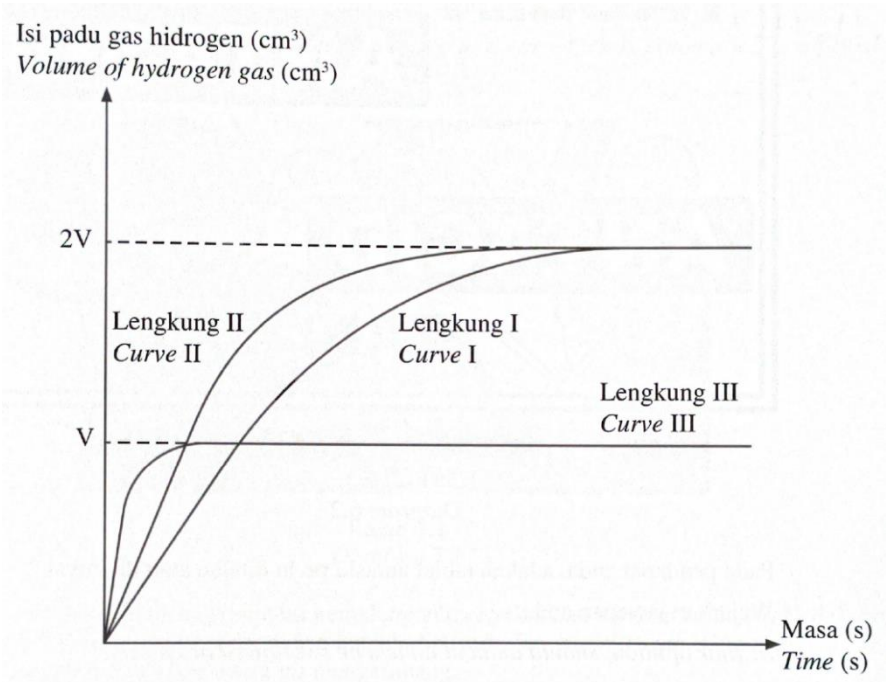
Berdasarkan Jadual 4,
Based on Table 4,

(i) kenal pasti faktor yang mempengaruhi kadar tindak balas.
identify the factor that affects the rate of reaction.

……...

[1 markah]
[*1 mark*]

(b) Berdasarkan maklumat pada Jadual 4, keputusan eksperimen ditunjukkan dalam Rajah 6.1 melalui lengkung I dan lengkung **II**, manakala lengkung **III** diperoleh apabila eksperimen diulang.
*Based on the information in Table 4, the results of the experiment are shown in Diagram 6.1 through curves I and **II**, whereas curve **III** is obtained when the experiment is repeated.*



Rajah / *Diagram 6.1*

Berdasarkan Rajah 6.1, terangkan bagaimana lengkung III diperoleh tanpa mengubah bahan tindak balas.
Based on Diagram 6.1, explain how curve III is obtained without changing the reactants.

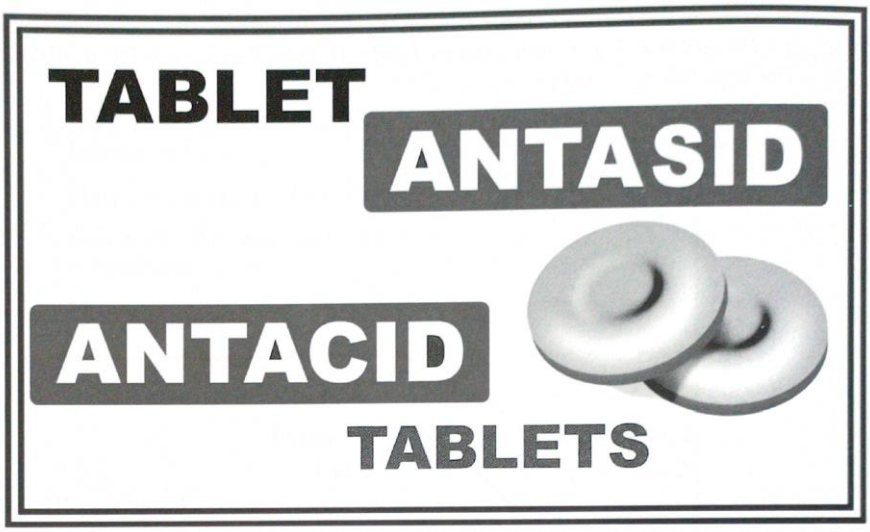
.....

.....

.....

[2 markah]
[*2 marks*]

(c) Rajah 6.2 menunjukkan tablet antacid yang digunakan untuk merawat gastrik.
Diagram 6.2 shows antacid tablet used to treat gastric.



Rajah / *Diagram 6.2*

Pada pendapat anda, adakah tablet antacid perlu ditelan atau dikunyah? Wajarkah jawapan anda.
In your opinion, should antacid tablets be swallowed or chewed? Justify your answer.

.....

.....

.....

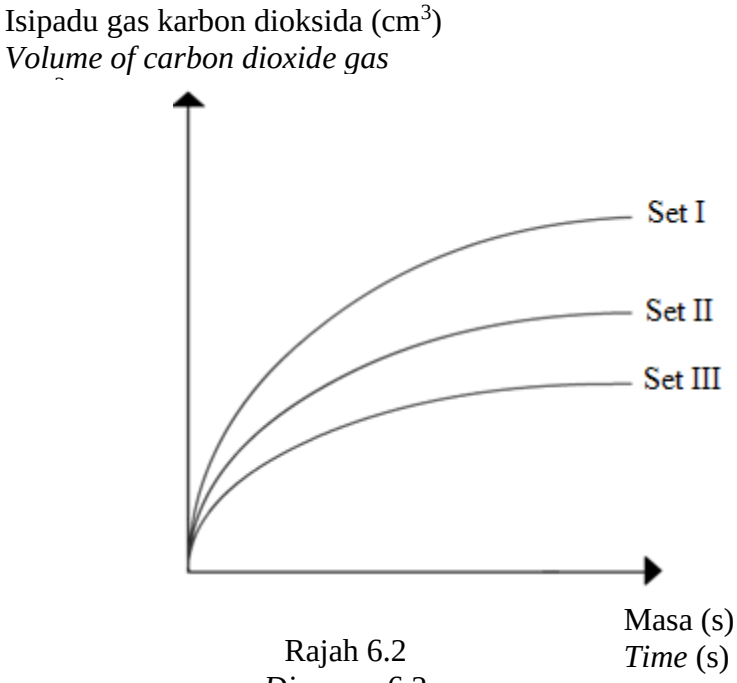
.....

[3 markah]
[3 *marks*]

3 (Q6, SPMRSM 2021)

(b) Tiga set eksperimen telah dijalankan untuk mengkaji kesan kepekatan terhadap kadar tindak balas antara asid hidroklorik dengan serbuk magnesium karbonat berlebihan.
Rajah 6.2 menunjukkan lengkung graf isipadu gas karbon dioksida melawan masa yang diperoleh daripada tiga set eksperimen itu, Set I, Set II dan Set III.

Three sets of experiment are carried out to study the effect of concentration on the rate of reaction between hydrochloric acid on with excess magnesium carbonate powder.
Diagram 6.2 *shows the curves of the graph of volume of carbon dioxide gas against time obtained from the three sets of experiment, Set* I, *Set* II *and Set* III.



Rajah 6.2
Diagram 6.2

Berdasarkan Rajah 6.2,
Based on Diagram 6.2,

(ii) Set eksperimen manakah yang menggunakan kepekatan asid hidroklorik paling tinggi?
Terangkan jawapan anda.
Which set of experiment used the highest concentration of hydrochloric acid?
Explain your answer
……..

……...
[2 marks]

4 (a) (ii) **(Q9, SPMRSM 2022)**

Pil antasid mengandungi kalsium karbonat. Jadual 9 menunjukkan isipadu gas yang terkumpul melawan masa untuk tindak balas di antara pil antasid dengan asid hidroklorik. Set I dan Set II menggunakan pil antasid dengan saiz yang berbeza.
The antacid tablets contain calcium carbonate. Table 9 shows the volume of gas collected against time for the reaction between antacid tablets with hydrochloric acid. Set I and Set II use the different size of antacid tablets.

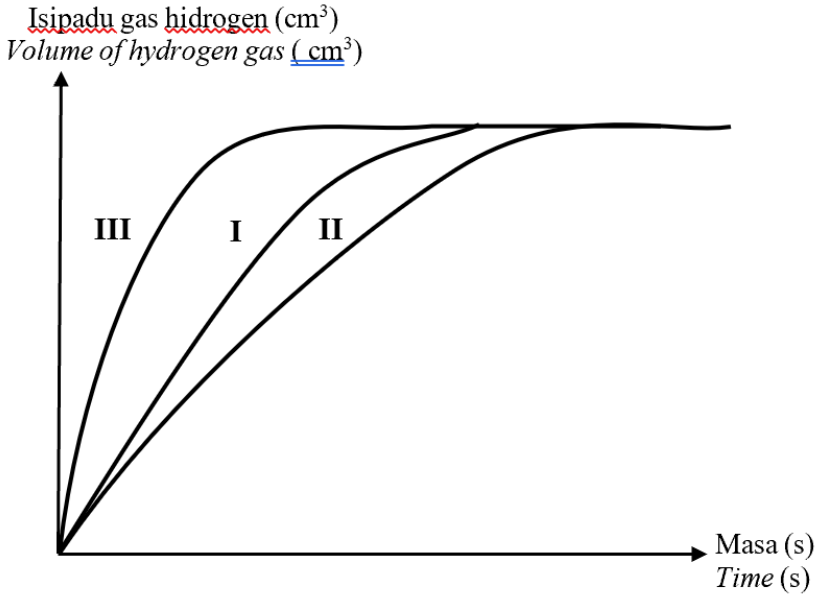
Set	**Masa (min)** ***Time*** **(min)**	**0**	**1**	**2**	**3**	**4**	**5**
I	Isipadu gas terhasil(cm^3) *Volume of gas evolved* (cm^3)	0.00	31.00	48.00	48.00	48.00	48.00
II	Isipadu gas terhasil (cm^3) *Volume of gas evolved* (cm^3)	0.00	38.00	54.00	67.00	72.00	72.00

Jadual / *Table 9*

Hitungkan kadar tindak balas purata bagi Set I dan Set II.
Calculate the average rate of reaction for Set I and Set II.

[2 markah]
[*2 marks*]

(b) Rajah 9.2 menunjukkan graf isipadu gas yang terhasil melawan masa bagi tiga set eksperimen untuk menyiasat faktor-faktor yang mempengaruhi kadar tindak balas antara zink dan asid nitrik.
Diagram 9.2 shows the graph of volume of gas released against time for three sets of experiments to investigate the factors affecting rate of reaction between zinc and nitric acid.



Rajah 9.2
Diagrm 9.2

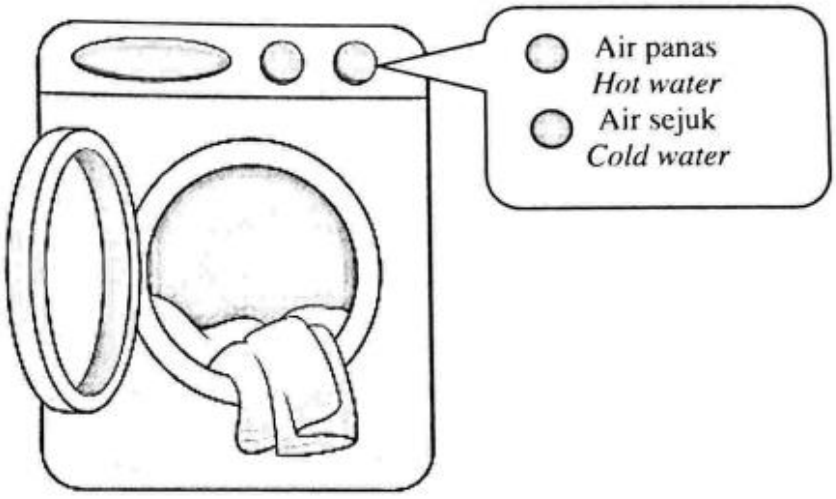
Serbuk zink berlebihan ditambah ke dalam 25 cm3 asid nitrik 0.2 mol dm-3 pada 30 ºC dalam Set I. Cadangkan perubahan yang boleh dilakukan selain dari kepekatan asid nitrik dan suhu pada Set I untuk mendapatkan lengkung seperti dalam Set II dan Set III.
Terangkan kedua-dua cadangan anda berdasarkan teori perlanggaran.
Excess zinc powder is added to 25 cm3 of 0.2 mol dm-3 nitric acid at 30 ºC in Set I. Suggest changes that can be done to Set I other than the concentration of nitric acid and temperature to obtain the curve as shown in Set II and Set III.
Explain both of your suggestions based on the collision theory.

[10 markah]
[*10 marks*]

5 (Q9, SBP 2021)

(a) Rajah 9 menunjukkan dua pilihan suhu air yang terdapat pada mesin basuh di kedai dobi.

Diagram 9 shows two water temperature options available on the washing machine in the laundry mart.



Rajah / *Diagram* 6.2

Berdasarkan Rajah 6.2,
Based on Diagram 6.2,

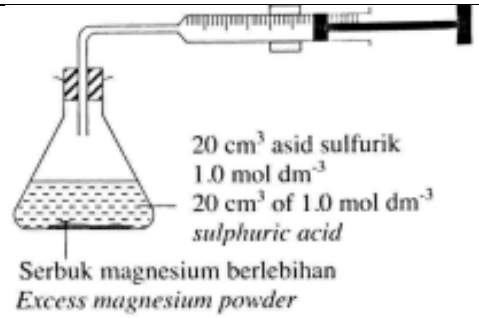
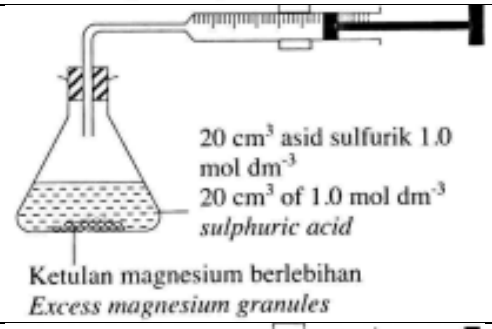
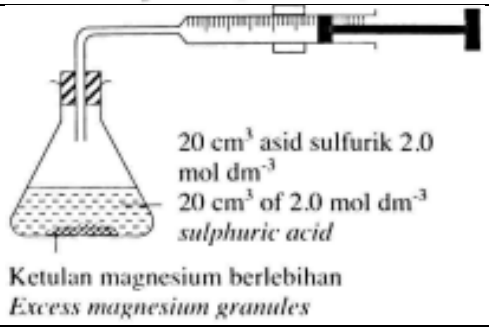
(i) Berdasarkan Rajah 9, pilihan suhu air yang manakah dapat membersih pakaian dengan lebih cepat? Terangkan jawapan anda
Based on Diagram 9, which water temperature option can clean clothes faster? Explain your answer

[3 marks]

(ii) Nyatakan dua factor yang dapat mempengaruhi kadar tindak balas selain daripada suhu.
State two factors that can affect the rate of reaction other than temperature.

[2 markah/2 marks]

(b) Seorang pelajar menjalankan tiga set eksperimen untuk mengkaji factor yang mempengaruhi kadar tindak balas antara magnesium and asid sulfurik.
Jadual 9 menunjukkan masa yang diambil untuk mengumpul 30cm^3 gas yang terbebas bagi ketiga-tiga set eksperimen itu.
A student carried out three sets experiment to investigate factors that affect the rate of reaction between magnesium and sulphuric acid.
Table 9 shows the time taken collect 30cm3 of gas released for the three sets of experiment.

Set		Masa yang diambil untuk mengumpul 30 cm^3 gas (s) *Time taken to collect 30 cm^{3}of gas (s)*
1		55
2		90
3		45

Jadual /*Table 9*

Based on Table 9,
Berdasarkan Jadual 9,

(i) Tuliskan persamaan kimia bagi tindak balas dalam Set III.
Hitungkan isi padu maksimum gas yang terbebaas.
[Isi padu molar pada keaadaan bilik = 24 dm^3 mol^{-1}]

Write the chemical equation for the reaction in Set III
Calculate the maximum volume of the gas released.
[Molar volume at room conditions = 24 dm^3 mol^{-1}]

[5 markah/*5 marks]*

(ii) Bandingkan kadar tindak balas antara:
Compare the rate of reaction between:

- Set I dan Set II
  Set I and Set II

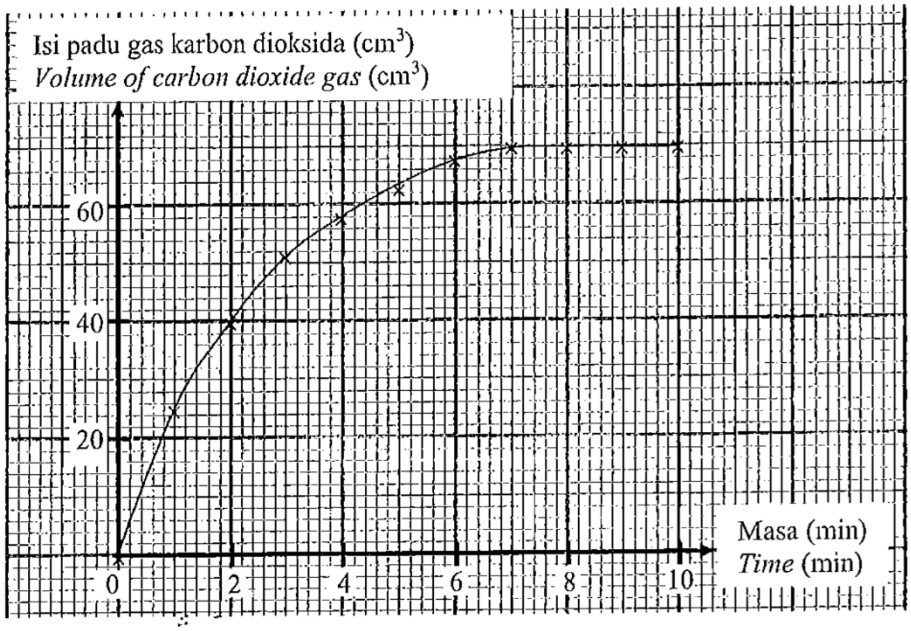
- Set II dan Set III
  Set I and Set III

Terangkan jawapan anda berdasarkan Teori Perlanggaran.
Explain your answer based on the Collision Theory

[10 markah/10 marks]

6 **(Q6, SBP 2022)**

Rajah 6 menunjuldcan graf isi padu gas karbon dioksida melawan masa bagi tindak balas antara serbuk magnesium karbonat berlebihan dengan 50 cm3 asid sulfurik 1.0 mol din 3.
Diagram 6 shows a graph of volume of carbon dioxide gas against time for a reaction between excess magnesium carbonate powder and 50 cm3 of 1.0 mol dm-3 sulphuric acid.



Rajah / *Diagram 6*

(a) Nyatakan jenis zarah dalam magnesium karbonat.
State the type of particle in magnesium carbonate.

.....

[1 markah]
[*1 mark*]

(b) Tuliskan per samaan kimia bagi tindak balas itu.
Write the chemical equation for the reaction.

.....

[2 markah]
[*2 marks*]

(c) Berdasarkan Rajah 6,
Based on Diagram 6,

(i) Mengapakah lengkung pada graf mendatar selepas 7 minit?
Why is the curve in the graph becomes horizontal after 7 minutes?

.....

[1 markah]
[1 *mark*]

(ii) Hitung kadar tindak balas pada minit kedua.
Calculate the rate of reaction at the second minute.

[2 markah]
[*2 marks*]

(d) Jadual 6 menunjukkan maklumat bagi dua set eksperimen untuk menyiasat faktor yang mempengaruhi kadar tindak balas antara kalsium karbonat dengan asid
Table 6 shows the information for two sets of experiment to investigate factor affecting the rate of reaction between calcium carbonate and nitric acid.

Set	Bahan tindak balas *Reactants*	Masa yang diambil untuk mengumpulkan 30cm3 gas karbon dioksida (s) *Time taken to collect 30cm^3 of carbon dioxide gas (s)*
I	5 g serbuk kalsium karbonat 5 g calcium carbonate powder + 50 cm^3 asid nitric 1.0 mol dm^{-3} 50 cm^3 of 1.0 mol dm^{-3} nitric acid	32
II	5 g serbuk kalsium karbonat 5 g calcium carbonate powder + 25 cm^3 asid nitric 2.0 mol dm^{-3} 25 cm^3 of 2.0 mol dm^{-3} nitric acid	20

Jadual 6
Table 6

Berdasarkan maklumat dalam Jadual 6, bandingkan kadar tindak balas antara Set dan Set II.
Terangkan jawapan anda dengan meuggunakan teori perlanggaran.
Based on Table 6, compare the rate of reaction between Set I and Set IL Explain your answer by using the collision theory.

.....

.....

.....

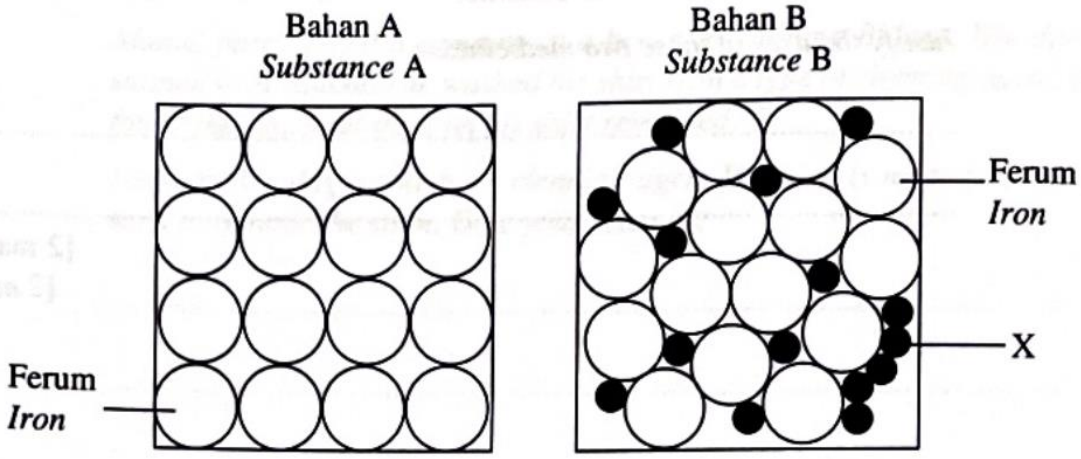
.....

[3 markah/3 *marks*]

BAB 8: BAHAN BUATAN DALAM INDUSTRI

1 (Q8, SPM 2021)

Rajah 5 menuniukkan dua jenis bahan yang sering digunakan dalam pembinaan bangunan tinggi.
Diagram 5 shows two types of substances that are frequently used in the construction of high rise building.



Rajah 5
Diagram 5

Berdasarkan Rajah 5,
Based on Diagram 5,

(i) apakah bahan X?
what is substance X?

.....
[1 markah]
[1 *mark*]

(ii) dalam pembinaan bangunan tinggi, bahan B lebih banyak digunakan dalam industri pembinaan. Berikan sebab anda.
in the construction of high rise buldings, substance B *is used more in construction industry. Giveyour reason*.

.....
[1 markah]
[1 *mark*]

(iii) satu tiang jeti telah dilanggar oleh sebuah feri dan menyebabkannya pecah. Sebagai seorang jurutera, pilih salah **satu** bahan dalam Rajah 5 dan apakah yang perlu and lakukandengan bahan tersebut bagi memperkukuhkan tiangjeti itu? Berikan alasan anda.
*A jetty pillar was hit by a ferry and cause it to break. As an engineer, choose **one** of the substances in Diagram 5 and what should be done with the substance to strengthen the jetty pillar? Give your reason.*

.....

.....

.....

.....
[3 markah]
[3 *marks*]

(b) Jadual 5 menunjukkan maklumat tentang duajenis kaca P dan kaca Q.
Table 5 *shows information about two types of glasses P and Q.*

Jenis kaca ***Type of glass***	**Komposisi** ***Composition***	**Kegunaan** ***Uses***
P	Silika *Silica* Natrium karbonat *Sodium carbonate* Kalsium karbonat *Calcium carbonate*	Tingkap kaca *Window glass*
Q	Silika *Silica* Argentum klorida *Silver chloride* Kalsium karbonat *Calcium carbonate*	Tingkap kaca *Window glass*

Jadual 5
Table 5

(i) Nyatakan dua persamaan sifat bagi kaca P dan kaca Q.
State two similarities of the properties of glass P *and glass* Q.

.....

.....
[2 markah]

(ii) Jika anda ingin memasang tingkap kaca di rumah anda yang dapat menghalang sinar ultraungu, jenis kaca yang manakah yang anda akan pilih? Berikan alasan anda.
If you wish to install a glass window at your house that is able to prevent the ultraviolet rays, which type of glass will be chosen? Give your reason.

.....

.....

[2 markah]
[2 *marks*]

(iii) Nyatakan satu kegunaan lain kaca yang dinyatakan di **8**(b)(ji).
State one other uses of the glass that is stated in **8**(b)(i).

.....

[1 markah]
[1 *mark*]

2 (Q2, SPMRSM 2021)

Jadual 2 menunjukkan bahan buatan industry A dan B serta kegunaan masing-masing.
Table 2 shows manufactured substances in industry A and B and their respective uses.

(a) Komponen utama dalam bahan A dan B adalah sama.
Namakan komponen tersebut.
Main component in substance A and B are the same.
Name the component.

……...
[1mark]

(b) Nyatakan dua sifat asas A dan B.
State two basic properties of A and B.

……...

……...
[2 marks]

(c) Nyatakan satu perbezaan untuk kedua-dua bahan A dan B.
State one difference for both substance A and B.

……...

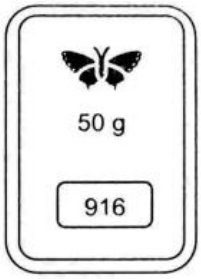
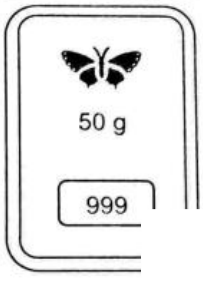
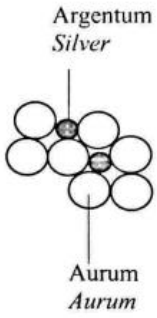
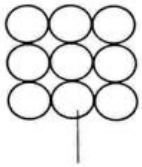
……...
[1 mark]

(d) Nyatakan kegunaan lain bagi bahan A.
State another usage of substance A.

……...
[1 mark]

3 (Q8, SBP 2021)

(a) Aurum merupakan unsur utama dalam emas. Jadual 8 menunjukkan maklumat berkaitan dua jenis kepingan emas yang terdapat di pasaran.
Aurum is the main element consists in gold. Table 8 shows information related to the two types of gold bar available in the market.

Kepingan emas *Gold bar*	 **A**	 **B**
Susunan atom *Arrangement of atoms*		

Jadual/ *Table* 8

(i) Nyatakan maksud aloi.
State the meaning of alloy.

……..
[1 markah]

(ii) Emas manakah yang lebih sesuai untuk dijadikan barang kemas?
Which gold bar is more suitable to make jewellery?

……..
[1 markah]

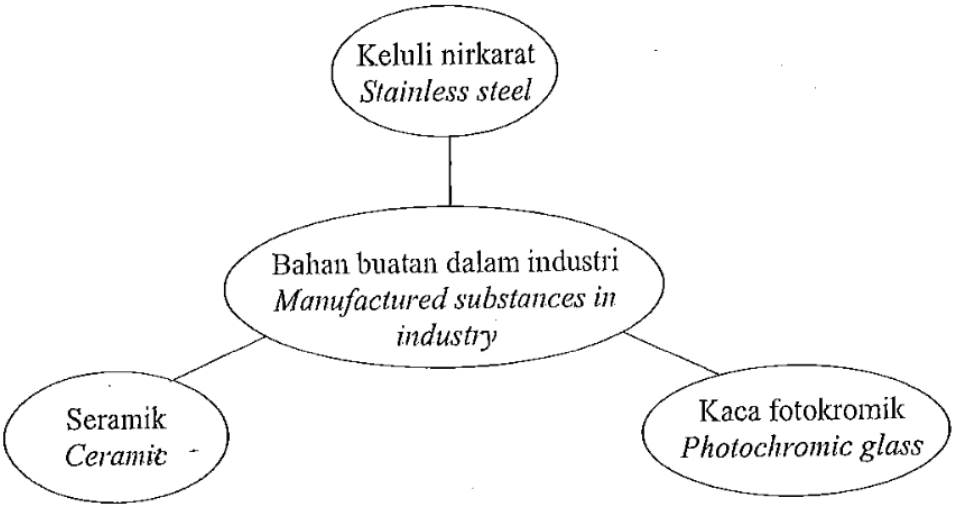
(iii) Berdasarkan jawapan anda di 8(a)(ii), bandingkan kedua-dua jenis ema situ dari segi susunan atom bagi menerangkan pilihan anda.
Based on your answer in 8(a)(ii), compare the two types of gold in terms of the arrangement of atoms to explain your choice.

……..

……..
[2 markah]

4 (Q1, SBP 2022)

Rajah 1 menunjukkan peta buih bagi contoh-contoh bahan buatan dalam industry.
Diagram 1 shows a bubble map for the examples of the manufactured substances in industry.



Rajah / *Diagram* 1

(ii) Keluli nirkarat lebih keras daripada logam tulennya.
Terangkan mengapa.
Stainless steel is harder than its pure metal.
Explain why.

.....

.....
[2 markah]
[2 *mark*]

(b) Nyatakan satu sifat istimewa kaca fotokromik.
State one special property of photochromic glass.

.....
[1 markah]

(c) Selain daripada membuat pasu, apakah kegunaan lain seramik dalam kehidupan harian?
Besides making vase, what is the other use of ceramic in daily life?

.....
[1 markah]

PANEL

WAFA BINTI MOHAMAD FAUZI	MRSM ALOR GAJAH
MUHAMMAD HAZRIQ BIN ARIS	MRSM ARAU
NUR SITI FATIMAH BINTI BUKHORI	MRSM ARAU
NIK NURUL FATIHAH BINTI MOHD NOOR	MRSM ATM BERA
NURUL AMIRA BINTI ABU BAKAR	MRSM ATM BERA
NUR SYUHADHA BINTI MOHAMAD ASERI	MRSM ATM BERA
SITI RAUDHAH BINTI ABDUL MANAP	MRSM BAGAN DATUK
AMIERUL HAFREEZ BIN NOOR HASNAN	MRSM BAGAN DATUK
NURAZIELLA BINTI ABDULLAH	MRSM BALING
NURUL 'AFIFAH SYA-IRAH BT ABD NASIR	MRSM BALING
SHAHIRA BINTI MAT YUSOF	MRSM BATU PAHAT
NORHANA HUMAIRAH BINTI ALIAS	MRSM BENTONG
AHMAD TAJUDIN BIN ABDUL RAHMAN	MRSM BESERI
NUR FARHANA BINTI MOHAMAD ALI	MRSM BESERI
RAHAYU BINTI ABDUL RAHMAN	MRSM BESUT
NUR SYAMIMI BINTI AB RASID	MRSM BESUT
NUR QUSYAIRI BIN MOHAMED FAUZI	MRSM BETONG
MUHAMMAD FIRDAUS BIN HAMZAH	MRSM FELDA TROLAK
MUHAMAD HAIZAT BIN GHAZALI	MRSM GEMENCHEH
NIK MUHAMMAD IRFAN HAKIMI BIN MOHD SAUFI	MRSM JOHOR BAHRU
AZHAR BIN ZAWAWI	MRSM JOHOR BAHRU
ABDUL HAFIZ BIN SHEIK MUHAMED	MRSM JELI
NURHAYATUN SOBARIAH BINTI ABDUL RAZAK	MRSM KOTA PUTRA
WAN MUHAMMAD NAJMI BIN WAN ANUAR	MRSM KUALA KLAWANG
NUR ADILA BINTI RAMLON	MRSM KUANTAN
DINAH ADELINA BINTI RAZALI	MRSM KUANTAN
AMIR FARHAN BIN OMAR	MRSM KUCHING
AIDA ROHAYU BINTI ABDUL KARIM	MRSM LANGKAWI
MUHAMMAD NORAZRAA BIN NORDIN	MRSM LANGKAWI
KARTIKA BINTI FIRMAN	MRSM MERSING
NAJIBULLA BIN ROMAINOR	MRSM PENGKALAN CHEPA
ELYSA ANAK CHUNDANG	MRSM KOTA PUTRA
SHAHADAD BIN ZAINOL ABIDIN	MRSM PENGKALAN CHEPA
NORIZAN BINTI RAMLI	MRSM SERTING
DANIAL FIKRI BIN SAMSUDIN	MRSM TUMPAT
SAIDAH NAFISAH BT ZULKUPLI	MRSM TUMPAT
NAJIHAH BINTI HARON	MRSM TUN ABDUL RAZAK
NURFARIZAH BINTI MUHAMMAD FAISAL	MRSM TUN GHAFAR BABA
BASIRAH BINTI ABU BAKAR	MRSM TUN GHAZALI SHAFIE
AMALIN SOFEA BINTI ROZANI	MRSM TUN MOHAMMAD FUAD STEPHENS
NAWAL BINTI NASARUDIN	MRSM TUN MOHAMMAD FUAD STEPHENS
NAJWA BINTI AHMAD SHAHRIR	MRSM TUN MUSTAPHA
NOR AZIEDA BINTI AZAHARI	BPM
GHAZALI BIN MUSA	BPM