

Bahagian A

[60 markah]

Jawab semua soalan.

- 1** Polimer merupakan bahan yang sangat penting dalam kehidupan seharian. Salah satu contoh ialah polipropena. Rajah 1 menunjukkan kegunaan polipropena dalam kehidupan seharian.

Polymers are very important materials in everyday life. One of the examples is polypropene. Diagram 1 shows the uses of polypropene in daily life.

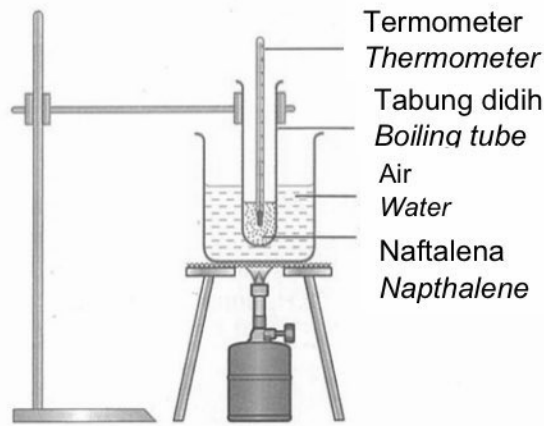


Rajah 1/Diagram 1

- (a) (i) Nyatakan nama bagi monomer polipropena.
State the name of the monomer for polypropene.
-
- [1 markah/ mark]
- (ii) Tuliskan formula molekul bagi monomer tersebut.
Write the molecular formula for the monomer.
-
- [1 markah/ mark]
- (b) (i) Kenalpasti jenis tindak balas pempolimeran bagi menghasilkan polipropena.
Identify the type of polymerisation reaction to produce polypropene.
-
- [1 markah/ mark]
- (ii) Terangkan bagaimana tindak balas di 1(b)(i) berlaku bagi membentuk polimer tersebut.
Explain how the reaction in 1(b)(i) occurs to form the polymer.
-
-
- [2 markah/ marks]

- 2 Sekumpulan pelajar menjalankan eksperimen untuk menentukan takat lebur bagi serbuk naftalena, $C_{10}H_8$. Rajah 2 menunjukkan susunan radas bagi eksperimen itu.

A group of students carry out an experiment to determine the melting point of naphthalene powder, $C_{10}H_8$. Diagram 2 shows the apparatus set-up for the experiment.

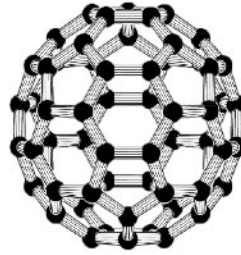


Rajah 2/Diagram 2

- (a) Nyatakan jenis zarah yang terdapat dalam naftalena.
State the type of particles in naphthalene.
-
- [1 markah/ mark]
- (b) Nyatakan perubahan keadaan jirim yang berlaku dalam eksperimen ini.
State the changes in the state of matter that occur in this experiment.
-
- [1 markah/ mark]
- (c) Apakah kaedah bagi memastikan naftalena dipanaskan secara sekata?
What is the method to ensure naphthalene is heated evenly?
-
- [1 markah/ mark]
- (d) Apakah yang berlaku jika naftalena dipanaskan secara langsung menggunakan penunu Bunsen? Terangkan.
What will happen if naphthalene is heated directly using the Bunsen burner? Explain.
-
-
- [2 markah/ marks]

- 3 (a) Rajah 3 menunjukkan bebola fullerena yang digunakan dalam sistem penapisan air dalam bidang nanoteknologi.

Diagram 3 shows a fullerene ball that is used in a water filter system in the nanotechnology field.



Formula molekul : C_{60}
Molecular formula

Rajah 3/Diagram 3

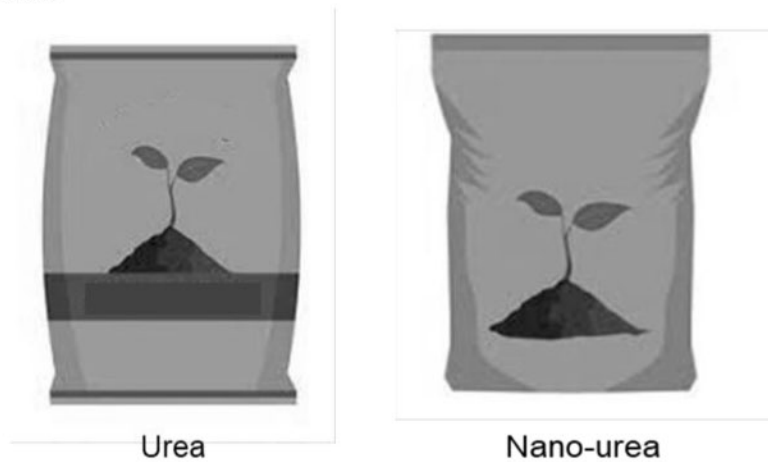
- (i) Nyatakan satu alotrop bagi karbon yang digunakan dalam bebola fullerena.
State one carbon allotrope that is used in the fullerene balls.

.....
[1 markah/ mark]

- (ii) Mengapakah alotrop di 3(a)(i) sesuai digunakan?
Why is the allotrope in 3(a)(i) suitable to be used?

.....
[1 markah/ mark]

- (b) Seorang petani ingin membeli baja untuk digunakan dalam projek pertaniannya yang diusahakan secara komersial.
Rajah 4 menunjukkan dua jenis baja yang digunakan secara meluas dalam bidang pertanian.
A farmer wants to buy fertiliser to use in his commercial farming project. Diagram 4 shows two types of fertilisers that are widely used in agriculture.



Rajah 4/Diagram 4

Berdasarkan Rajah 4,
Based on Diagram 4,

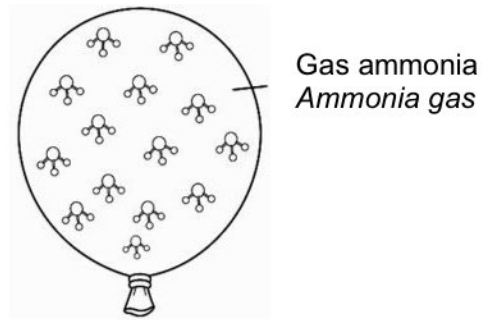
- (i) Pilih baja yang lebih sesuai digunakan oleh petani tersebut untuk meningkatkan hasil tanaman dalam tempoh yang singkat.
Choose fertiliser that is more suitable to use by the farmer to increase the crop yields in shorter time.

.....
[1 markah/ mark]

- (ii) Terangkan jawapan anda di 3(b)(i).
Explain your answer in 3(b)(i).

.....
.....
.....
.....
[3 markah/ marks]

- 4 (a) Rajah 5 menunjukkan sebiji belon yang berisi gas ammonia.
Diagram 5 shows a balloon filled with ammonia gas.



Rajah 5/Diagram 5

- (i) Tuliskan formula kimia bagi gas ammonia.
Write the chemical formula for ammonia gas.

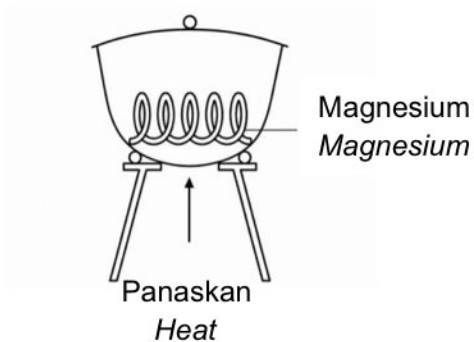
.....
 [1 markah/ mark]

- (ii) Nyatakan komposisi atom bagi ammonia.
State the atomic composition of ammonia.

.....

 [2 markah/ marks]

- (b) Rajah 6 menunjukkan gambar rajah susunan radas bagi tindak balas pengoksidaan magnesium.
Diagram 6 shows the diagram of set-up apparatus of oxidation reaction of magnesium.



Rajah 6/Diagram 6

- (i) Tuliskan persamaan kimia bagi tindak balas tersebut.
Write a chemical equation for the reaction.

.....
 [1 markah/ mark]

- (ii) 2.88 g magnesium bertindak balas dengan 1.92 g oksigen. Apakah formula empirik bagi magnesium oksida?

[Jisim atom relatif: Mg = 24, O = 16]

2.88 g of magnesium reacts with 1.92 g oxygen. What is the empirical formula of magnesium oxide?

[Relative atomic mass: Mg = 24, O = 16]

[3 markah/ marks]

- 5 Jadual 1 menunjukkan maklumat bagi sejenis aloi yang digunakan dalam pembuatan alat pembedahan.

Table 1 shows the information for a type of alloy used in the manufacture of surgical instruments.

Bahan Material	Peratus Percentage
Besi Iron	73
Nikel Nickel	18
Kromium Chromium	8
Karbon Carbon	1

Jadual 1/ Table 1

- (a) Apakah yang dimaksudkan dengan aloi?
What is meant by alloy?

.....
[1 markah/ mark]

- (b) Berdasarkan Jadual 1,
Based on Table 1,

- (i) Nyatakan satu sifat bagi aloi tersebut yang menjadikannya sesuai digunakan dalam pembuatan alat pembedahan.
State one property of the alloy that makes it suitable to be used in the manufacture of surgical instruments.

.....
[1 markah/ mark]

- (ii) Hitung bilangan mol besi yang terdapat dalam satu sampel aloi di atas yang berjisim 200 g.
[Jisim atom relatif: Fe=56]
Calculate the number of moles of iron present in a sample of the above alloy with a mass of 200 g.
[Relative atomic mass: Fe=56]

[2 markah/ marks]

- (iii) Lukiskan rajah susunan atom bagi aloi tersebut.
Draw the diagram of arrangement of atoms in the alloy.



[2 markah/ marks]

- (iv) Terangkan mengapa aloi lebih kuat dan keras berbanding logam tulennya.
Explain why alloy is harder and stronger than its pure metal.

.....

.....

.....

[2 markah/ marks]

- 6 Rajah 7 menunjukkan kedudukan unsur P, Q, R dan S dalam Jadual Berkala Unsur.
Diagram 7 shows the positions of elements P, Q, R and S in the Periodic Table of Elements.

[illegible]

Rajah 7/ Diagram 7

- (a) Nyatakan nama lain bagi Kumpulan 1.
State another name of Group 1.
-
- [1 markah/ mark]
- (b) Terangkan mengapa unsur S tidak reaktif secara kimia?
Explain why element S is chemically unreactive?
-
- [1 markah/ mark]
- (c) Unsur Q bertindak balas dengan R menghasilkan sebatian ion, QR.
Element Q reacts with R to produce an ionic compound, QR.
- (i) Tuliskan persamaan kimia yang seimbang bagi tindak balas ini.
Write the balanced chemical equation for this reaction.
-
- [2 markah/ marks]
- (ii) 4.6 g unsur Q bertindak balas sepenuhnya dengan gas R.
Hitungkan jisim sebatian QR yang dihasilkan.
*4.6 g of element Q reacts completely with gas R.
Calculate the mass of compound QR produced.*
[Jisim atom relatif: Q = 23, R = 35.5]
[Relative atomic mass: Q = 23, R = 35.5]

[2 markah/ marks]

- (d) Banding dan terangkan kereaktifan unsur P dan Q.
Compare and explain the reactivity of elements P and Q.

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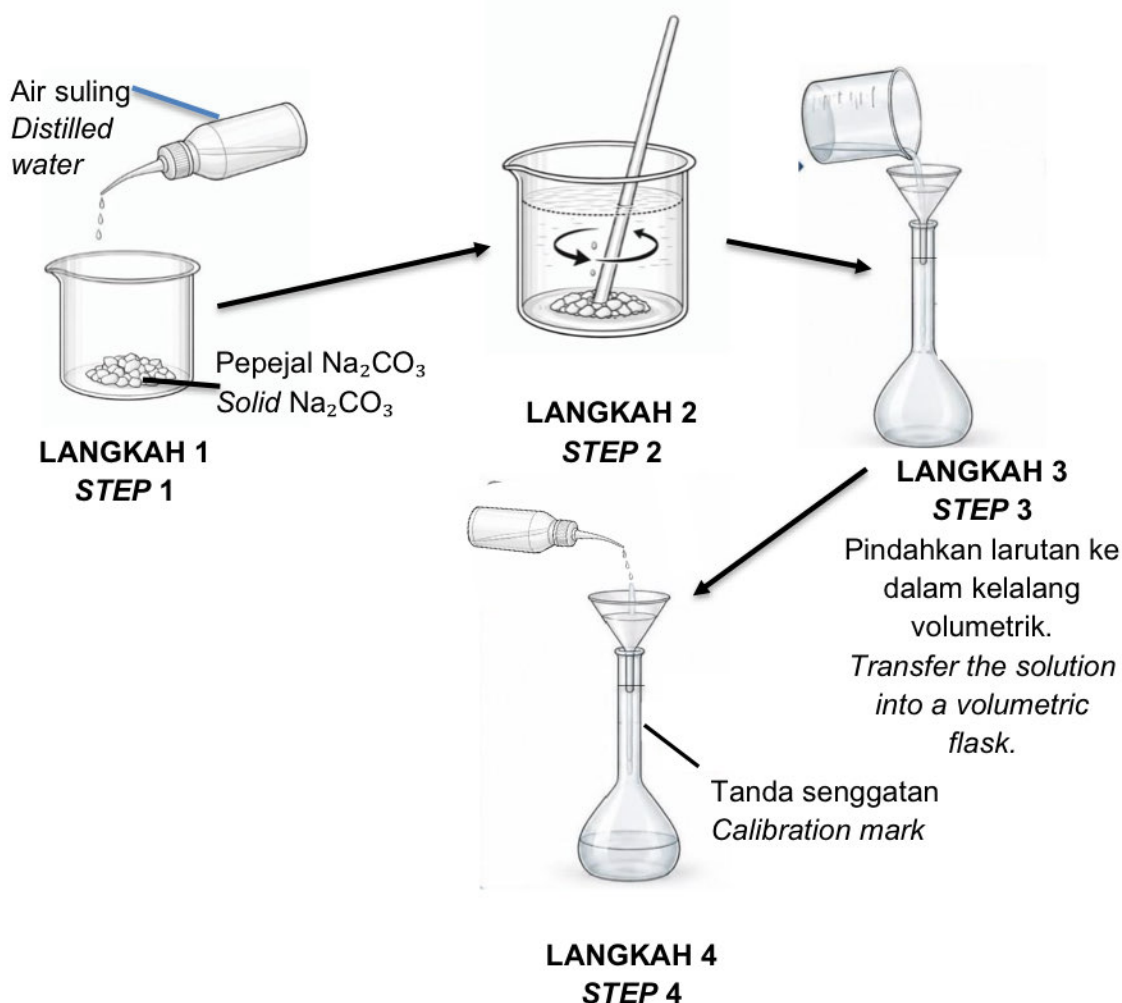
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[3 markah/ marks]

- 7 Seorang pelajar ingin menyediakan 250 cm³ larutan natrium karbonat, Na₂CO₃ berkepekatan 0.20 mol dm⁻³ menggunakan serbuk pepejal natrium karbonat, Na₂CO₃. Rajah 8 menunjukkan sebahagian daripada langkah-langkah penyediaan larutan itu.

A student wants to prepare 250 cm³ of sodium carbonate solution, Na₂CO₃ with a concentration of 0.20 mol dm⁻³ using solid sodium carbonate powder, Na₂CO₃. Diagram 8 shows part of the steps in preparing the solution.



Rajah 8/Diagram 8

- (a) Nyatakan istilah bagi 'larutan yang diketahui kepekataannya dengan tepat'.
State the term for 'solution with known concentration'.

[1 markah/ mark]

- (b) (i) Mengapakah pepejal natrium karbonat perlu dilarutkan dalam Langkah 2?
Why does the solid sodium carbonate need to be dissolved in Step 2?

[1 markah/ mark]

- (ii) Hitungkan jisim natrium karbonat yang diperlukan untuk menghasilkan larutan akueus ini.

[Jisim atom relatif: Na = 23, C = 12, O = 16]

Calculate the mass of sodium carbonate needed to prepare the aqueous solution.

[Relative atomic mass: Na = 23, C = 12, O = 16]

[3 markah/ marks]

- (c) Terangkan kesan jika air suling ditambah melebihi tanda senggatan di Langkah 4.

Explain the effect if distilled water is added above the calibration mark in Step 4.

.....

[3 markah/ marks]

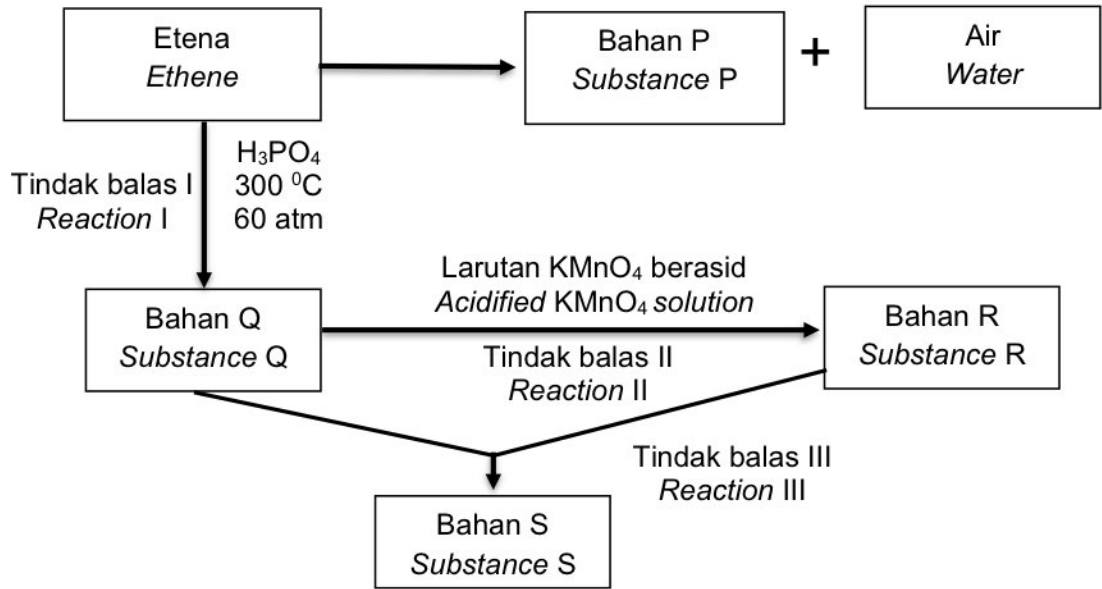
- (d) Seterusnya, pelajar diarahkan untuk mencairkan larutan tersebut kepada kepekatan yang lebih rendah dengan isipadu yang sama. Semasa melakukan pemindahan larutan asal ke dalam kelalang volumetrik yang lain, Pelajar A telah menggunakan silinder penyukat manakala Pelajar B menggunakan pipet. Wajarkan pemilihan radas bagi dua orang pelajar ini.

Next, the students were instructed to dilute the solution to a lower concentration with the same volume. During the transfer of the original solution into another volumetric flask, Student A used a measuring cylinder while Student B used a pipette. Justify the choice of apparatus by these two students

.....

[2 markah/ marks]

- 8 Rajah 9 menunjukkan carta alir bagi siri tindak balas yang dialami oleh etena.
Diagram 9 shows the flow chart for a series of reactions undergone by ethene.



Rajah 9/ Diagram 9

- (a) Nyatakan formula am bagi etena.
State the general formula for ethene.
-
- [1 markah/ mark]
- (b) Etena terbakar dengan lengkap dalam oksigen yang berlebihan membentuk Bahan P dan air, H₂O. Nyatakan nama bagi Bahan P.
Ethene is burnt completely in excess oxygen to form Substance P and water, H₂O. State the name of Substance P.
-
- [1 markah/ mark]

- (c) (i) Etena mengalami Tindak balas I untuk menghasilkan Bahan Q.
Lukiskan formula struktur dan nyatakan nama tindak balas tersebut.
Ethene undergoes Reaction I to form Substance Q. Draw the structural formula and state the name of the reaction.

Tindak balas
Reaction :

Formula struktur
Structural formula

[2 markah/ marks]

- (ii) Tuliskan persamaan kimia yang seimbang bagi Tindak balas I.
Write a balance chemical equation for Reaction I.

.....
[1 markah/ mark]

- (d) Jadual 2 menunjukkan peratus jisim karbon per molekul dan keadaan fizik bagi etena dan Bahan Q.

Table 2 shows the percentage of carbon by mass per molecule and the physical state of ethene and Substance Q.

Bahan Substance	Peratus jisim karbon per molekul Percentage of carbon by mass per molecule	Keadaan fizik Physical state
Etena Ethene	85.71	Gas Gas
Bahan Q Substance Q	52.17	Cecair Liquid

Jadual 2/ Table 2

Tentukan bahan yang lebih sesuai sebagai bahan api domestik. Wajarkan jawapan anda.

Determine the substance which is more suitable as a domestic fuel. Justify your answer.

.....
.....

[3 markah/ marks]

- (e) Banding dan bezakan sifat fizik Bahan R dan Bahan S.
Compare and contrast the physical properties of Substance R and Substance S.

.....

.....

[2 markah / marks]



SERTAI TELEGRAM @exercise_students

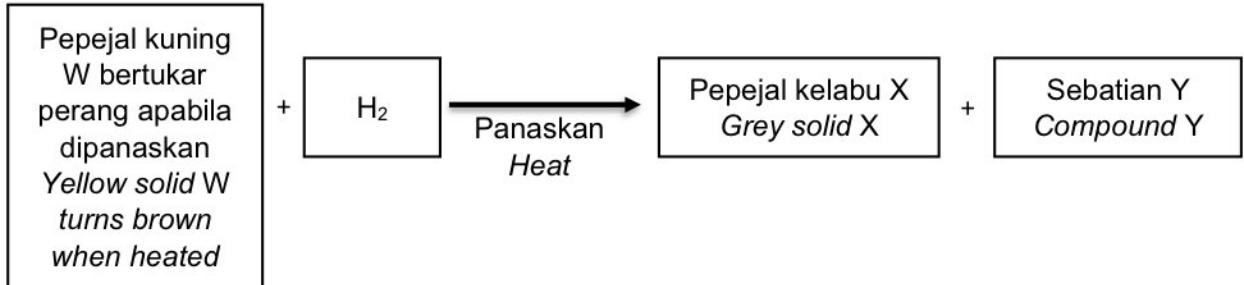
Bahagian B

[20 markah]

Bahagian ini mengandungi dua soalan. Jawab satu soalan.

- 9 Rajah 10 menunjukkan tindak balas bagi oksida logam W dalam penghasilan pepejal X dan sebatian Y.

Diagram 10 shows a reaction of oxide of metal W in production of solid X and compound Y.

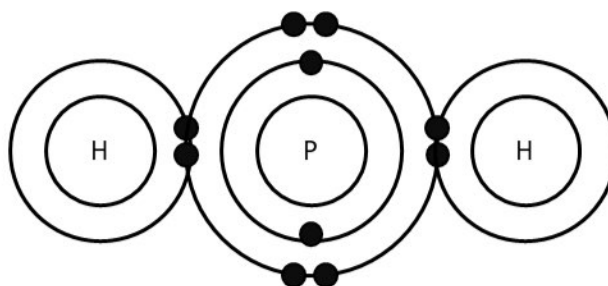


Rajah 10/Diagram 10

- (a) Nyatakan jenis ikatan dan jenis zarah dalam gas hidrogen, H_2 .
State the type of bond and the type of particle in hydrogen gas, H_2 .
 [2 markah/ marks]
- (b) Berdasarkan Rajah 10,
Based on Diagram 10,
- (i) Kenal pasti pepejal W dan pepejal kelabu X
Identify solid W and grey solid X
 [2 markah/ marks]
- (ii) Terangkan kekonduksian elektrik bagi pepejal X
Explain the electrical conductivity of solid X
 [2 markah/ marks]
- (iii) Tulis persamaan kimia bagi tindak balas di atas. Hitungkan jisim pepejal X apabila 55.75 g pepejal W dan 19.2 dm^3 gas hidrogen bertindak balas dengan lengkap.
*[Jisim molar W = 223 g mol^{-1} , jisim molar X = 207 g mol^{-1}]
 [Isipadu molar: $24.0 \text{ dm}^3 \text{ mol}^{-1}$ pada keadaan bilik]*

Write the chemical equation for the reaction above. Calculate the mass of solid X when 55.75 g of solid W and 19.2 dm^3 hydrogen gas react completely.
*[Molar mass of W = 223 g mol^{-1} , molar mass of X: 207 g mol^{-1}]
 [Molar volume: $24.0 \text{ dm}^3 \text{ mol}^{-1}$ at room conditions]*
 [6 markah/ marks]

- (c) Rajah 11 menunjukkan susunan elektron bagi sebatian Y.
Diagram 11 shows the electron arrangement of compound Y.



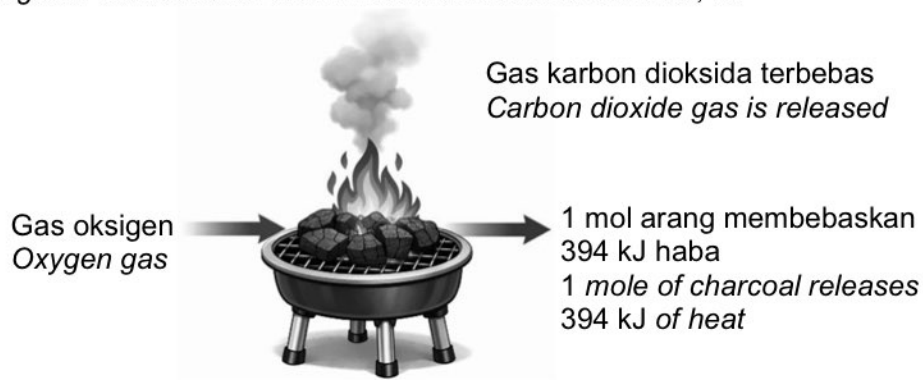
Rajah 11/*Diagram 11*

Berdasarkan Rajah 11, kenalpasti P, nyatakan jenis sebatian dan huraikan pembentukan sebatian Y.

Based on Diagram 11, identify P, state the type of compound and describe the formation of compound Y.

[8 markah/ marks]

- 10 (a) Rajah 12 menunjukkan tindak balas pembakaran bagi arang, C.
Diagram 12 shows the combustion reaction for charcoal, C.



Rajah 12 / Diagram 12

- (i) Apakah maksud haba pembakaran dan nyatakan jenis tindak balas yang membebaskan haba.
What is meant by heat of combustion and state the type of reaction that releases heat.

[2 markah/ marks]

- (ii) Berdasarkan Rajah 12, tuliskan persamaan termokimia bagi mewakili tindak balas itu. Sertakan gambar rajah aras tenaga dan hitungkan nilai bahan api bagi arang.

[Jisim atom relative: C = 12]

Based on Diagram 12, write a thermochemical equation to represent the reaction. Draw an energy level diagram and calculate the fuel value of charcoal.

[Relative atomic mass: C = 12]

[6 markah/ marks]

- (b) Jadual 3 menunjukkan haba tindak balas bagi dua set eksperimen.
Table 3 shows the heat of reaction for two sets of experiments.

Set	Bahan tindak balas <i>Reactants</i>	Haba tindak balas, kJ mol^{-1} <i>Heat of reaction, kJ mol^{-1}</i>
I	50 cm ³ larutan natrium karbonat 1.0 mol dm ⁻³ + 50 cm ³ larutan zink klorida 1.0 mol dm ⁻³ 50 cm ³ of sodium carbonate solution 1.0 mol dm ⁻³ + 50 cm ³ of zinc chloride solution 1.0 mol dm ⁻³	+ 23.3
II	50 cm ³ larutan barium nitrat 1.0 mol dm ⁻³ + 50 cm ³ larutan kuprum(II) sulfat 1.0 mol dm ⁻³ 50 cm ³ of barium nitrate solution 1.0 mol dm ⁻³ + 50 cm ³ of copper(II)sulphate solution 1.0 mol dm ⁻³	- 43.0

Jadual 3/ Table 3



Berdasarkan Jadual 3,
Based on Table 3,

- (i) nyatakan pemerhatian yang boleh diperolehi berdasarkan nilai haba tindak balas dalam Set I.
state the observations that can be obtained based on the heat value of the reaction in Set I.

[2 markah/ marks]

- (ii) terangkan perbezaan haba tindak balas bagi Set I dan Set II. Penerangan anda mestilah merangkumi:
- Jenis tindak balas
 - Perubahan suhu
 - Jumlah kandungan tenaga bahan tindak balas dan hasil tindak balas
 - Perubahan tenaga haba semasa pemecahan ikatan dan pembentukan ikatan.

explain the difference in the heat of reaction for Set I and Set II. Your explanation must include:

- *Type of reaction*
- *Change in temperature*
- *Total energy content of the reactants and products*
- *Change in heat energy during the breaking of bond and the formation of bond.*

[6 markah/ marks]

- (iii) Tuliskan persamaan ion bagi Set I dan Set II dan nyatakan nama mendakan yang terhasil dalam kedua-dua set.
Write the ionic equations for Set I and Set II and state the name of the precipitate formed in both sets.

[4 markah/ marks]

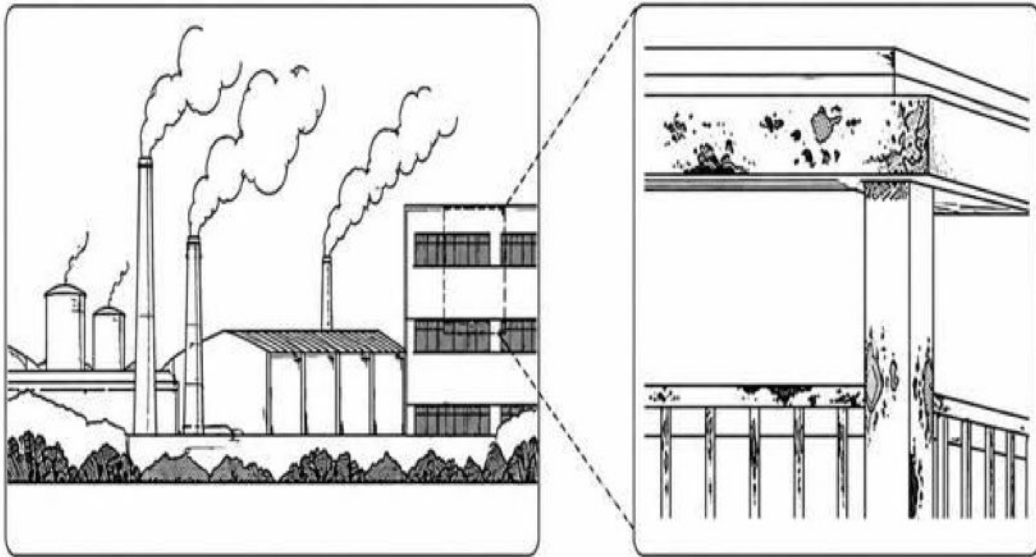
Bahagian C

[20 markah]

Soalan ini mesti dijawab.

- 11 Sebuah kawasan perindustrian mempunyai beberapa buah kilang yang mengeluarkan gas sulfur dioksida, SO_2 dan nitrogen dioksida, NO_2 . Gas-gas ini larut dalam titisan air di udara membentuk asid lemah yang menyebabkan hujan asid. Rajah 13 menunjukkan keadaan sebahagian struktur besi sebuah bangunan di kawasan perindustrian tersebut.

An industrial area has several factories that release sulphur dioxide, SO_2 and nitrogen dioxide, NO_2 gases. These gases dissolve in water droplets in the air to form weak acids that cause acid rain. Diagram 13 shows the condition of part of the iron structure of a building in the industrial area.



Rajah 13/Diagram 13

Berdasarkan Rajah 13,
Based on Diagram 13,

- (a) (i) Nyatakan nama tindak balas yang berlaku pada struktur besi itu.
State the name of the reaction that occurs on the iron structure.
[1 markah/ mark]
- (ii) Terangkan mengapa tindak balas berlaku lebih cepat dalam situasi di atas.
Explain why the reaction occurs more rapidly in the situation above.
[2 markah/ marks]



- (b) Sebuah syarikat pembinaan ingin melindungi struktur besi bangunan tersebut menggunakan kaedah perlindungan katod.

Jadual 4 menunjukkan nilai keupayaan elektrod piawai bagi beberapa logam.

A construction company intends to protect the iron structure of the building using cathodic protection. Table 4 shows the standard electrode potential values of several metals.

Tindak balas Sel Setengah <i>Half-cell Reaction</i>	Nilai E° / V <i>E° value / V</i>
$X^{2+} + 2e \rightleftharpoons X$	-0.76
$Fe^{2+} + 2e \rightleftharpoons Fe$	-0.44
$Y^{2+} + 2e \rightleftharpoons Y$	+0.34

Jadual 4/ Table 4

Berdasarkan Jadual 4,
Based on Table 4,

Cadangkan logam yang paling sesuai digunakan sebagai logam korban. Terangkan jawapan anda. Tulis setengah persamaan pengoksidaan bagi logam korban yang anda pilih.

Suggest the most suitable metal to be used as a sacrificial metal. Explain your answer. Write the oxidation half-equation for the sacrificial metal that you have chosen.

[4 markah/ marks]

- (c) Satu eksperimen dijalankan di makmal bagi mengkaji kadar tindak balas antara besi dengan asid sulfurik. Jadual 5 menunjukkan data yang dikumpul dalam eksperimen ini.

A laboratory experiment was carried out to investigate the rate of reaction between iron and sulphuric acid. Table 5 shows the data collected in this experiment.

Set	Bahan tindak balas <i>Reactants</i>	Masa untuk mengumpul 20 cm ³ gas hidrogen (s) <i>Time taken to collect 20 cm³ hydrogen gas (s)</i>
P	5 g serbuk besi 5 g of iron powder + 50 cm ³ asid sulfurik 0.5 mol dm ⁻³ 50 cm ³ of 0.5 mol dm ⁻³ sulphuric acid	53
Q	5 g serbuk besi 5 g of iron powder + 50 cm ³ asid sulfurik 1.0 mol dm ⁻³ 50 cm ³ of 1.0 mol dm ⁻³ sulphuric acid	27

Jadual 5/ Table 5

Bandingkan kadar tindak balas antara Set P dan Set Q. Terangkan perbezaan kadar tindak balas tersebut berdasarkan teori perlanggaran.

Compare the rate of reaction between Set P and Set Q.

Explain the difference in the rate of reaction based on the collision theory.

[5 markah/ marks]

- (d) Cadangkan satu eksperimen untuk mengkaji kesan suhu asid terhadap kadar tindak balas dengan besi.

Jawapan anda hendaklah merangkumi:

- Prosedur
- Hubungan antara suhu asid dengan kadar tindak balas
- Rumus untuk menentukan kadar tindak balas

Suggest an experiment to investigate the effect of temperature of acid on the rate of reaction with iron.

Your answer should include:

- Procedure
- Relationship between the temperature of acid and the rate of reaction
- Formula to determine the rate of reaction

[8 markah/ marks]

KERTAS PEPERIKSAAN TAMAT