

SULIT

NAMA :

TINGKATAN :

**MAJLIS PENGETUA SEKOLAH MALAYSIA
KUALA LUMPUR**

MODUL TOP 5 KUALA LUMPUR 2026
PEPERIKSAAN PERCUBAAN SPM
KIMIA 4541/2
TINGKATAN 5
Kertas 2
2 jam 30 minit



JANGAN BUKA KERTAS PEPERIKSAAN INI SEHINGGA DIBERITAHU

1. Tuliskan **nama** dan **kelas** anda pada ruang yang disediakan.
2. Kertas peperiksaan ini mengandungi **tiga** bahagian: **Bahagian A**, **Bahagian B** dan **Bahagian C**.
3. Jawapan hendaklah ditulis pada ruang jawapan yang disediakan di dalam kertas peperiksaan ini.
4. Kertas peperiksaan ini adalah dalam dwibahasa.
5. Jawapan boleh ditulis dalam bahasa Melayu atau bahasa Inggeris.
6. Rajah yang mengiringi soalan tidak dilukis mengikut skala kecuali dinyatakan.
7. Kerja mengira anda mesti ditunjukkan.
8. **Kertas peperiksaan ini** hendaklah diserahkan kepada pengawas peperiksaan pada akhir peperiksaan.

Untuk Kegunaan Pemeriksa			
Bahagian	Soalan	Markah Penuh	Markah Diperoleh
A	1	5	
	2	5	
	3	6	
	4	7	
	5	8	
	6	9	
	7	10	
	8	10	
B	9	20	
	10	20	
C	11	20	
Jumlah		100	

Kertas peperiksaan ini mengandungi 44 halaman bercetak.

Bahagian A

[60 markah]

Jawab semua soalan.

- 1 Rajah 1 menunjukkan pembentukan titisan air pada permukaan luar gelas.
Diagram 1 shows the formation of water droplets on the outside of a glass.



Rajah 1
Diagram 1

Berdasarkan Rajah 1,
Based on Diagram 1,

- (a) nyatakan nama proses semasa pembentukan titisan air pada permukaan luar gelas tersebut.
(R) *state the name of the process during the formation of water droplets at the outside of the glass.*

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

- (b) (i) Apakah jenis zarah yang terdapat dalam air?
(R) *What types of particles are found in water?*

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

- (ii) Lukiskan susunan zarah air dalam udara.
(R) *Draw the arrangement of water particles in the air.*



[1 markah]

[1 mark]

- (c) Sekiranya air dipanaskan sehingga suhu 90°C , apakah perubahan yang akan berlaku kepada zarah-zarah air dari segi tenaga kinetik dan pergerakan zarah dalam air tersebut?

If the water is heated to a temperature of 90°C , what changes will happen to the water particles in terms of kinetic energy and the movement of the particles in the water?

.....

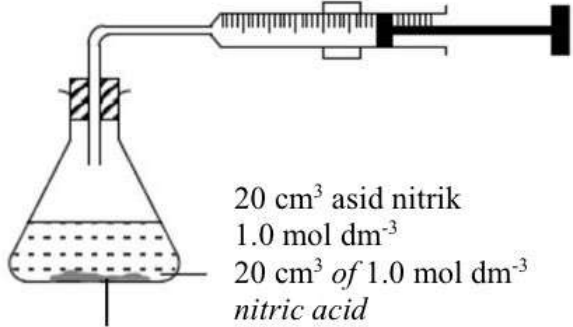
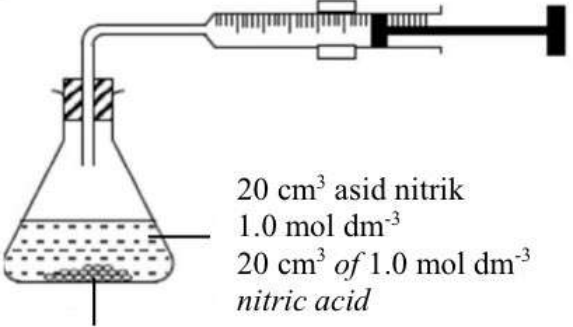
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[2 markah]

[2 marks]

- 2 Jadual 1 menunjukkan dua eksperimen yang dijalankan untuk mengkaji faktor yang mempengaruhi kadar tindak balas.

Table 1 shows two experiments carried out to study the factor that affects the rate of reaction.

Eksperimen <i>Experiment</i>	Susunan radas <i>Set-up of apparatus</i>	Masa yang diambil untuk mengumpul 60 cm ³ gas (s) <i>Time taken to collect 60 cm³ of gas (s)</i>
I	 20 cm³ asid nitrik 1.0 mol dm⁻³ 20 cm³ of 1.0 mol dm⁻³ nitric acid Serbuk zink berlebihan <i>Excess zinc powder</i>	55
II	 20 cm³ asid nitrik 1.0 mol dm⁻³ 20 cm³ of 1.0 mol dm⁻³ nitric acid Ketulan zink berlebihan <i>Excess zinc granules</i>	90

Jadual 1

Table 1

Berdasarkan Jadual 1,

Based on Table 1,

(a) berikan **satu** faktor yang boleh mempengaruhi kadar tindak balas.

(R) *give one factor that can affects the rate of reaction.*

[1 markah]

[1 mark]

- (b) nyatakan **satu** sebab mengapa isi padu akhir gas yang diperolehi dalam Eksperimen I dan Eksperimen II adalah sama.

*state **one** reason why the final volume of gas obtained in Experiments I and II are the same.*

.....

.....

[1 markah]

[1 mark]

- (c) (i) Hitung kadar tindak balas purata bagi Eksperimen II.
(S) *Calculate the average rate of reaction for Experiment II.*

[1 markah]

[1 mark]

- (ii) Tuliskan persamaan kimia bagi eksperimen itu.
(S) *Write a chemical equation for the experiment.*

.....

[2 markah]

[2 marks]

- 3 Jadual 2 menunjukkan maklumat beberapa unsur dalam Jadual Berkala Unsur.
Table 2 shows the information of a few elements in the Periodic Table of Elements.

Unsur <i>Element</i>	Na	Mg	Al	Si	P	S	Cl
Nombor proton <i>Proton number</i>	11	12	13	14	15	16	17

Jadual 2

Table 2

- (a) Berdasarkan Jadual 2, nyatakan sifat bagi aluminium oksida.

(R) *Based on Table 2, state the property of aluminium oxide.*

.....
[1 markah]

[1 mark]

- (b) Unsur P bertindak balas dengan unsur Cl membentuk sebatian X.

(R) Apakah sifat fizik bagi sebatian X?

Element P reacts with element Cl to form compound X.

What is the physical property for compound X?

.....
[1 markah]

[1 mark]

- (c) (i) Unsur Na bertindak balas dengan unsur Cl membentuk sebatian Y.

(S) Tulis persamaan kimia bagi pembentukan sebatian Y.

Element Na reacts with element Cl to form compound Y.

Write the chemical equation for the formation of compound Y.

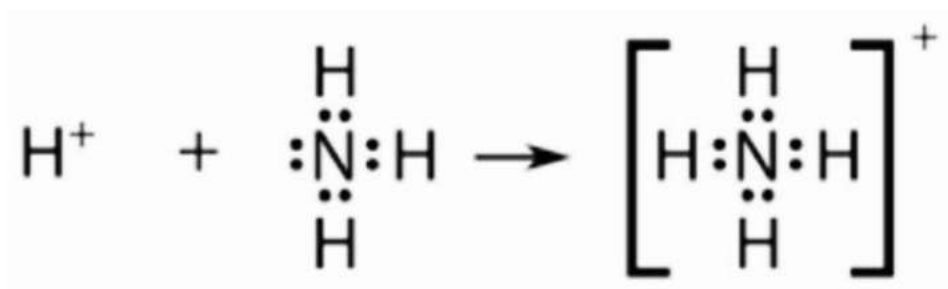
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[2 markah]

[2 marks]

- (ii) 0.05 mol Na bertindak balas dengan Cl untuk membentuk sebatian Y.
- (S) Hitungkan isi padu gas klorin yang diperlukan.
[Isi padu molar = $24 \text{ dm}^3 \text{ mol}^{-1}$ pada keadaan bilik]
0.05 mol Na *reacts with element Cl to form compound Y.*
Calculate the volume of chlorine gas required.
[*Molar volume = $24 \text{ dm}^3 \text{ mol}^{-1}$ at room conditions*]

[2 markah]
[2 marks]

- 4 Rajah 2.1 menunjukkan struktur Lewis bagi pembentukan ion ammonium, NH_4^+ .
Diagram 2.1 shows the Lewis structure for the formation of ammonium ion, NH_4^+ .



Rajah 2.1
Diagram 2.1

Berdasarkan Rajah 2.1,
Based on Diagram 2.1,

- (a) (i) tuliskan susunan elektron bagi atom nitrogen.
(R) *write the electron arrangement of nitrogen atom.*

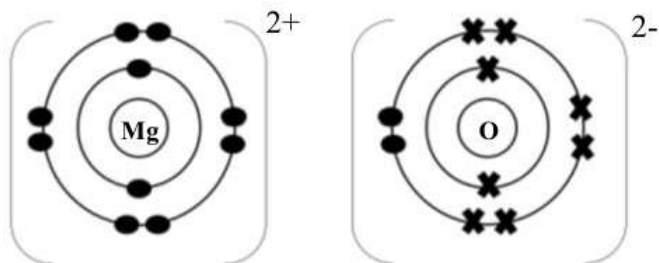
.....
[1 markah]
[1 mark]

- (ii) nyatakan jenis ikatan yang terbentuk.
(R) *state the type of bond formed.*

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

- (b) Rajah 2.2 menunjukkan susunan elektron bagi dua jenis unsur berlainan yang bertindak balas membentuk suatu sebatian.
(S)

Diagram 2.2 shows electron arrangement of two different elements that react to form a compound.



Rajah 2.2
Diagram 2.2

Tuliskan persamaan kimia bagi tindak balas yang berlaku.

Write the chemical equation for the reaction occur.

.....
[2 markah]
[2 marks]

- (c) Hitung jisim magnesium yang digunakan sekiranya 2.0 g sebatian terbentuk dalam tindak
(S) balas itu.

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

Calculate the mass of magnesium used if 2.0 g of compound formed in the reaction.

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

[3 markah]
[3 marks]

[Lihat halaman sebelah
SULIT

- 5 Rajah 3.1 menunjukkan perbualan di antara Tiara dan ibunya.
Diagram 3.1 shows the conversation between Tiara and her mother.



Rajah 3.1
Diagram 3.1

- (a) Berdasarkan perbualan di atas,
Based on the conversation above,

- (i) nyatakan maksud asid.
(R) *state the meaning of acid.*

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

- (ii) tuliskan persamaan kimia bagi tindak balas antara cuka dan natrium hidroksida.
(S) *write the chemical equation for the reaction between vinegar and sodium hydroxide.*

.....
[2 markah]
[2 marks]

- (b) Tindak balas antara cuka dan ketulan marmar menghasilkan gas yang tidak berwarna.
(R) Nyatakan nama gas tersebut.

Reaction between vinegar and marble chips produced a colourless gas. State the name of the gas.

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

- (c) Tiara ingin menyediakan 350 cm³ asid metanoik 0.1 mol dm⁻³ daripada 0.2 mol dm⁻³ asid metanoik. Hitung isi padu asid metanoik yang diperlukan untuk menyediakan larutan yang diinginkan.

Tiara wants to prepare 350 cm³ of 0.1 mol dm⁻³ methanoic acid from 0.2 mol dm⁻³ methanoic acid. Calculate the volume of methanoic acid needed to prepare the required solution.

[2 markah]
[2 marks]

- (c) Rajah 3.2 menunjukkan seorang kanak-kanak sedang menangis kerana telah digigit seekor serangga semasa bermain di taman permainan.
(T)

Diagram 3.2 shows a boy is crying because he was bitten by an insect while he is playing at the playground.



Sengat semut api mengandungi asid.
Fire ant sting contains acid.

Rajah 3.2
Diagram 3.2

Cadangkan **satu** bahan yang boleh disapu pada kakinya untuk mengurangkan rasa sakit tanpa menyebabkan kecederaan seterusnya. Wajarkan cadangan anda.

*Suggest **one** substance that can be applied on the skin to relieve the pain without causing further injury. Justify your suggestion.*

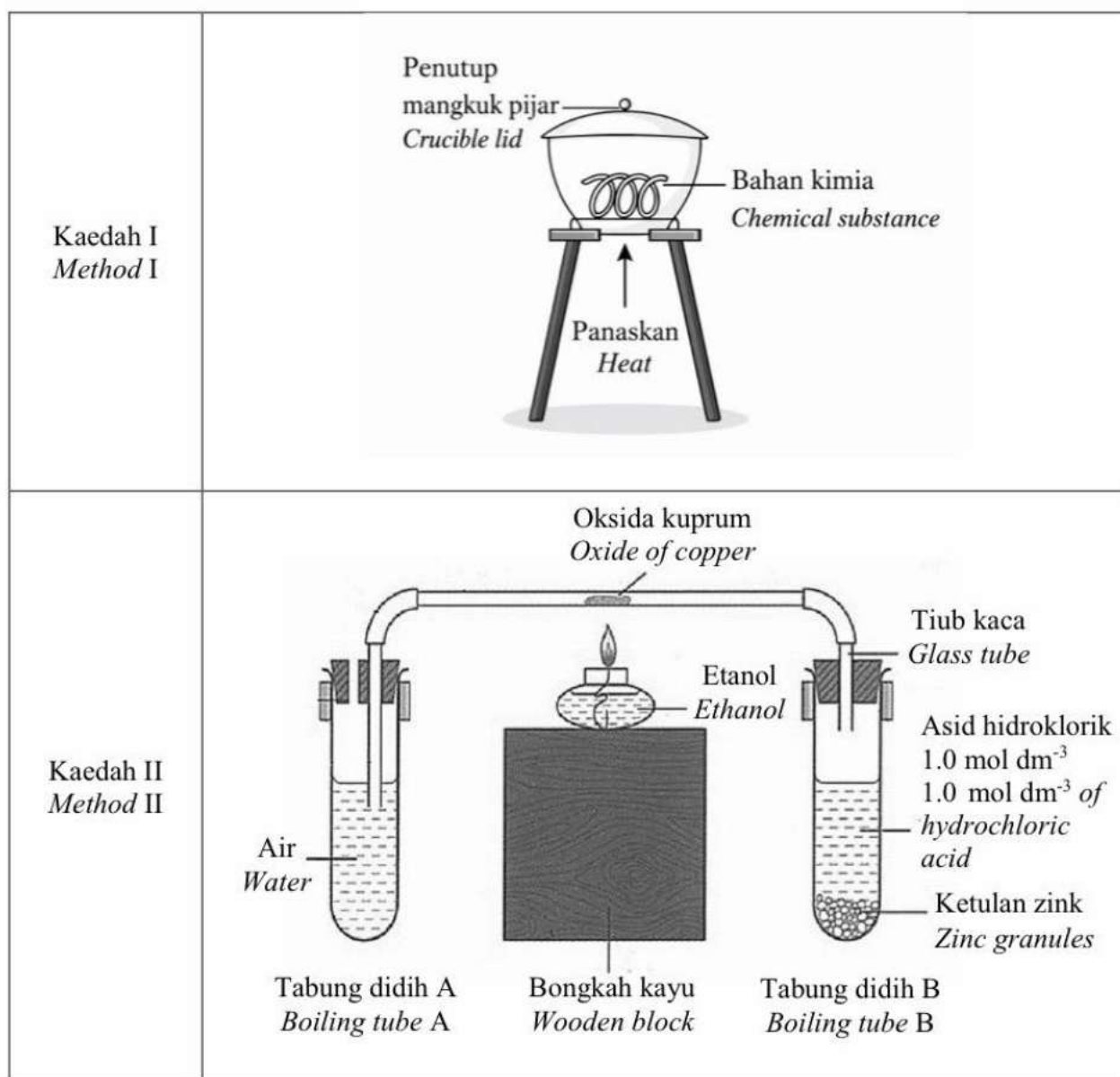
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.....

.....

[2 markah]
[2 marks]

- 6 Rajah 4 menunjukkan dua kaedah untuk menentukan formula empirik suatu sebatian.
Diagram 4 shows two methods to determine the empirical formula of a compound.



Rajah 4
Diagram 4

Berdasarkan Rajah 4,
Based on Diagram 4,

(a) (i) apakah yang dimaksudkan dengan formula empirik?

(R) *what is meant by empirical formula?*

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

(ii) nyatakan kaedah yang sesuai untuk menentukan formula empirik zink oksida?

(T) Berikan sebab anda.

state the method which is suitable to determine the empirical formula of zinc oxide?
Give your reason.

.....
.....
.....
[2 markah]
[2 marks]

- (iii) Berdasarkan Kaedah II, hitungkan formula empirik bagi kuprum oksida dengan menggunakan maklumat berikut.

Based on Method II, calculate the empirical formula of copper oxide using the following information.

Perkara <i>Description</i>	Jisim (g) <i>Mass (g)</i>
Jisim tiub kaca <i>Mass of glass tube</i>	10.21
Jisim tiub kaca + kuprum oksida sebelum pemanasan <i>Mass of glass tube + copper oxide before heating</i>	16.46
Jisim tiub kaca + kuprum selepas pemanasan <i>Mass of glass tube + copper after heating</i>	15.21

[Jisim atom relatif: O = 16, Cu = 64]

[Relative atomic mass: O = 16, Cu = 64]

[4 markah]

[4 marks]

- (b) Gas hidrogen dialirkan selama 10 saat sebelum pemanasan dimulakan dan aliran gas diteruskan sehingga salur kaca berada pada suhu bilik setelah pemanasan dihentikan. (S) Jelaskan mengapa.

Hydrogen gas is flowed for 10 seconds before heating is started and the gas flow is continued until the glass tube at room temperature after heating is stopped.

Explain why.

.....

.....

.....

[2 markah]

[2 marks]

[Lihat halaman sebelah

SULIT

- 7 Berikut ialah bahan-bahan yang digunakan dalam penyediaan sabun.
The following are the ingredients used in the preparation of soap.

- | |
|---|
| <ul style="list-style-type: none"> • Minyak sawit
<i>Palm oil</i> • Larutan kalium hidroksida pekat
<i>Concentrated potassium hydroxide solution</i> • Air suling
<i>Distilled water</i> • Natrium klorida
<i>Sodium chloride</i> |
|---|

- (a) Berdasarkan pengetahuan anda dalam penyediaan sabun,
Based on your knowledge in soap preparation,

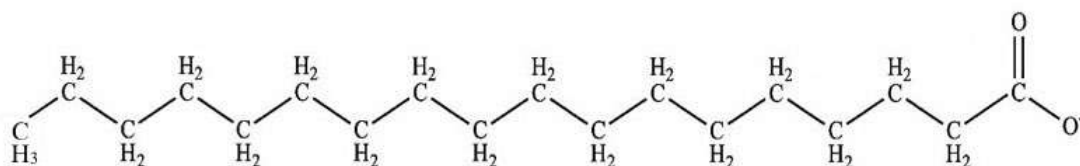
- (i) nyatakan nama bagi tindak balas yang digunakan dalam penyediaan sabun.
(R) *state the name of the reaction used in the preparation of soap.*

[1 markah]
 [1 mark]

- (ii) apakah fungsi natrium klorida dalam penyediaan sabun?
(R) *what is the function of sodium chloride in the preparation of soap?*

[1 markah]
 [1 mark]

- (iii) Rajah 5 menunjukkan formula struktur satu anion sabun.
(S) *Diagram 5 shows the structural formula of a soap anion.*



Rajah 5
 Diagram 5

Bulatkan pada bahagian anion sabun yang larut dalam air pada Rajah 5.
Circle the part of the soap anion that is soluble in water on Diagram 5.

[1 markah]
 [1 mark]

- (iv) Nyatakan **satu** bahan yang boleh digunakan untuk menggantikan minyak sawit dalam penyediaan sabun di dalam makmal.

*State **one** substance that can be used to replace palm oil in the preparation of soap in the laboratory.*

[1 markah]

[1 mark]

- (b) Jadual 3.1 menunjukkan dua set eksperimen untuk membandingkan keberkesanan tindakan pencucian sabun dan detergen di dalam air berasid.

Table 3.1 shows two sets of experiments to compare the effectiveness of cleansing action of soap and detergent in acidic water.

Set	Bahan Materials
I	100 cm ³ larutan sabun + 50 cm ³ air berasid + stokin dengan kotoran berminyak 100 cm ³ of soap solution + 50 cm ³ of acidic water + socks with oil stain
II	100 cm ³ larutan detergen + 50 cm ³ air berasid + stokin dengan kotoran berminyak 100 cm ³ of detergent solution + 50 cm ³ of acidic water + socks with oil stain

Jadual 3.1

Table 3.1

Nyatakan pemerhatian bagi Set I dan Set II.

State observations for Set I and Set II.

Set I :

Set II :

[2 markah]

[2 marks]

[Lihat halaman sebelah

SULIT

- (c) Jadual 3.2 menunjukkan maklumat berkaitan dua jenis ubat, P dan S.
Table 3.2 shows the information about two types of medicines, P and S.

Ubat <i>Medicine</i>	Penerangan <i>Description</i>
P	Digunakan untuk melegakan kesakitan Tidak sepatutnya diberikan kepada kanak-kanak <i>Used to relieve pain</i> <i>Should not be given to children</i>
S	Digunakan untuk merawat jangkitan yang disebabkan bakteria <i>Used to treat infections caused by bacteria</i>

Jadual 3.2
Table 3.2

Berdasarkan Jadual 3.2,
Based on Table 3.2,

- (i) anak lelaki Azmir sedang demam. Beri **satu** alasan mengapa ubat P tidak sesuai untuk
(T) anaknya yang berumur satu tahun. Cadangkan **satu** ubat yang boleh menggantikan ubat P.

*Azmir's son has a fever. Give **one** reason why medicine P is not suitable for his one year old son. Suggest **a** medicine that can replace medicine P.*

.....

.....

.....

[2 markah]
[2 marks]

- (ii) Apakah tindakan yang perlu diambil untuk memastikan keberkesanan ubat S?
(T) Berikan alasan anda.

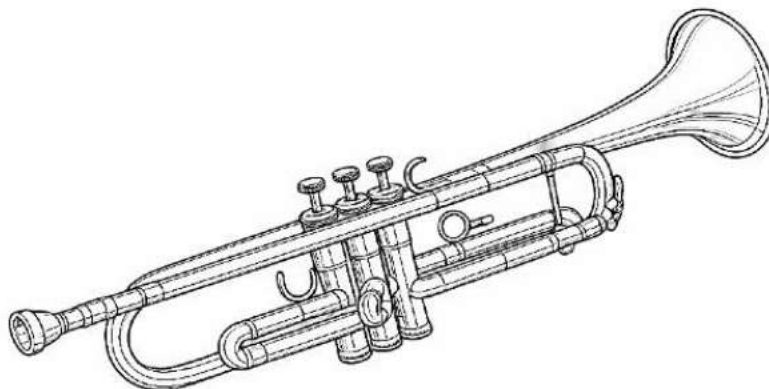
*What action should be taken to ensure the effectiveness of medicine S?
Give your reason.*

.....

.....

[2 markah]
[2 marks]

- 8 (a) Rajah 6 menunjukkan suatu peralatan yang diperbuat daripada sejenis aloi.
Diagram 6 shows an equipment made of a kind of alloy.



Rajah 6
Diagram 6

Berdasarkan Rajah 6,
Based on Diagram 6,

- (i) nyatakan maksud aloi.
(R) *state the meaning of alloy.*

.....
.....

[1 markah]
[1 mark]

- (ii) nyatakan nama aloi bagi peralatan ini.
(R) *state the name of the alloy for this equipment.*

.....
.....

[1 markah]
[1 mark]

- (iii) nyatakan dua unsur yang menghasilkan aloi bagi jawapan anda di 8(a)(ii).
(S) *state the two elements that produce the alloy for your answer in 8(a)(ii).*

.....
.....

[1 markah]
[1 mark]

[Lihat halaman sebelah
SULIT

- (b) Jadual 4 menunjukkan dua jenis bahan buatan dalam industri.
Table 4 shows two different types of manufactured substances in industry.

Bahan buatan <i>Manufactured substance</i>	Nama produk <i>Name of the product</i>	Komponen <i>Components</i>
A	Konkrit diperkukuhkan <i>Reinforced concrete</i>	Simen, pasir, batu kecil dan keluli <i>Cement, sand, pebbles and steel</i>
B	Silikon karbida <i>Silicone carbide</i>	Silikon dan karbon <i>Silicone and carbon</i>

Jadual 4

Table 4

- (i) Nyatakan jenis bahan buatan A dan B.
(R) *State the types of manufactured substances A and B.*

A :

B :

[2 markah]

[2 marks]

- (ii) Apakah kelebihan menggunakan konkrit diperkukuhkan berbanding konkrit?
(S) *What is the advantage of using reinforced concrete over concrete?*

.....

.....

[1 markah]

[1 mark]

- (c) Kaca fotokromik sangat sensitif terhadap cahaya. Kaca fotokromik lazimnya digunakan untuk membuat kaca bagi cermin mata yang menjadi gelap di bawah sinaran matahari yang terang, tetapi menjadi lutsinar dalam kecerahan biasa atau rendah.

Photochromic glass is very sensitive to light. Photochromic glass is commonly used to make glasses that darken in bright sunlight, but become transparent in normal or low brightness.

- (i) Nyatakan nama bahan kimia yang menyebabkan perubahan tersebut.

(R) *State the name of the chemical that causes the change.*

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

- (ii) Terangkan secara ringkas bagaimana perubahan tersebut berlaku.

(S) *Briefly explain how these changes occur.*

.....
.....
.....
.....
[2 markah]
[2 marks]

- (iii) Nyatakan **satu** kegunaan kaca fotokromik dalam kehidupan harian kita selain daripada cermin mata gelap.

*State **one** use of photochromic glasses in our daily lives other than sunglasses.*

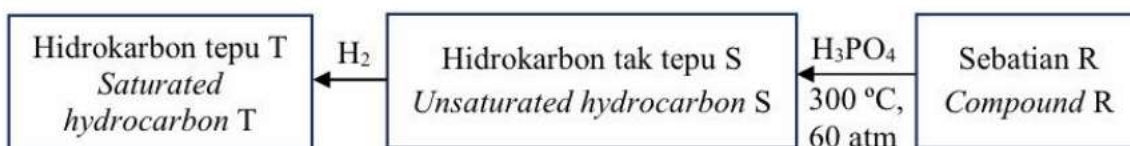
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[1 markah]
[1 mark]

Bahagian B

[20 markah]

Bahagian ini mengandungi **dua** soalan. Jawab **satu** soalan.

- 9 (a) Rajah 7.1 menunjukkan carta alir bagi penukaran hidrokarbon tak tepu S. Hidrokarbon tak tepu S mempunyai tiga atom karbon per molekul. *Diagram 7.1 shows a flow chart for the conversion of unsaturated hydrocarbon S. Unsaturated hydrocarbon S has three carbon atoms per molecule.*



Rajah 7.1
Diagram 7.1

Berdasarkan Rajah 7.1,
Based on Diagram 7.1,

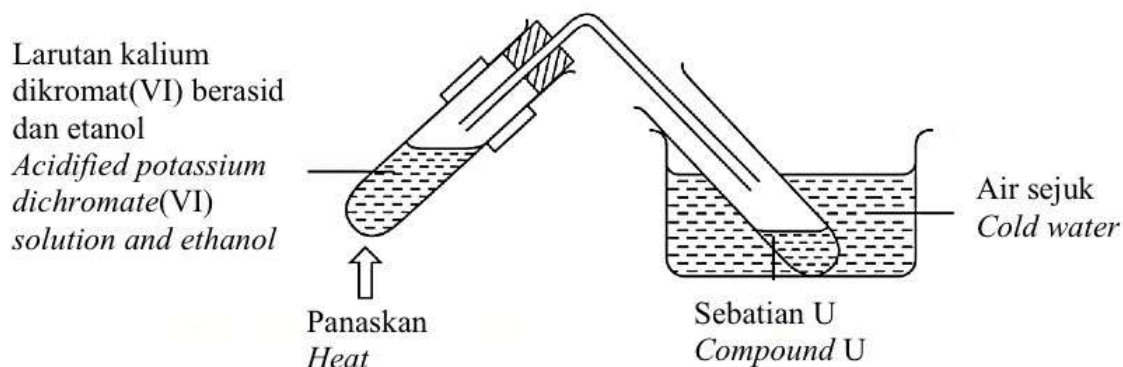
- (i) nyatakan nama dan kumpulan berfungsi bagi hidrokarbon tak tepu S.
(S) Lukis formula struktur sebatian R, nyatakan nama sebatian R dan formula amnya.
state the name and functional group of the unsaturated hydrocarbon S.
Draw the structural formula of compound R, state the name of compound R and its general formula.

[5 markah]
[5 marks]

- (ii) Kedua-dua hidrokarbon tak tepu S dan hidrokarbon tepu T boleh dibakar lengkap dalam oksigen berlebihan.
(T) Tulis persamaan kimia bagi pembakaran lengkap untuk hidrokarbon tepu T. Tentukan hidrokarbon yang akan menghasilkan jelaga yang lebih banyak. Terangkan jawapan anda.
[Jisim atom relatif: H = 1, C = 12]
Both unsaturated hydrocarbons S and saturated hydrocarbon T can be burned completely in oxygen.
Write the chemical equation for a complete combustion of saturated hydrocarbon T.
Determine which hydrocarbon will produce more soot. Explain your answer.
[Relative atomic mass: H = 1, C = 12]

[6 markah]
[6 marks]

- (b) Rajah 7.2 menunjukkan suatu susunan radas bagi tindak balas melibatkan etanol.
Diagram 7.2 shows an apparatus set-up for a reaction involving ethanol.



Rajah 7.2
 Diagram 7.2

Sebatian U yang terhasil digunakan dalam tindak balas A seperti yang ditunjukkan dalam Jadual 5.

Compound U produced is used in reaction A as shown in Table 5.

Tindak balas <i>Reaction</i>	Susunan radas <i>Apparatus set-up</i>	Pemerhatian <i>Observation</i>
A		

Jadual 5
 Table 5

Berdasarkan Rajah 7.2 dan Jadual 5,
Based on Diagram 7.2 and Table 5,

- (i) nyatakan nama sebatian U dan tindak balas untuk menghasilkan sebatian U. Nyatakan perubahan warna bagi larutan kalium dikromat(VI) berasid.

state the name of compound U and the reaction to produce compound U. State the colour change of acidified potassium dichromate(VI) solution.

[3 markah]

[3 marks]

- (ii) nyatakan nama tindak balas A dan sebatian X. Tulis persamaan kimia bagi tindak balas

- (S) A serta nyatakan **dua** sifat fizik sebatian X.

*State the name of reaction A and compound X. Write the chemical equation for reaction A and state **two** physical properties of compound X.*

[6 markah]

[6 marks]

Soalan 9

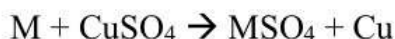
[illegible]

This image shows a full page of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for handwriting practice. There are no margins, text, or other markings on the page.

This image shows a full page of a handwriting practice worksheet. It consists of multiple rows of horizontal dashed lines spaced evenly down the page, providing a guide for letter height and placement. The background is plain white, and there are no margins or additional markings.

- 10 (a) Persamaan kimia bagi tindak balas penyesaran antara logam M dengan larutan kuprum(II) sulfat adalah seperti berikut:

Chemical equation for the displacement reaction between metal M and copper(II) sulphate solution is as follow:



- (i) Berdasarkan persamaan kimia itu, cadangkan logam M, jika haba penyesaran bagi tindak balas yang diperoleh daripada eksperimen ialah -210 kJ mol^{-1} .

Based on the chemical equation, suggest metal M, if heat of displacement for the reaction obtained from the experiment is -210 kJ mol^{-1} .

[1 markah]

[1 mark]

- (ii) Lukis gambar rajah aras tenaga bagi tindak balas penyesaran antara logam M dengan larutan kuprum(II) sulfat.

Draw the energy level diagram for the displacement reaction between metal M and copper(II) sulphate solution.

[3 markah]

[3 marks]

- (iii) Hitung perubahan suhu apabila serbuk M yang berlebihan dicampurkan ke dalam 100 cm^3 larutan kuprum(II) sulfat 0.5 mol dm^{-3} .

[Muatan haba tentu larutan = $4.2 \text{ J g}^{-1} \text{ }^\circ\text{C}^{-1}$]

Calculate the temperature change when excess powder M is added into 100 cm^3 of 0.5 mol dm^{-3} copper(II) sulphate solution.

[Specific heat capacity of solution = $4.2 \text{ J g}^{-1} \text{ }^\circ\text{C}^{-1}$]

[3 markah]

[3 marks]

- (iv) Jelaskan mengapa logam M yang ditambah kepada larutan kuprum(II) sulfat perlu berada dalam bentuk serbuk dan berlebihan.

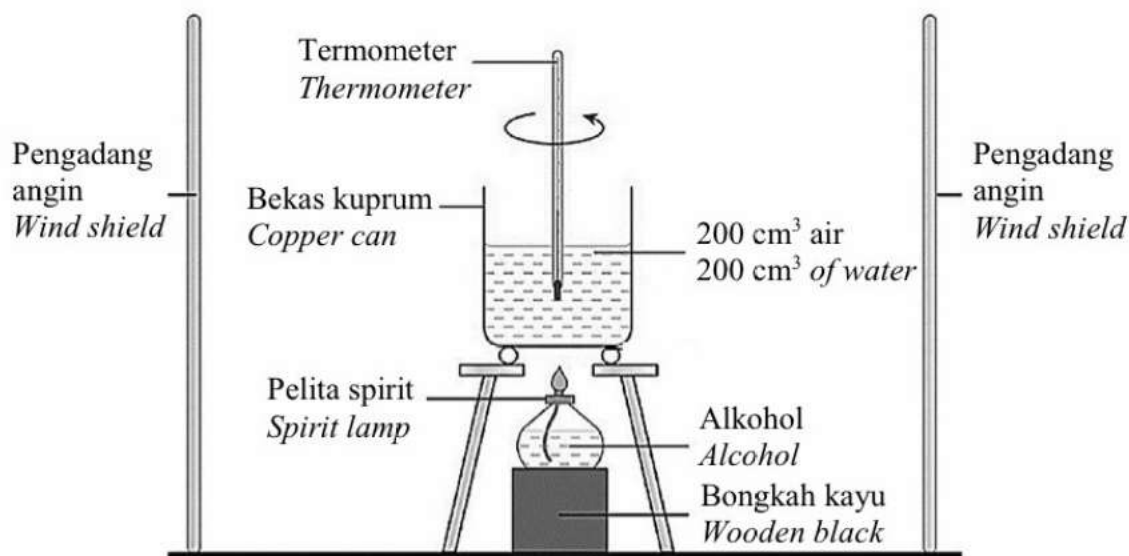
Explain why metal M that added into copper(II) sulphate solution must be in powder form and in excess.

[3 markah]

[3 marks]

- (b) Rajah 8.1 menunjukkan susunan radas yang digunakan untuk menentukan haba pembakaran bagi alkohol di dalam makmal kimia.

Diagram 8.1 shows the apparatus set-up used to determine the heat of combustion of alcohols in chemistry laboratory.



Rajah 8.1
Diagram 8.1

Jadual 6.1 menunjukkan haba pembakaran yang diperolehi daripada eksperimen yang dijalankan menggunakan susunan radas seperti dalam Rajah 8.1.

Table 6.1 shows the heat of combustion that obtained from the experiment carried out using the apparatus set-up as in Diagram 8.1.

Alkohol <i>Alcohol</i>	Haba pembakaran (kJ mol^{-1}) <i>Heat of combustion (kJ mol^{-1})</i>
Etanol <i>Ethanol</i>	-1300
Propanol <i>Propanol</i>	-1963
Butanol <i>Butanol</i>	-2613

Jadual 6.1
Table 6.1

- (i) Apakah yang dimaksudkan dengan haba pembakaran etanol?
(R) *What is meant by heat of combustion of ethanol?*

[1 markah]
[1 mark]

[Lihat halaman sebelah
SULIT

- (ii) Didapati haba pembakaran alkohol yang diperolehi daripada eksperimen dalam Rajah 7.1 kurang tepat. Cadangkan **satu** penambahbaikan yang perlu dilakukan ke atas susunan radas yang digunakan supaya keputusan yang lebih tepat akan diperolehi.

*It is found that the heat of combustion of alcohols obtained from the experiment in Diagram 7.1 are inaccurate. Suggest **an** improvement that can be done on the apparatus set-up used in order to obtain more accurate results.*

[1 markah]

[1 mark]

- (iii) Berdasarkan Jadual 6.1, terangkan mengapa haba pembakaran bagi ketiga-tiga alkohol tersebut berbeza.

Based on Table 6.1, explain why the heat of combustion of the three alcohols are different.

[4 markah]

[4 marks]

- (iv) Rajah 8.2 menunjukkan tren pintar hidrogen yang dicipta oleh syarikat pengangkutan untuk mengurangkan pembebasan gas rumah hijau berbanding dengan tren yang menggunakan bahan api tradisional.

Diagram 8.2 shows a smart hydrogen train created by transportation company to reduce greenhouse gas emissions compared to the train that uses traditional fuel.



Rajah 8.2
Diagram 8.2

Jadual 6.2 menunjukkan tiga jenis bahan api dengan nilai bahan api masing-masing.
Table 6.2 shows three types of fuel with their fuel values respectively.

Jenis bahan api <i>Type of fuel</i>	Nilai bahan api (kJ g⁻¹) <i>Fuel value (kJ g⁻¹)</i>
Hidrogen <i>Hydrogen</i>	143
Petrol <i>Petrol</i>	34
Arang batu <i>Coal</i>	30

Jadual 6.2

Table 6.2

Berdasarkan maklumat dalam Jadual 6.2,

Based on the information in Table 6.2,

- nyatakan maksud nilai bahan api.
state the meaning of fuel value.
- adakah gas hidrogen sesuai digunakan sebagai bahan api dalam tren berbanding dengan bahan api tradisional? Wajarkan jawapan anda.
is hydrogen gas suitable to be used as a fuel in train compared to the traditional fuel? Justify your answer.
- hitung haba pembakaran bagi hidrogen.
calculate heat of combustion of hydrogen.
[Jisim atom relatif: H = 1]
[Relative atomic mass: H = 1]

[4 markah]

[4 marks]

[Lihat halaman sebelah

SULIT

Soalan 10

[illegible]

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[illegible]

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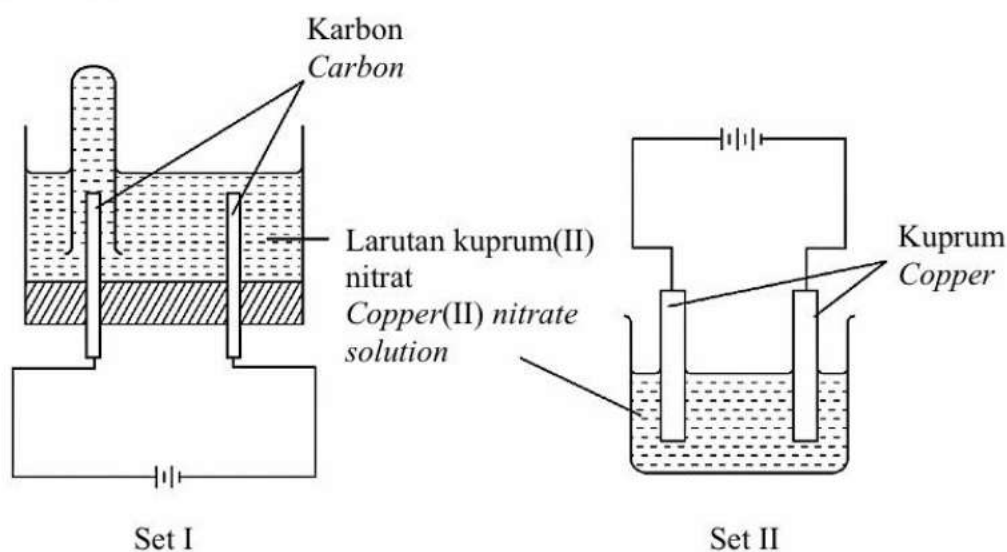
Bahagian C

[20 markah]

Soalan ini mesti dijawab.

- 11 (a) Seorang murid menjalankan eksperimen di dalam makmal untuk mengkaji faktor yang mempengaruhi pemilihan ion untuk dinyahcas pada elektrod berbeza. Rajah 9.1 menunjukkan susunan radas bagi kedua-dua set eksperimen itu.

A student conducts an experiment in laboratory to investigate the factors that affect the discharge of ions at different electrodes. Diagram 9.1 shows the apparatus set-up for both sets of the experiment.



Rajah 9.1
Diagram 9.1

Jadual 7.1 menunjukkan nilai keupayaan elektrod piawai bagi beberapa bahan.
Table 7.1 shows the value of standard electrode potential for a few substances.

Tindak balas sel setengah <i>Half-cell reaction</i>	E^0 (V) (298 K)
$\text{Cu}^{2+} + 2\text{e}^- \rightleftharpoons \text{Cu}$	+0.34
$\text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^- \rightleftharpoons 4\text{OH}^-$	+0.40
$2\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{H}_2$	0.00
$\text{NO}_3^- + 4\text{H}^+ + 3\text{e}^- \rightleftharpoons \text{NO} + 2\text{H}_2\text{O}$	+0.96

Jadual 7.1
Table 7.1

Berdasarkan Rajah 12 dan Jadual 7.1,
Based on Diagram 12 and Table 7.1,

Banding dan bezakan Set I dan Set II dari segi:

Compare and contrast between Set I and Set II based on:

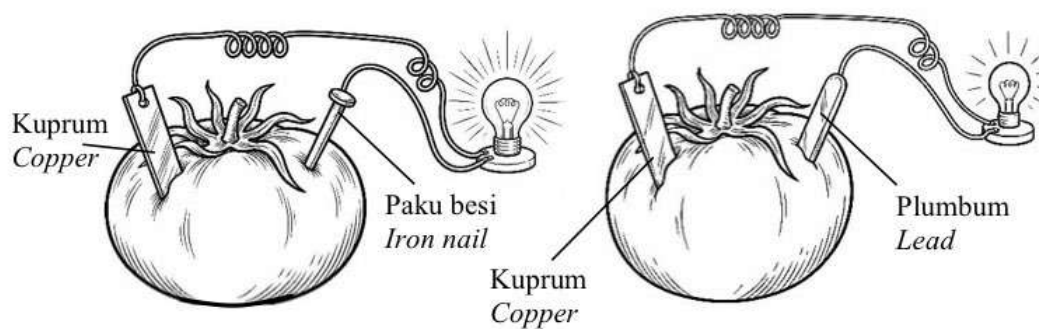
- Ion-ion tertarik ke anod
Ions attracted to anode
- Zarah yang dioksidakan dan sebabnya
Particles to be oxidised and the reason
- Pemerhatian di anod
Observation at anode
- Setengah persamaan bagi tindak balas di anod
Half equation for the reaction at anode

[10 markah]

[10 marks]

- (b) (i) Rajah 9.2 menunjukkan perbezaan kecerahan nyalaan mentol apabila dua pasang logam yang berbeza digunakan.

Diagram 9.2 shows the difference in brightness of bulb when two different pairs of metal are used.



Rajah 9.2
Diagram 9.2

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Berdasarkan Rajah 8.2, rancang eksperimen untuk menyiasat hubungan antara pasangan logam dengan nilai voltan sel. Anda dikehendaki menggunakan bahan dan radas di bawah.

Based on Diagram 8.2, plan an experiment to investigate the relationship between metal pairs and cell voltage. You are required to use the materials and apparatus below.

Kepingan kuprum <i>Copper strip</i>	Kepingan zink <i>Zinc strip</i>	Voltmeter <i>Voltmeter</i>
Paku besi <i>Iron nail</i>	Kertas pasir <i>Sand paper</i>	Wayar penyambung <i>Connecting wires</i>
Larutan natrium klorida, NaCl 1.0 mol dm ⁻³ 1.0 mol dm ⁻³ of sodium chloride solution, NaCl		

Huraikan secara ringkas langkah pembinaan sel kimia itu. Kemudian tentukan nilai voltan yang diperolehi bagi setiap pasangan logam menggunakan Jadual 7.2.

Describe briefly the steps of constructing the voltaic cells. Then, determine the value of voltage obtained for each metal pair using Table 7.2.

Tindak balas sel setengah <i>Half-cell reaction</i>	E ⁰ (V) (298 K)
$\text{Cu}^{2+} + 2\text{e}^- \rightleftharpoons \text{Cu}$	+0.34
$\text{Zn}^{2+} + 2\text{e}^- \rightleftharpoons \text{Zn}$	-0.76
$2\text{H}^+ + 2\text{e}^- \rightleftharpoons \text{H}_2$	0.00
$\text{Fe}^{2+} + 2\text{e}^- \rightleftharpoons \text{Fe}$	-0.44

Jadual 7.2

Table 7.2

[8 markah]

[8 marks]

- (ii) Gas X terbentuk di terminal positif bagi sel kimia yang dibina dalam soalan 11(b)(i).

- (S) Huraikan **satu** ujian kimia untuk mengesahkan gas X.

Gas X is formed at the positive terminal of chemical cell build in question 11(b)(i).

Describe a chemical test to verify gas X.

[2 markah]

[2 marks]

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This image shows a full page of white paper with horizontal dotted lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the page.

This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

KERTAS PEPERIKSAAN TAMAT

JADUAL BERKALA UNSUR

1 H Hidrogen 1 3 Li Litium 7 11 Na Natrium 23 19 K Kalium 39 37 Rb Rubidium 86 55 Cs Sesium 133 87 Fr Fransium 223 4 Be Berilium 9 12 Mg Magnesium 24 20 Ca Kalsium 40 38 Sr Strontium 88 56 Ba Barium 137 88 Ra Radium 226 21 Sc Skandium 45 39 Y Yttrium 89 57 La Lantanum 139 89 Ac Aktinium 227 22 Ti Titanium 48 40 Zr Zirkonium 91 72 Hf Hafnium 179 104 Rf Ruterfordium 257 23 V Vanadium 51 41 Nb Niobium 93 73 Ta Tantalum 181 105 Db Dubnium 260 24 Cr Kromium 52 42 Mo Molibdenum 96 74 W Tungsten 184 106 Sg Silborgium 263 25 Mn Mangan 55 43 Tc Teknesium 98 75 Re Renium 186 107 Bh Bohrium 262 26 Fe Ferum 56 44 Ru Rutenium 101 76 Os Osmium 190 108 Hs Hassium 265 27 Co Kobalt 59 45 Rh Rodium 103 77 Ir Iridium 192 109 Mt Meitnerium 266 28 Ni Nikel 59 46 Pd Paladium 106 78 Pt Platinum 195 110 Ds Darmstadtium 281 29 Cu Kuprum 64 47 Ag Argentum 108 79 Au Aurum 197 30 Zn Zink 65 48 Cd Kadmium 112 80 Hg Merkuri 201 5 B Boron 11 13 Al Aluminium 27 31 Ga Galium 70 49 In Indium 115 81 Tl Talium 204 6 C Karbon 12 14 Si Silikon 28 32 Ge Germanium 73 50 Sn Stannum 119 82 Pb Plumbum 207 7 N Nitrogen 14 15 P Fosforus 31 33 As Arsenik 75 51 Sb Antimoni 122 83 Bi Bismut 209 8 O Oksigen 16 16 S Sulfur 32 34 Se Selenium 79 52 Te Telurium 128 84 Po Polonium 210 9 F Flourin 19 17 Cl Klorin 35 35 Br Bromin 80 53 I Iodin 127 85 At Astatin 210 10 Ne Neon 20 18 Ar Argon 40 36 Kr Kripton 84 54 Xe Xenon 131 86 Rn Radon 222

10

Ne

Neon

20

Nombor proton

—

10

—

Ne

Simbol

—

Neon

Nama unsur

—

20

Jisim atom relatif

1 H Hydrogen 1	10 Ne Neon 20 Proton number Symbol Name of element Relative atomic mass																																																																																																																																																										
3 Li Lithium 7	4 Be Beryllium 9	5 B Boron 11	6 C Carbon 12	7 N Nitrogen 14	8 O Oxygen 16	9 F Fluorine 19	10 He Helium 4	11 Na Sodium 23	12 Mg Magnesium 24	13 Al Aluminium 27	14 Si Silicon 28	15 P Phosphorus 31	16 S Sulfur 32	17 Cl Chlorine 35	18 Ar Argon 40	19 K Potassium 39	20 Ca Calcium 40	21 Sc Scandium 45	22 Ti Titanium 48	23 V Vanadium 51	24 Cr Chromium 52	25 Mn Manganese 55	26 Fe Iron 56	27 Co Cobalt 59	28 Ni Nickel 59	29 Cu Copper 64	30 Zn Zinc 65	31 Ga Gallium 70	32 Ge Germanium 73	33 As Arsenic 75	34 Se Selenium 79	35 Br Bromine 80	36 Kr Krypton 84	37 Rb Rubidium 86	38 Sr Strontium 88	39 Y Yttrium 89	40 Zr Zirconium 91	41 Nb Niobium 93	42 Mo Molybdenum 96	43 Tc Technetium 98	44 Ru Ruthenium 101	45 Rh Rhodium 103	46 Pd Palladium 106	47 Ag Silver 108	48 Cd Cadmium 112	49 In Indium 115	50 Sn Tin 119	51 Sb Antimony 122	52 Te Tellurium 128	53 I Iodine 127	54 Xe Xenon 131	55 Cs Cesium 133	56 Ba Barium 137	57 La Lanthanum 139	58 Ce Cerium 140	59 Pr Praseodymium 141	60 Nd Neodymium 144	61 Pm Promethium 147	62 Sm Samarium 150	63 Eu Europium 152	64 Gd Gadolinium 157	65 Tb Terbium 159	66 Dy Dysprosium 163	67 Ho Holmium 165	68 Er Erbium 167	69 Tm Thulium 169	70 Yb Ytterbium 173	71 Lu Lutetium 175	72 Hf Hafnium 178	73 Ta Tantalum 181	74 W Tungsten 184	75 Re Rhenium 186	76 Os Osmium 190	77 Ir Iridium 192	78 Pt Platinum 195	79 Au Gold 197	80 Hg Mercury 201	81 Tl Thallium 204	82 Pb Lead 207	83 Bi Bismuth 209	84 Po Polonium 210	85 At Astatine 210	86 Rn Radon 222	87 Fr Francium 223	88 Ra Radium 226	89 Ac Actinium 227	90 Th Thorium 232	91 Pa Protactinium 231	92 U Uranium 238	93 Np Neptunium 237	94 Pu Plutonium 244	95 Am Americium 243	96 Cm Curium 247	97 Bk Berkelium 247	98 Cf Californium 249	99 Es Einsteinium 254	100 Fm Fermium 253	101 Md Mendelevium 256	102 No Nobelium 254	103 Lr Lawrencium 257	104 Rf Rutherfordium 261	105 Db Dubnium 260	106 Sg Seaborgium 263	107 Bh Bohrium 262	108 Hs Hassium 265	109 Mt Meitnerium 266	110 Ds Darmstadtium 281	111 La Lanthanum 139	112 Ce Cerium 140	113 Pr Praseodymium 141	114 Nd Neodymium 144	115 Pm Promethium 147	116 Sm Samarium 150	117 Eu Europium 152	118 Gd Gadolinium 157	119 Tb Terbium 159	120 Dy Dysprosium 163	121 Ho Holmium 165	122 Er Erbium 167	123 Tm Thulium 169	124 Yb Ytterbium 173	125 Lu Lutetium 175	126 Hf Hafnium 178	127 Ta Tantalum 181	128 W Tungsten 184	129 Re Rhenium 186	130 Os Osmium 190	131 Ir Iridium 192	132 Pt Platinum 195	133 Au Gold 197	134 Hg Mercury 201	135 Tl Thallium 204	136 Pb Lead 207	137 Bi Bismuth 209	138 Po Polonium 210	139 At Astatine 210	140 Rn Radon 222	141 Fr Francium 223	142 Ra Radium 226	143 Ac Actinium 227	144 Th Thorium 232	145 Pa Protactinium 231	146 U Uranium 238	147 Np Neptunium 237	148 Pu Plutonium 244	149 Am Americium 243	150 Cm Curium 247	151 Bk Berkelium 247	152 Cf Californium 249	153 Es Einsteinium 254	154 Fm Fermium 253	155 Md Mendelevium 256	156 No Nobelium 254	157 Lr Lawrencium 257	158