Chem Quest

2024

K1 TINGKATAN 4

Jom A+ Kimia

SPM 2023

PERCUMA - TIDAK DIJUAL

[Johor – JB – Tangkak – Skudai]
[Kedah – Kelantan – Negeri Sembilan]
[Pahang – Perlis – Putrajaya – SBP]
[Selangor-Set 1&2 – Terengganu MPP3]
[JUJ-Set 1&2 – Melaka – MRSM = 17Set]

Nama : ..... Kelas : .....

BAB1 - Pengenalan kepada Kimia

[Pahang JUJ Set 2 2023-01] Antara pernyataan berikut yang manakah melibatkan bidang kimia?
Which of the following statements involve chemistry field?

A Kajian tentang nutrisi haiwan
Study of the animal nutrition

B Mengkaji tekanan cecair dan gas
Investigate the liquid and gas pressure

C Mengkaji arus dan voltan dalam litar elektrik
Investigate the current and voltage of electricity

D Kajian untuk menurunkan takat lebur sesuatu bahan
Research in decreasing the melting point of a substance

[Selangor2023 Set 1-01] Apakah yang dilakukan selepas mengumpul data dalam suatu penyiasatan saintifik?
What is done after collecting data in a scientific investigation?

A Menginterpretasi dan menganalisis data
Interpreting and analysing the data

B Membuat hipotesis
Making a hypothesis

C Membina inferens
Constructing an inference

D Mengenal pasti pemboleh ubah
Identifying the variables

[Selangaor2023 Set 01-01] Pernyataan yang manakah benar tentang bahan-bahan kimia?
Which statement is true about chemicals?

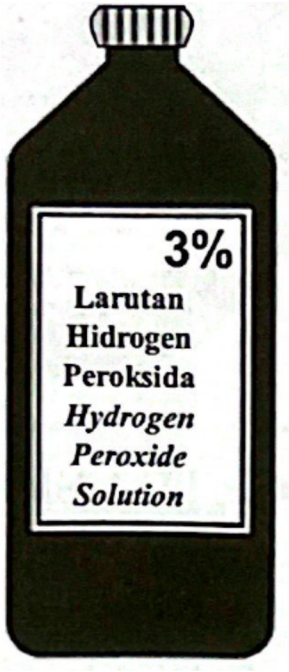
A Sifat-sifat bahan kimia dipelajari dalam Kimia
The properties of chemicals are studied in Chemistry

B Air digunakan untuk melarutkan semua bahan kimia
Water is used to dissolve all chemicals

C Semua bahan kimia adalah beracun dan berbahaya terhadap semua benda hidup
All chemicals are poisonous and harmful to all living things

D Semua bahan kimia boleh didapati di makmal kimia
All chemicals could be found in a chemistry laboratory

[Negeri Sembilan 2023-01] Rajah 1 menunjukkan cara penyimpanan satu larutan.
Diagram 1 shows the way to store a solution.



Antara yang berikut, ciri manakah yang menyebabkan larutan ini disimpan di dalam botol yang gelap?
Which of the following properties is the reason why the solution is stored in a dark bottle?

A Mudah terurai
Easily decomposed

B Mudah meletup
Easily explode

C Mudah meruap dan mudah terbakar
Volatile andflammable

D Mudah bertindak balas dengan kelembapan di udara
Easily reacts with moisture in the air

[Pahang 2023-01] Rajah 1 menunjukkan peralatan keselamatan di dalam makmal.
Diagram 1 shows the safety equipment in the laboratory.

Antara bahan berikut, yang manakah perlu dikendalikan di dalam peralatan keselamatan yang ditunjukkan dalam Rajah 1?
Which of the following chemicals need to be handled inside the safety equipment shown in Diagram 1?

A Gas oksigen
Oxygen gas

B Asid nitric
Nitric acid

C Gas klorin
Chlorine gas

D Kalium manganat(VII) berasid
Acidified potassium manganate(VII)

BAB2 - Jirim dan Struktur Atom

2.1 Konsep Asas Jirim

[Negeri Sembilan 2023-02] Bahan yang manakah merupakan satu unsur?
Which substance is an element?

A Air
Water

C Ammonia
Ammonia

B Karbon
Carbon

D Udara
Air

[Kelantan 2023-01] Antara berikut, yang manakah unsur?
Which of the following is an element?

A. Ammonia
Ammonia

C. Butanol
Butanol

B. Naftalena
Naphthalene

D. Oksigen
Oxygen

[Pahang JUJ Set 1 2023-02] Bahan manakah terdiri daripada atom?
Which substance consists of atoms?

A Gas neon
Neon gas

C Gas hydrogen
Hydrogen gas

B Gas oksigen
Oxygen gas

D Gas Ammonia
Ammonia gas

[Selangor2023 Set 1-15] Antara berikut, yang manakah wujud sebagai gas monoatom?
Which of the following exists as monoatomic gas?

A Klorin
Chlorine

C Argon
Argon

B Oksigen
Oxygen

D Hidrogen
Hydrogen

[Johor Skudai2023-02] Antara yang berikut, yang manakah adalah satu gas monoatom?
Which of the following is a monoatomic gas?

A Argon
Argon

B Klorin
Chlorine

C Hidrogen
Hydrogen

D Oksigen
Oxygen

[SBP2023-01] Antara yang berikut, bahan manakah yang wujud sebagai molekul pada suhu bilik?
Which of the following substances exist as molecule at room condition?

A Iodin
Iodine

B Helium
Helium

C Karbon
Carbon

D Kalsium
Calcium

[Pahang 2023-02] Antara bahan berikut, yang manakah wujud sebagai molekul?
Which of the following substances exist as molecules?

A Helium
Helium

B Karbon
Carbon

C Oksigen
Oxygen

D Platinum
Platinum

[Perlis 2023-04] Bahan manakah terdiri daripada ion?
Which substance consists of ions?

A Karbon dioksida
Carbon dioxide

B Sulfur dioksida
Sulphur dioxide

C Kalsium klorida
Calcium chloride

D Hidrogen klorida
Hydrogen chloride

[Kedah2023-01] Unsur manakah wujud dalam keadaan molekul pada suhu bilik?
Which element exist as a molecule in room temperature?

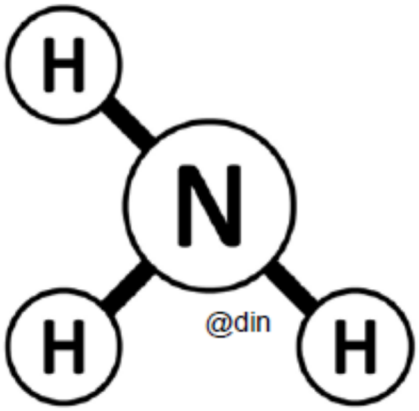
A Air
Water

B Karbon
Carbon

C Gas oksigen
Oxygen gas

D Natrium klorida
Sodium chloride

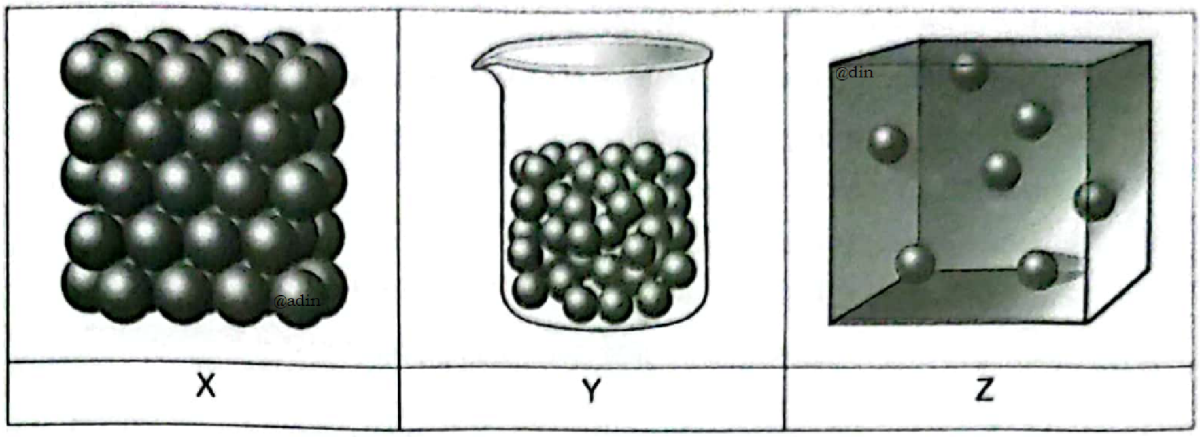
[MRSM2023-01] Rajah 1 menunjukkan formula struktur bagi bahan X.
Diagram 1 shows structural formula of substance X.



Apakah jenis zarah bagi bahan X?
What is the type of particle of substance X?

A Ion *Ion*	B Atom *Atom*	C Molekul *Molecule*

[Kedah2023-25] Rajah di bawah menunjukkan susunan zarah bagi bahan X, Y dan Z pada suhu bilik.
Diagram below shows the arrangement of particles for substances X, Y and Z at room temperature.



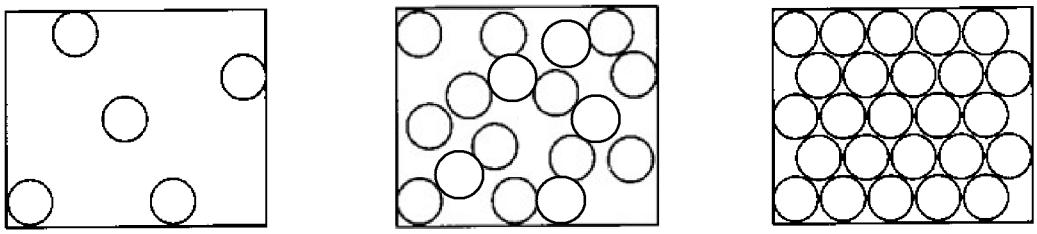
Apakah bahan X, Y dan Z?
What are the substances of X, Y and Z?

	X	*Y*	*Z*
A	*Bromin* *Bromine*	*Magnesium* *Magnesium*	*Hidrogen* *Hydrogen*
B	*Hidrogen* *Hydrogen*	*Bromin* *Bromine*	*Magnesium* *Magnesium*
C	*Hidrogen* *Hydrogen*	*Magnesium* *Magnesium*	*Bromin* *Bromine*
D	*Magnesium* *Magnesium*	*Bromin* *Bromine*	*Hidrogen* *Hydrogen*

[Selangaor2023 Set 01-08] Antara berikut, bahan yang manakah terdiri daripada atom, molekul dan ion?
Which of the following substances consist of atoms, molecules and ions?

	Atom *Atom*	Molekul *Molecule*	Ion *Ion*
A	Kuprum *Copper*	Magnesium oksida *Magnesium oxide*	Air Water
B	Kuprum *Copper*	Air *Water*	Magnesium oksida *Magnesium oxide*
C	Karbon dioksida *Carbon dioxide*	Kuprum *Copper*	Magnesium oksida *Magnesium oxide*
D	Magnesium oksida *Magnesium oxide*	Air *Water*	Kuprum *Copper*

[Johor Skudai2023-01] Rajah 1 menunjukkan susunan zarah dalam tiga keadaan jirim pada suhu bilik.
Diagram 1 shows the arrangement of particles in three states of matter at room temperature.



Rajah 1/Diagram 1

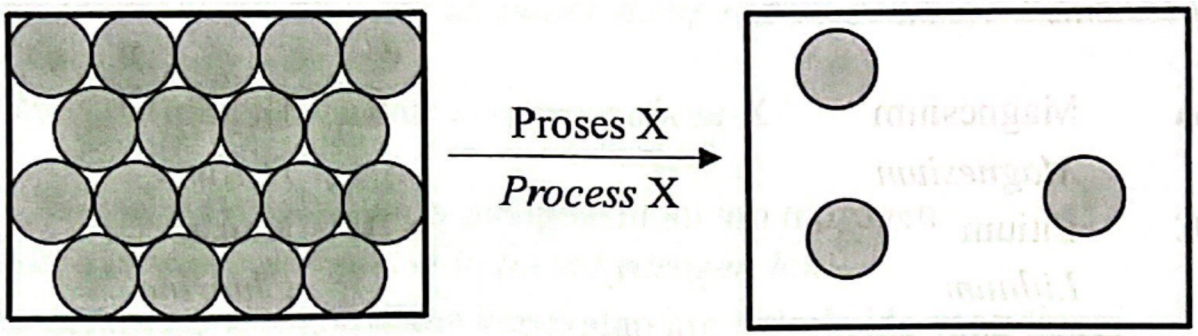
Apakah bahan P, Q dan R pada suhu bilik?
What are substances P, Q and R at room temperature?

	P	***Q***	***R***
A.	*Air* *Water*	*Glukosa* *Glucose*	*Hidrogen* *Hydrogen*
B.	*Air* *Water*	*Hidrogen* *Hydrogen*	*Glukosa* *Glucose*
C.	*Glukosa* *Glucose*	*Hidrogen* *Hydrogen*	*Air* *Water*
D.	*Hidrogen* *Hydrogen*	*Air* *Water*	*Glukosa* *Glucose*

[Terengganu2023-02] Antara yang berikut, padanan manakah yang betul bagi setiap bahan dan jenis zarahnya?
Which of the following is the correct match of each substance and its type of particles?

			
A	*Ion* *Ion*	*Molekul* *Molecule*	*Atom* *Atom*
B	*Molekul* *Molecule*	*Ion* *Ion*	*Atom* *Atom*
C	*Molekul* *Molecule*	*Atom* *Atom*	*Ion* *Ion*
D	*Atom* *Atom*	*Ion* *Ion*	*Molekul* *Molecule*

[Negeri Sembilan 2023-03] Rajah 2 menunjukkan susunan zarah bagi pertukaran keadaan jirim.
Diagram 2 shows the particles arrangement for the change of state of matter.



Antara yang berikut, bahan manakah yang akan mengalami proses X?
Which of the following substances will undergo process X?

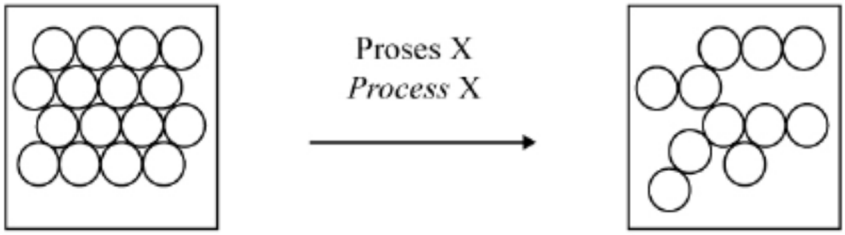
A Naftalena
Naphthalene

C Glukosa
Glucose

B Garam biasa
Table salt

D Cuka
Vinegar

[Selangaor2023 Set 01-14] Rajah 2 menunjukkan susunan zarah bagi pertukaran keadaan jirim.
Diagram 2 shows the particles arrangement for the change of state of matter.



Antara berikut, yang manakah adalah Proses X?
Which of the following is Process X?

A Pemejalwapan
Sublimation

B Kondensasi
Condensation

C Peleburan
Melting

D Penyejatan
Evaporation

[Johor Bahru 2023-01] Antara yang berikut, proses manakah yang menukarkan gas kepada cecair?
Which of the following process changes gas into liquid?

A Peleburan
Melting

B Pendidihan
Boiling

C Kondensasi
Condensation

D Pemejalwapan
Sublimation

[Pahang JUJ Set 2 2023-34] Bahan X mempunyai sifat-sifat yang berikut :
Substance X has the following properties:

- Takat lebur 50°C
  Melting point 50°C
- Takat didih 85°C
  Boiling point 85°C

Apakah keadaan fizikal X pada suhu bilik?
What is the physical state of X at room temperature?

A Gas
Gas

B Cecair
Liquid

C Pepejal
Solid

D Cecair dan gas
Liquid and gas

[Johor PPD Tangkak 2023-03] Haba diserap atau dibebaskan semasa perubahan keadaan jirim. Antara berikut, yang manakah dipadankan dengan betul?
Heat is absorbed or released during conversion of state. Which of the following pair is correctly matched?

	Proses yang terlibat *Process involved*	Haba diserap atau dibebaskan *Heat is absorbed or released*
A	Peleburan *Melting*	Haba dibebaskan *Heat is released*
B	Pendidihan *Boiling*	Haba dibebaskan *Heat is released*
C	Pemejalwapan *Sublimation*	Haba diserap *Heat is absorbed*
D	Pengendapan *Deposition*	Haba diserap *Heat is absorbed*

[Terengganu2023-25] Jadual 25 menunjukkan takat lebur dan takat didih bahan J, K, L dan M.
Table 25 shows melting point and boiling point of substances J, K. L and M.

Bahan *Substances*	Takat lebur (°C) *Meltinq point (°C)*	Takat didih (°C) *Boiling point (°C)*
J	-101.0	-35.0
K	-94.0	65.0
L	17.8	290.0
M	97.8	883.0

Bahan manakah yang akan berubah daripada cecair kepada pepejal apabila diletakkan di dalam peti ais yang bersuhu 2.0°C?
Which substance that will change from liquid to solid when placed in the freezer at temperature 2.0°C?

A J B K C L D M

[Putrajaya2023-17] Jadual 1 menunjukkan takat lebur dan takat didih bahan P, Q, R dan S.
Table 1 below shows the melting and boiling points of substances P, Q, R and S.

Bahan ***Substance***	**Takat Lebur (°C)** ***Melting point* (°C)**	**Takat didih (°C)** ***Boiling point* (°C)**
P	-75	-15
Q	-20	97
R	35	147
S	5	120

Jadual 1/ Table 1

Bahan yang manakah cecair pada suhu bilik?
Which substance is a liquid at roon temperature?

A Q sahaja
Q only

C Q dan S
Q and S

B R sahaja
R only

D R dan S
R and S

[Perlis 2023-20] Jadual 1 menunjukkan takat lebur dan takat didih bahan W, X, Y dan Z.
Table 1 below shows the melting and boiling points of substances W, X, Y and Z.

Bahan *Substance*	Takat lebur (°C) *Melting point* (°C)	Takat didih (°C) *Boiling point* (°C)
W	-75	-15
X	-20	97
Y	35	147
Z	5	120

Bahan yang manakah cecair pada suhu bilik?
Which substance is a liquid at room temperature?

A X dan Z
X and Z

C W sahaja
W only

B Y dan Z
Y and Z

D X sahaja
X only

[SBP2023-16] Antara yang berikut, perubahan keadaan jirim manakah yang menyebabkan tenaga kinetik zarah- zarah bertambah?
Which of the following inter-conversions of matter causes the kinetik energy of particles increases?

A Ais → Stim
Ice → Steam

C Stim → Air
Steam → Water

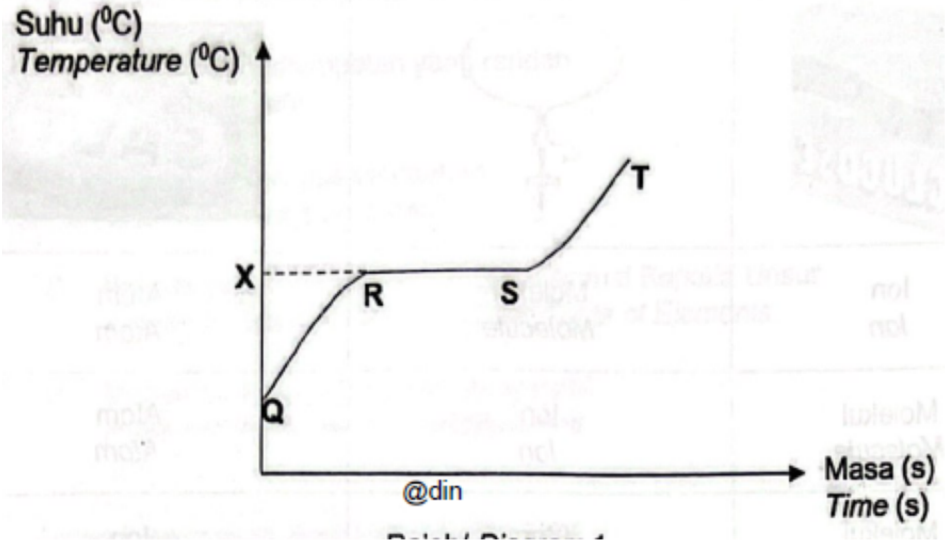
B Air → Ais
Water → Ice

D Stim → Ais
Steam → Ice

[Kelantan 2023-08] Antara bahan berikut yang manakah cecair pada 100°C
Which of the following substance is a liquid at 100°C?

	Bahan *Substance*	Takat lebur, °C *Melting point, °C*	Takat didih, °C *Boiling point, °C*
A	P	-157	-9
B	Q	-13	55
C	R	80	196
D	S	110	200

[Terengganu2023-01] Rajah 1 menunjukkan satu lengkung perubahan keadaan jirim bagi pepejal Z.
Diagram 1 shows a curve of change in the state of matter for solid Z.



Apakah takat X dan keadaan fizik Z dari R ke S?
What is the point X and physical state Z from R to S?

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

[Pahang JUJ Set 2 2023-02] Antara proses berikut yang manakah membebaskan tenaga haba?
Which of the following process release heat energy?

A Peleburan
Melting

B Pendidihan
Boiling

C Pengendapan
Deposition

D Pemejalwapan
Sublimation

[Melaka 2023-29] Rajah 7 menunjukkan pembentukan titisan air pada dinding luar gelas yang mengandungi minuman sejuk.
Diagram 7 shows the formation of water droplet on the outer wall of the glass containing a cold drink.

Antara berikut, penyataan manakah yang benar tentang pemerhatian di dalam Rajah 7?
Which of the following statements is correct about observation in Diagram 7?

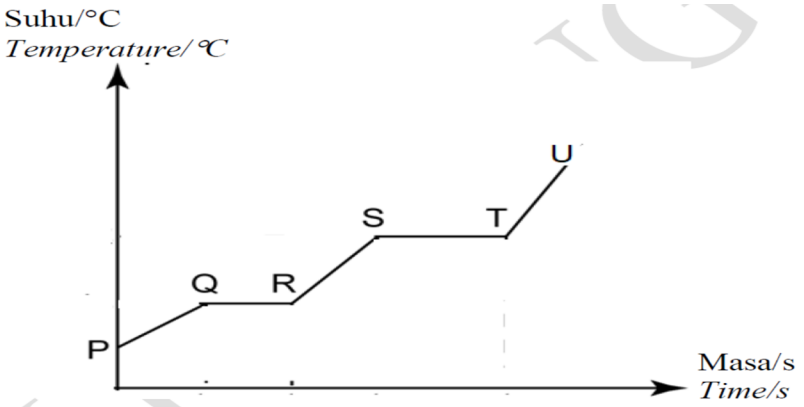
A Haba diserap dari persekitaran
Heat is absorbed from the surrounding

B Udara persekitaran yang panas terkondensasi
Hot surrounding air condenses

C Daya tarikan antara zarah semakin lemah
The attraction force between particles become weaker

D Proses pengendapan berlaku
The deposition process takes place

[Pahang JUJ Set 1 2023-16] F4 Bab 02
16 Rajah 3 menunjukkan graf suhu melawan masa bagi pemanasan pepejal naftalena.
Diagram 3 shows a graph of temperature against time for the heating of solid naphthalene.



Antara berikut, fasa manakah yang menunjukkan daya tarikan antara zarah naftalena yang paling kuat?
Which of the following phases shows the strongest force of attraction between naphthalene particles?

A P ke Q
P to Q

C S ke T
S to T

B R ke S
R to S

D T ke U
T to U

2.2 Perkembangan Model Atom

[Perlis 2023-13] Siapakah yang menjumpai neutron?
Who discovered neutrons?

A Neils Bohr
B J. J. Thomson
C James Chadwick
D Ernest Rutherford

[Johor Bahru 2023-02] Antara yang berikut, ahli saintis manakah yang menemui elektron?
Which of the following scientists discovered electron?

A John Dalton
B Ernest Rutherford
C Niels Bohr
D J.J Thompson

2.3 Struktur Atom

[Pahang JUJ Set 2 2023-18] Antara berikut, yang manakah betul mengenai proton?
Which of the following is correct about proton?

A Zarah subatom neutral
Neutral subatomic particle

B Terlibat dalam tindak balas kimia
Involves in chemical reaction

C Bergerak dalam petala mengelilingi nukleus
Move in shells around the nucleus

D Mempunyai jisim relatif yang sama seperti neutron
Has the same relative mass as neutron

[Johor Skudai2023-04] Rajah menunjukkan perwakilan piawai bagi atom natrium.
Diagram shows the standard representation of sodium atom.

23 11	Na

Apakah bilangan elektron valens bagi atom tersebut?
What is the number of valence electron of the atom?

A 1 B 2 C 11 D 12

[Negeri Sembilan 2023-21] Rajah 5 menunjukkan perwakilan piawai bagi atom *Z*.
Diagram 5 shows the standard representation of atom Z.

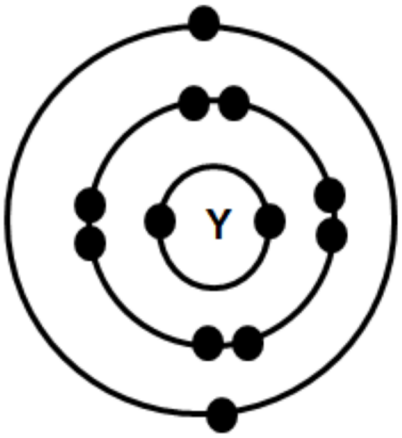
12 6	Z

Rajah 5/ Diagram 5

Apakah bilangan elektron valens bagi atom *Z*?
What is the number of valence electrons for atom Z?

A 2 B 3 C 4 D 6

[Pahang 2023-16] Rajah 2 menunjukkan susunan elektron bagi atom Y
Diagram 2 shows the electron arrangement of atom Y.



Bilangan neutron bagi atom Y ialah 12. Apakah perwakilan piawai bagi atom Y?
Number of neutron of atom Y is 12. What is the standard representation for atom Y?

A

24 12	Y

C

12 6	Y

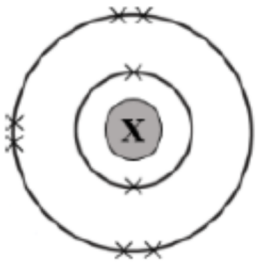
B

12 24	Y

D

12 12	Y

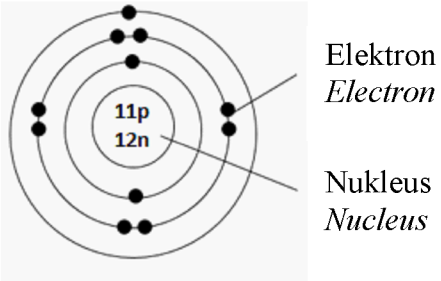
[MRSM2023-16] Rajah 8 menunjukkan susunan elektron bagi atom X yang mempunyai jisim atom relatif 17.
Diagram 8 shows the electron arrangement of atom X with the relative atomic mass of 17.



Berapakah bilangan neutron yang terdapat dalam nukleus atom X?
How many neutrons are there in the nucleus of atom X?

A 6 B 8 C 9 D 17

[Putrajaya2023-31] Rajah 11 menunjukkan susunan elektron bagi atom W.
Diagram 11 shows the electron arrangement of atom W.



Apakah perwakilan piawai bagi atom W?
What is the standard representation of atom W?

A	11 23	W

C	23 12	W

B	12 23	W

D	23 11	W

[Selangor2023 Set 1-08] Rajah 1 menunjukkan simbol perwakilan piawai bagi atom berilium.
Diagram 1 shows the standard representation symbol of beryllium atom.

9 4	Be

Apakah bilangan proton bagi atom berilium?
What is the number of protons for beryllium atom?

A 2 B 3 C 4 D 9

[Pahang 2023-31] Jadual 2 menunjukkan nombor proton bagi empat unsur.
Table 2 shows the proton number of four elements.

Unsur *Element*	Nombor proton *Proton number*
J	8
K	10
L	19
M	20

Diberi formula ion bagi unsur X ialah X2+. Unsur yang manakah mempunyai bilangan elektron valens yang sama seperti unsur X?
Given that the ionic formula of element X is X2+. Which element has the same number of valence electron as element X?

A J B K C L D M

[SBP2023-31] Berikut adalah maklumat tentang zarah X.
The following are information about particle X.

• Ion X^{2-} mempunyai susunan elektron 2.8.8
X^{2-} ion has electron arrangement of 2.8.8

• Bilangan neutron atom X adalah 16/
The number of neutrons of atom X is 16

Apakah nombor nukleon bagi atom unsur X?
What is the nucleon number of atom of element X?

A 30 B 32 C 34 D 36

[Kedah2023-29] Jadual menunjukkan maklumat bagi dua jenis zarah.
The table shows information about two typos of particle.

Zarah *Particle*	Nombor proton *Proton number*	Susunan elektron *Electron arrangement*
Y	9	2.8
Z	17	2.8.8

Apakah yang dapat diterangkan mengenai zarah Y dan Z berdasarkan jadual di atas?
What can be explained about particle Y and Z based on the table above?

A Gas nadir
Inert gases

B Ion negatif
Negative ions

C Atom logam
Atom of metals

D Isotop unsur yang sama
Isotopes of the same element

2.4 Isotop dan Penggunaannya

[Melaka 2023-01] Antara berikut yang manakah definisi isotop?
Which of the following is the definition of an isotope?

A Atom-atom yang sama yang mempunyai bilangan neutron yang sama tetapi bilangan proton yang berbeza
The same atoms that have the same number of neutrons but different number of protons

B Atom-atom yang berbeza yang mempunyai bilangan neutron yang sama tetapi bilangan proton yang berbeza
Different atoms that have the same number of neutrons but different number of protons

C Atom-atom yang sama yang mempunyai bilangan proton yang sama tetapi bilangan neutron yang berbeza
The same atoms that have the same number of protons but different number of neutrons

D Atom-atom yang berbeza yang mempunyai bilangan proton yang sama tetapi bilangan neutron yang berbeza
Different atoms that have the same number of protons but different number of neutrons

[Johor Bahru 2023-14] Antara bahan berikut, yang manakah ialah isotop magnesium?
Which of the following substances is an isotope of magnesium?

I	12 24	Mg

III	24 12	Mg

II	12 26	Mg

IV	26 12	Mg

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

[Pahang JUJ Set 1 2023-31] Jadual 2 menunjukkan kelimpahan semulajadi bagi isotop T.
Table 2 shows natural abundance of isotope T.

Isotop Isotope	Kelimpahan semulajadi Natural abundance
$^{28}_{14}T$	92.23 %
$^{29}_{14}T$	4.68 %
$^{30}_{14}T$	3.09 %

Jadual 2 /*Table 2*

Apakah jisim atom relatif bagi T?/ *What is the relative atomic mass of T?*

A 14.00 B 28.00 C 28.10 D 33.33

[Johor Skudai2023-05] Antara yang berikut, yang manakah adalah persamaan isotop bagi unsur?
Which of the following are the similarities of isotopes of elements?

I Bilangan neutron
Number of neutrons

II Bilangan proton
Number of protons

III Sifat fizik
Physical properties

IV Sifat kimia
Chemical properties

A I dan III
I and III

C II dan III
II and III

B I dan IV
I and IV

D II dan IV
II and IV

[Kelantan 2023-13] Jadual 1 menunjukkan maklumat bagi isotop atom-atom magnesium.
Table 1 shows information for isotopes of magnesium atoms

Isotop Isotope	Nombor proton Proton number	Jisim atom relatif Relative atomic mass	Kelimpahan semulajadi, % % Natural abundance, %
Mg-24	12	24	79
Mg-X	12	X	11
Mg-25	12	25	10

Apakah nilai X?/ *What is value of X?*
[Jisim atom relative/ *Relative atomic mass Mg=24]*

A. 22.1 B. 23.1 C. 24.1 D. 25.1

[Selangor2023 Set 1-14] Karbon-12 dan karbon-14 merupakan isotop. Apakah persamaan yang dimiliki oleh kedua-dua atom ini?
Carbon-12 and carbon-14 are isotopes.
What is the similarities do both atoms have?

I Bilangan proton
Number of protons

III Sifat fizik
Physical properties

II Bilangan neutron
Number of neutrons

IV Sifat kimia
Chemical properties

A I dan II
I and II

C II dan III
II and III

B I dan IV
I and IV

D III dan IV
III and IV

Kegunaan

[Pahang JUJ Set 2 2023-17] Antara yang berikut, yang manakah kegunaan karbon-14?
Which of the following is a use of carbon-14?

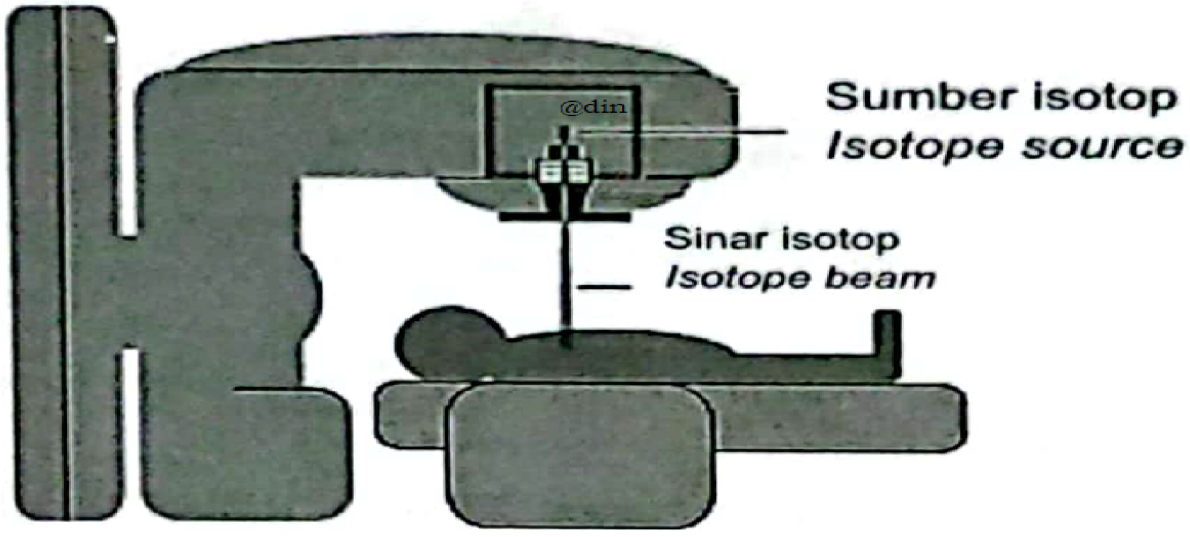
A Untuk merawat pesakit kanser
To treat cancer patients

B Untuk menganggar usia fosil dan artifak
To estimate the age of fossils and artifacts

C Untuk mengkaji metabolisme bagi fosforus dalam tumbuhan
To study the metabolism of phosphorus in plants

D Untuk memusnahkan bakteria dalam makanan tanpa mengubah kualiti makanan itu
To destroy bacteria in food without changing the quality of the food

[Kedah2023-15] Isotop digunakan secara meluas dalam pelbagai bidang termasuk perubatan.
Isotopes are used widely in various fields including medical.



Isotop manakah digunakan dalam rajah di atas.
Which isotope is used in the above diagram.

A Kobalt-60
Cobalt-60

B Karbon-14
Carbon-14

C Natrium-24
Sodium-24

D Fosforus-32
Phosphorus-32

[Putrajaya2023-02] Seorang pesakit kanser perlu menjalani rawatan radioterapi bagi membunuh sel-sel kanser. Apakah bahan yang digunakan dalam alat radioterapi itu?
A cancer patient needs to undergo radiotherapy treatment to kill cancer cells. What is the substance used in radiotherapy equipment?

A Iodin-131
Iodine-131

B Kobalt-60
Cobalt-60

C Natrium-24
Sodium-24

D Karbon-14
Carbon-14

[SBP2023-02] Antara yang berikut, padanan manakah yang betul?
Which of the following is matched correctly?

	Isotop *Isotope*	Kegunaan *Use*
A	Natrium-24 *Sodium-24*	Pengesan untuk mengkaji kumbahan *Detector to study sewage*
B	Plumbum-210 *Lead- 210*	Menganggar umur bahan artifak *Estimation of the age of artifacts*
C	Kobalt-60 *Cobalt-60*	Mensterilkan alat perubatan *Sterilising surgical tools*
D	Iodin-131 *Iodine-131*	Mengesan kebocoran paip bawah tanah *Detect leakage in underground pipes*

BAB 3 Konsep Mol, Formula dan Persamaan Kimia

3.1 Jisim Atom Relatif dan Jisim Molekul Relatif

[Selangor2023 Set 1-02] Antara berikut, yang manakah menunjukkan jisim atom relatif nitrogen yang betul?
Which of the following correctly shows the relative atomic mass of nitrogen?

A Purata jisim satu atom nitrogen
Jisim satu atom karbon-12

The average mass of a nitrogen atom
The mass of a carbon-12 atom

B Purata jisim satu atom nitrogen
12 x Jisim satu atom karbon-12

The average mass of a nitrogen atom
12 x The mass of a carbon-12 atom

C Purata jisim satu atom nitrogen
1/12 x Jisim satu atom karbon-12

The average mass of a nitrogen atom
1X 12 x The mass of a carbon-12 atom

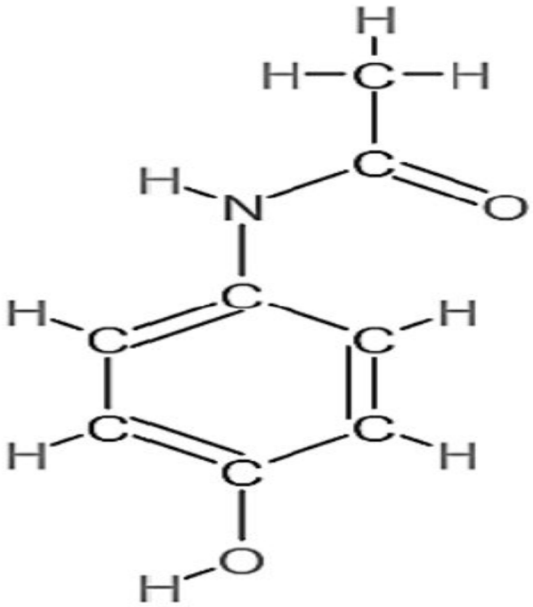
D Jisim satu atom karbon-12
1/12 x Purata jisim satu atom nitrogen

The mass of a carbon-12 atom
1X 12 x The average mass of a nitrogen atom

[Johor Skudai2023-27] Plaster of paris atau plaster gipsum sering digunakan untuk merawat pesakit yang mengalami kecederaan pada tulang. Ia terdiri daripada serbuk putih halus kalsium sulfat hemihidrat, $(CaSO_4)_2.H_2O$. Berapakah jisim molar kalsium sulfat hemihidrat?
[Jisim atom relatif: Ca = 40; S = 32; O = 16; H = 1]
Plaster of paris or gypsum plaster is often used to treat patients with bone injuries. It consists of a fine white powder of calcium sulphate hemihydrate, $(CaSO_4)_2.H_2O$. What is the molar mass of calcium sulphate hemihydrate?
[Relative atomic mass: Ca = 40; S = 32; O = 16; H = 1]

A 154 B 272 C 208 D 290

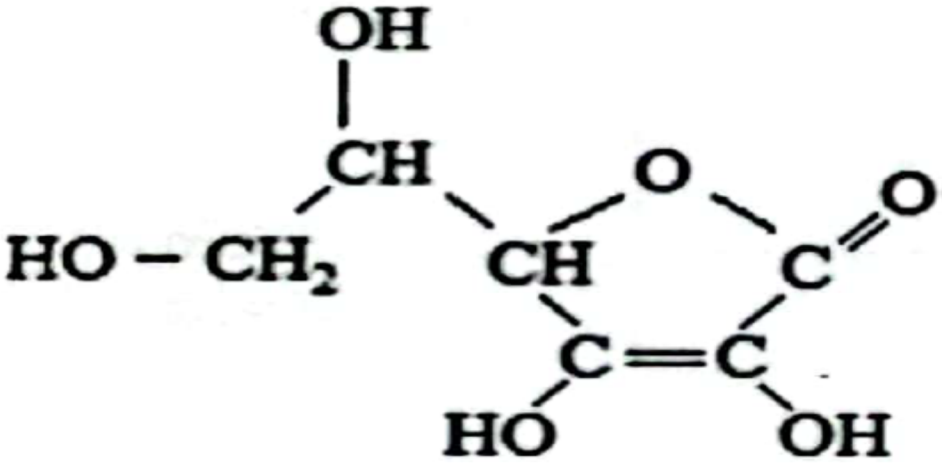
[Melaka 2023-03] Rajah 1 menunjukkan formula struktur bagi suatu bahan yang terdapat dalam ubat yang berfungsi melegakan rasa sakit.
Diagram 1 shows the structural formula for a substance found in a medicine that works to relieve pain.



Berapakah jisim molekul relatif bagi bahan itu?
What is the relative molecular mass for the substance?
[Jisim atom relatif/ [Relative atomic mass ; H = I, C = 12, N = 14, 0=16]

A 135 B 139 C 147 D 151

[Kedah2023-19] Rajah di bawah menunjukkan formula struktur bagi Vitamin C yang terdapat di dalam sebiji buah oren.
Diagram below shows the structural formula of Vitamin C that is found in an orange.



Apakah formula molekul bagi Vitamin C?
What is the molecular formula of Vitamin C?

A $C_6H_{10}O_7$ B $C_6H_8O_7$ C $C_6H_8O_8$ D $C_6H_8O_6$

3.2 Konsep Mol

[Perlis 2023-14] Antara berikut manakah merupakan nombor bagi pemalar Avogadro, NA?
Which of the following is the number for Avogadro's constant, NA?

A 6.02×10^{-24} mol^{-1} B 6.02×10^{23} mol^{-1}
C 6.02×10^{24} mol^{-1} D 6.02×10^{-23} mol^{-1}

[Negeri Sembilan 2023-04] Apakah unit bagi pemalar Avogadro?
What is the unit for Avogadro's constant?

A mol B mol^{-1} C g mol^{-1} D dm^3 mol^{-1}

[Putrajaya2023-04] Antara yang berikut, bahan manakah yang bersamaan dengan 1 mol?
[Pemalar Avogadro = 6.02 x 10^{23}, Jisim atom relatif: Mg = 24, Cl = 35.5, Isipadu molar gas pada keadaan bilik = 24 dm3 mol-1]
Which of the following substances equal to 1 mol?
[Avogadro constant = 6.02 x 10^{23}, Relative atomic mass: Mg = 24, Cl = 35.5, Molar volume of gas at room condition = 24 dm3 mol-1]

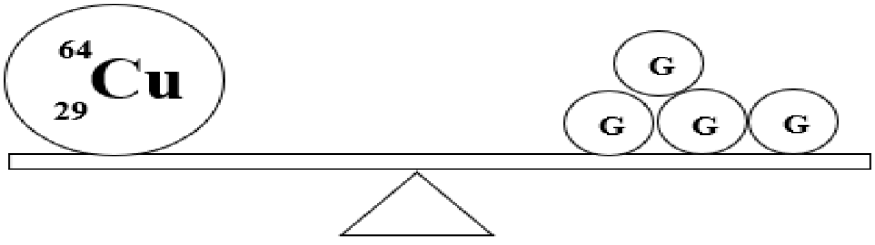
A Magnesium klorida mempunyai jisim 59.5 g
Magnesium chloride has mass 59.5 g

B Zink klorida mengandungi 6.02 x 10^{24} formula unit
Zinc chloride has 6.02 x 10^{24} formula units

C Silikon dioksida mengandungi 6.02 x 10^{23} molekul
Silicon dioxide consists of 6.02 x 10^{23} molecules

D Isipadu gas karbon dioksida pada keadaan bilik adalah 2400 cm^3
The volume of carbon dioxide at room condition is 2400 cm^3

[Putrajaya2023-16] Rajah 5 menunjukkan perbandingan jisim antara atom kuprum, Cu dengan atom G.
Diagram 5 shows a comparison of mass between copper, Cu atom with atom G.



Apakah jisim atom relatif bagi G?
What is the relative atomic mass of G?

A 16 B 29 C 64 D 116

[Johor PPD Tangkak 2023-02] Dua unsur X mempunyai jisim yang sama dengan satu atom kuprum. Berapakah jisim atom relatif X?
Two elements X have a mass equal as one copper atom. What is the relative atomic mass of X?
[Jisim atom relative/ Relative atomic mass: Cu = 64]

A 8 B 16 C 32 D 64

[MRSM2023-30] Berapakah jumlah bilangan atom hidrogen yang terdapat dalam 6.0 g propanol, C_3H_7OH?
[Jisim atom relatif: H = 1, C = 12, O = 16;
Pemalar Avogadro = 6.02×10^{23} mol^{-1}]
What is the total number of hydrogen atoms in 6.0 g of propanol, C_3H_7OH?
[Relative atomic mass: H = 1, C = 12, O = 16;
Avogadro constant = 6.02×10^{23} mol^{-1}]

A 4.816×10^{23}
B 4.214×10^{23}
C 2.408×10^{23}
D 6.020×10^{22}

[Melaka 2023-30] Bahan yang manakah mengandungi 6.02×10^{23} atom?
Which substance contains 6.02×10^{23} atom?

A 0.25 mol gas klorin
0.25 mol of chlorine gas

B 0.25 mol gas ammonia
0.25 mol of ammonia gas

C 0.5 mol gas oksigen
0.5 mol of oxygen gas

D 0.5 mol gas karbon dioksida
0.5 mol of carbon dioxide gas

[Selangor2023 Set 1-20] Antara berikut, bahan manakah yang mempunyai bilangan atom yang sama seperti dalam 0.2 mol gas hidrogen, H_2?
Which of the following substances contain the same number of atoms as in 0.2 moles of hydrogen gas, H_2?

I 0.1 mol gas argon, Ar
0.1 moles of argon gas, Ar

II 0.2 mol air, H_2O
0.2 moles of water, H_2O

III 0.1 mol sulfur trioksida, SO_3
0.1 moles of sulphur trioxide, SO_3

IV 0.4 mol magnesium, Mg
0.4 moles of magnesium, Mg

A I dan II
I and II

C II dan IV
II and IV

B I dan III
I and III

D III dan IV
III and IV

[Johor PPD Tangkak 2023-04] Kuantiti yang manakah adalah bersamaan dengan satu mol ammonia (NH3) dan satu mol gas metana (CH_4)?
Which quantity are the same for one mole of ammonia (NH3) and one mole methane (CH_4) gases?
[Jisim atom relative/ Relative atomic mass; H=1, C=12, N=14]

I Bilangan molekul
Number of molecules

II Bilangan atom
Number of atoms

III Isipadu
Volume

IV Jisim
Mass

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

[Johor PPD Tangkak 2023 36] Antara berikut, yang manakah mempunyai bilangan molekul yang sama dengan 17.6 g gas karbon dioksida?
Which of the following has the same number of molecules as 17.6 g carbon dioxide gas?
[Jisim atom relatif/ Relative atomic mass: C=12, O= 16, S =32, I=127]

A 7.2 g air
7.2 g of water

C 6.4 g gas oksigen
6.4 g of oxygen gas

B 50.8 g iodin
50.8 g of iodine

D 19.2 g sulfur dioksida
19.2 g of sulphur dioxide

3.3 Formula Kimia

[Selangaor2023 Set 01-02] Antara pasangan nama IUPAC dengan formula kimia sebatian berikut, yang manakah adalah betul?
Which pair of IUPAC name and chemical formula of the compound is correct?

	Nama IUPAC *IUPAC name*	Formula kimia *Chemical formula*
A	Magnesium nitrat *Magnesium nitrate*	$MgNO_3$
B	Kalsium karbonat *Calcium carbonate*	Ca_2CO_3
C	Natrium klorida *Sodium chloride*	NaCl
D	Aluminium sulfat *Aluminium sulphate*	$Al_3(SO_4)_2$

[SBP2023-03] Apakah formula kimia bagi ferum(III) oksida?
What is the chemical formula of iron(III) oxide

A FeO_3 B Fe_3O C Fe_2O_3 D Fe_3O_2

[Johor Skudai2023-03] Formula kimia bagi kuprum(I) oksida ialah
Chemical formula of copper(I) oxide is

A CuO B CuO_2 C Cu_2O D Cu_2O_2

[Putrajaya2023-03] Antara yang berikut, yang manakah formula ion yang betul?
Which of the following is the correct formula of an ion?

A Ag^{2+} B Ag^{3+} C Al+ D Al^{3+}

[Negeri Sembilan 2023-05] Antara yang berikut, kation manakah casnya dipadankan dengan betul?
Which of the following cation's charge is matched correctly?

	Kation *Cation*	Cas *Charge*
A	Ion zink *Zinc ion*	+1
B	Ion kalium *Potassium ion*	+2
C	Ion aluminium *Aluminium ion*	+1
D	Ion magnesium *Magnesium ion*	+2

[Pahang JUJ Set 1 2023-18] Formula bagi garam nitrat M ialah MNO_3. Apakah formula bagi garam fosfat M?
The formula for M nitrate salt is MNO_3. What is the formula for M phosphate salt?

A MPO_4 B M_2PO_4 C M_3PO_4 D $M_2(PO_4)_3$

[Putrajaya2023-33] Ion dikromat(VI), $Cr_2O_7^{2-}$ bertindak balas dengan suatu unsur Y dalam Kumpulan I untuk membentuk suatu sebatian Y. Y bukan simbol sebenar unsur itu. Apakah formula bagi sebatian itu?
Dichromate(VI) ion, $Cr_2O_7^{2-}$ reacts with an element Y in Group 1 to form a compound. Y is not the actual symbol of the element.
What is the formula of the compound?

A YCr_2O_7 B $Y(Cr_2O_7)_2$ C $Y_2Cr_2O_7$ D $Y_2(Cr_2O_7)_3$

[Johor Bahru 2023-08] Antara yang berikut, pernyataan manakah yang betul tentang formula empirik?
Which of the following statements is correct about empirical formula?

A Formula yang menunjukkan nisbah teringkas atom bagi setiap unsur dalam suatu sebatian
Formula that shows the simplest ratio of atoms of each element in a compound

B Formula yang menunjukkan bilangan sebenar atom yang terdapat di dalam satu molekul sesuatu sebatian
Formula that shows the actual number of atoms of each element in a molecule of a compound

C Formula yang menunjukkan nisbah mol bagi setiap unsur dalam suatu sebatian
Formula that shows the ratio of mole of each element in a compound

D Formula yang menunjukkan bilangan mol bagi setiap unsur dalam suatu scbatian
Formula that shows the number of mole of each element in a compound

[SBP2023-17] Antara yang berikut, bahan manakah yang mempunyai formula empirik yang betul?
Which of the following substances has the correct empirical formula?

	Bahan *Substance*	Formula empirik *Empirical formula*
A	Asid butanoik/ *Butanoic acid*	$C_4H_8O_2$
B	Etil etanoat /*Ethyl ethanoate*	$C_2H_4O_2$
C	Glukosa/*Glucose*	$C_6H_{12}O_6$
D	Pentanol/*Pentanol*	$C_5H_{12}O$

[MRSM2023-17] Antara yang berikut, yang manakah mempunyai formula empirik yang sama seperti etena, C_2H_4?
Which of the following has the same empirical formula as ethene, C_2H_4?

A C_2H_6 B C_3H_8 C C_4H_{10} D C_6H_{12}

[Johor Skudai2023-31] 0.40g logam X bertindak balas dengan fluorin untuk menghasilkan 0.78g X fluorida. Apakah formula empirik bagi X fluorida itu?
0.40g X metal reacts with fluorine to produce 0.78g of X fluoride. What is the empirical formula of the X fluoride?
[jisim atom relative/ Relative atomic mass :F = 19; X = 40

A X F B XF_2 C X_2F D XF_4

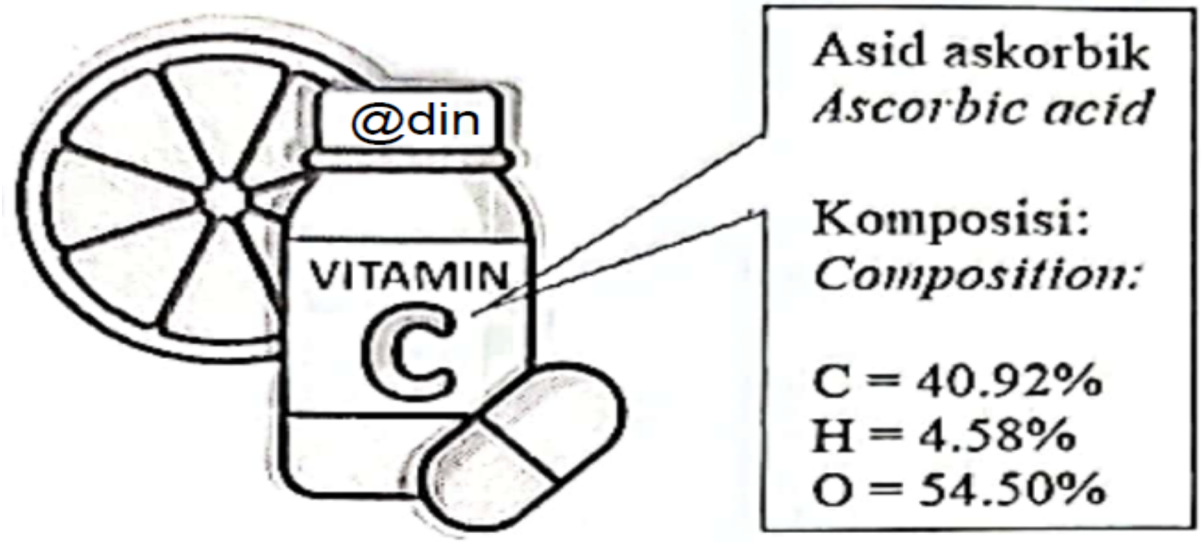
[SBP2023-32] Tindak balas antara 5.4 g unsur Q dengan x g klorin menghasilkan satu sebatian dengan formula empirik $QC1_3$? Apakah nilai x?
Reaction between 5.4 g element Q with x g chlorine produces a compound with the empirical formula $QC1_3$. What is the value of x?
[Jisim atom relatif/ Relative atomic mass : Cl = 35.5. Q = 27]

A 7.1 B 10.7 C 14.2 D 21.3

[Selangor2023 Set 1-26] Dalam satu tindak balas kimia, didapati 2.16 g magnesium telah bertindak balas selengkapnya dengan 0.84 g nitrogen. Apakah formula empirik sebatian yang terhasil?
In a chemical reaction, it was found that 2.16 g of magnesium reacted completely with 0.84 g of nitrogen.
What is the empirical formula of the compound formed?
[Jisim atom relative/ Relative atomic mass: N = 14, Mg = 24]

A MgN_3 B Mg_2N_3 C Mg_3N D Mg_3N_2

[Johor Bahru 2023-35] Rajah 12 menunjukkan komposisi asid askorbik dalam serum vitamin C yang digunakan dalam produk penjagaan kulit.
Diagram 12 shows the composition of ascorbic acid in vitamin C serum used in skin care products.



Apakah formula empirik bagi asid askorbik?
What is the empirical formula for ascorbic acid?
[Jisim atom relatif/ Relative atomic mass: H = 1; C = 12; O = 16]

A CHO B $C_3H_5O_3$ C $C_3H_4O_3$ D $C_6H_4O_3$

[Johor PPD Tangkak 2023 38] Rajah 20 menunjukkan komposisi unsur di dalam cangkerang siput.
Diagram 20 shows the composition of element in a seashell.

Cangkerang siput/ *Seashell*

Unsur *Element*	Jisim (g) *Mass (g)*
X	25.0
Y	7.5
Z	30.0

Apakah formula empirik bagi sebatian dalam cangkerang siput tersebut?
What is the empirical formula of the compound in the seashell?
[Jisim atom relatif/ Relative atomic mass: X=40; Y =12; Z=16]

A XYZ B XY_2Z C XYZ_3 D XYZ_2

[Selangaor2023 Set 01-27] Rajah 8 menunjukkan komposisi sejenis pinggan melamin.
Diagram 8 shows the composition of melamine plates.

Unsur *Elements*	Komposisi *Composition*
C	28.6 %
H	4.8 %
N	66.6 %

Apakah formula empirik melamin?
What is the empirical formula of melamine"?
[Jisim atom relative/ Relative atomic mass: H = 1, C = 12, N = 14]

A CHN B CH_2N_2 C C_2H_2N D C_2HN_2

[Pahang JUJ Set 2 2023-04] Apakah maksud formula molekul?
What is the meaning of molecular formula?

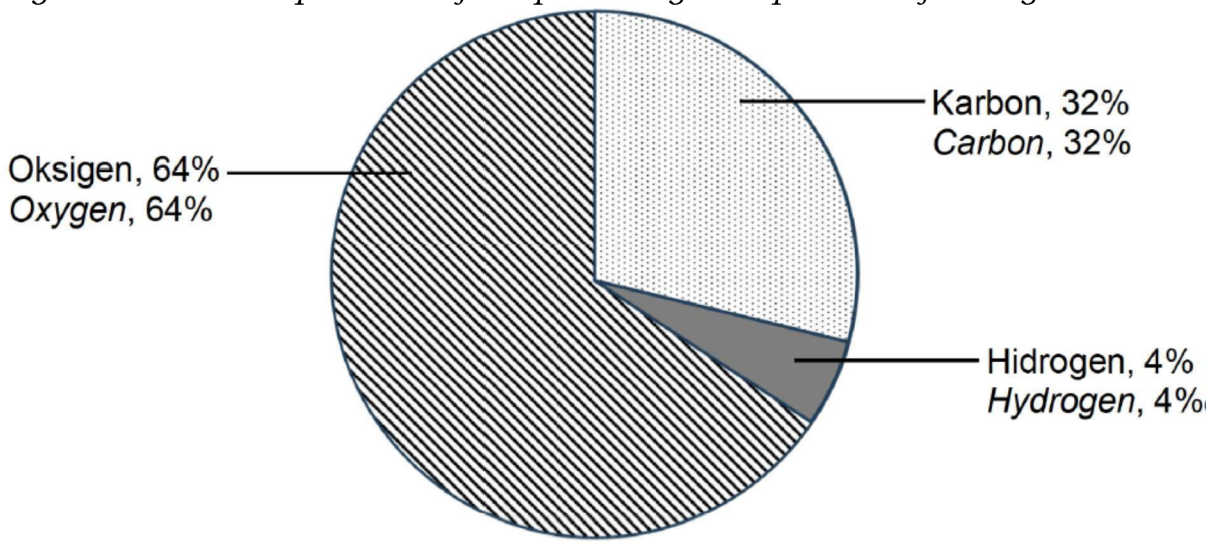
A Formula yang menunjukkan bilangan unsur dalam sebatian
Formula that shows the number of element in the compound

B Formula yang menunjukkan jumlah semua atom dalam sebatian
Formula that shows total of atoms in the compound

C Formula yang menunjukkan nisbah teringkas setiap atom unsur dalam sebatian
Formula that shows the simplest ratio of atoms of each element in the compound

D Formula yang menunjukkan bilangan sebenar atom setiap unsur dalam sebatian
Formula that shows the actual number of atoms of each element in the compound

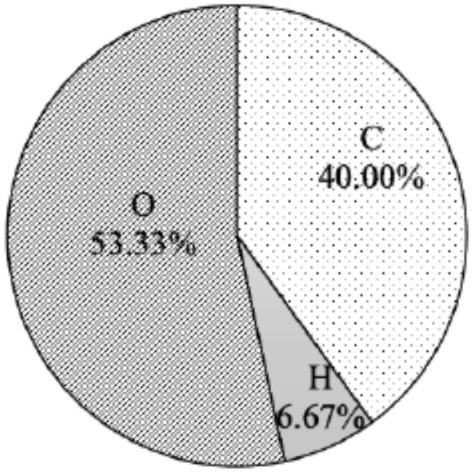
[Kelantan 2023-36] Rajah 18 menunjukkan carta pai bagi peratusan komposisi bagi satu asid organik.
Figure 18 shows a pie chart of the percentage composition of an organic acid.



Apakah formula molekul asid organik tersebut?
[Jisim atom relatif: H=1, C=12, O=16;
Jisim molar asid organik = 150 g mol^{-1}]
What is the molecular formula of the organic acid?
[Relative atomic mass : H=1, C=12, 0=16;
Molar mass organic acid = 150 g mol^{-1}]

A. $C_8H_{12}O_{16}$ B. $C_2H_3O_3$ C. $C_4H_6O_6$ D. $C_6H_{12}O_6$

[MRSM2023-37] Rajah 14 menunjukkan komposisi unsur bagi bahan W. Jisim molekul relatif bagi bahan W ialah 90.
Diagram 14 shows the composition of the elements in substance W. The relative molecular mass of substance W is 90.



Antara yang berikut, manakah pasangan formula empirik dan formula molekul yang betul bagi bahan W?
[Jisim atom relatif: H = 1, C = 12, O = 16]
Which of the following is the correct pair of empirical formula and molecular formula of substance W?
[Relative atomic mass: H = 1, C = 12, O = 16]

	Formula empirik *Empirical formula*	Formula molekul *Molecular formula*
A	CH_2O	CH_2O
B	CH_2O	$C_3H_6O_3$
C	$C_3H_6O_3$	$C_3H_6O_3$
D	CH_3O	$C_2H_6O_2$

[Johor Bahru 2023-36] Rajah 13 menunjukkan perwakilan piawai bagi atom P dan atom Q.
Diagram 13 shows the standard representation of atom P and atom Q.

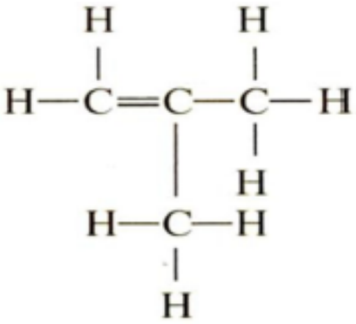
27 13	P		35 17	Q

Rajah 13 / *Diagram 13*

Hitung jisim molekul relatif bagi sebatian yang terbentuk apabila atom P membentuk ikatan dengan atom Q.
Calculate the relative molecular mass of the compound formed when atom P forms a bond with atom Q.

A 159 B 132 C 62 D 30

[Johor PPD Tangkak 2023-07] Rajah 3 menunjukkan formula struktur satu sebatian T.
Diagram 3 shows the structural formula of compound T.

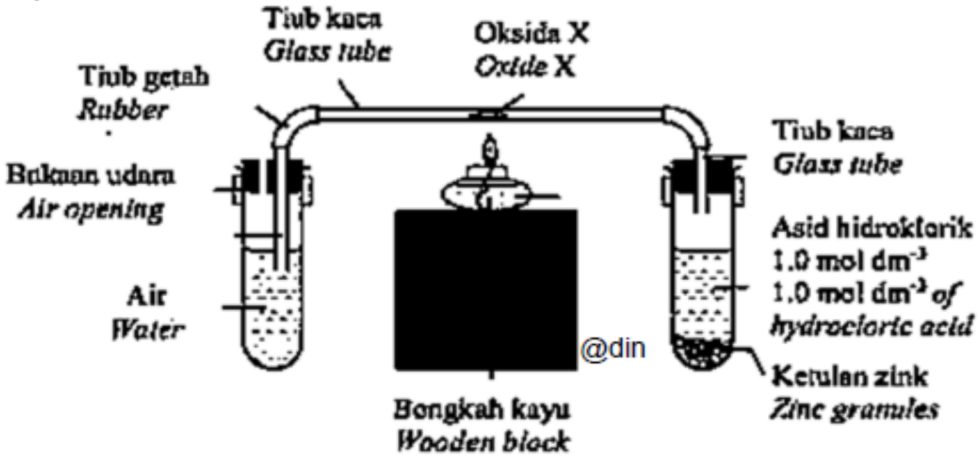


Rajah 3 / Diagram 3

Berapakah peratus jisim karbon dalam sebatian T?
What is the percentage of carbon by mass in compound T?
[Jisim atom relatif/ Relative atomic mass: H = 1; C = 12]

A 85.71 % B 82.79 % C 21.42 % D 20.69 %

[Johor PPD Tangkak 2023-05] Rajah 1 menunjukkan susunan radas untuk menentukan formula empirik suatu oksida logam.
Diagram 1 shows the set-up of the apparatus used to determine the empirical formula of a metal oxide.



Antara oksida logam berikut, yang manakah sesuai digunakan dalam eksperimen?
Which one of the following metal oxides is suitable to be used in the experiment?

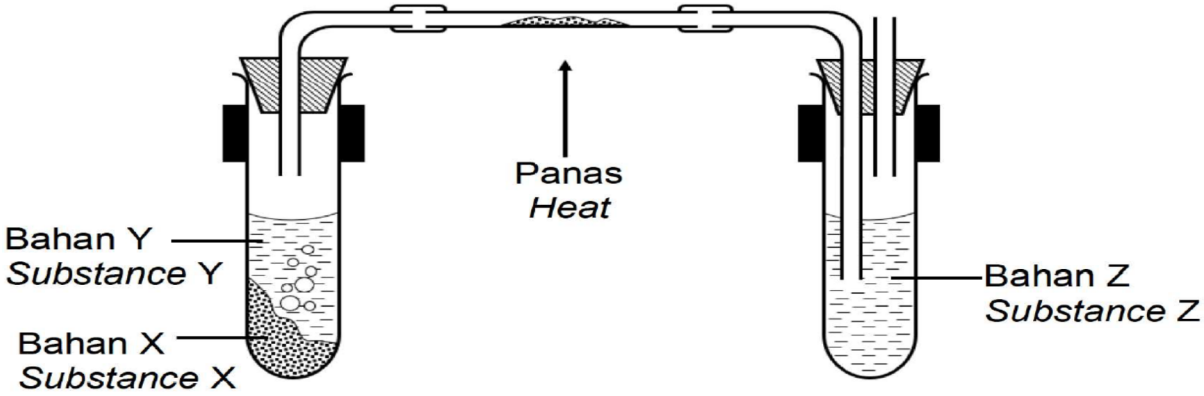
A Magnesium oksida
Magnesium oxide

B Kuprum(II) oksida
Copper(II) oxide

C Aluminium oksida
Aluminium oxide

D Kalsium oksida
Calcium oxide

[Kelantan 2023-10] Rajah 4 menunjukkan susunan radas yang digunakan untuk mencari formula empirik bagi satu oksida logam.
Diagram 4 shows the arrangement of the apparatus used to find the empirical formula for a metal oxide.

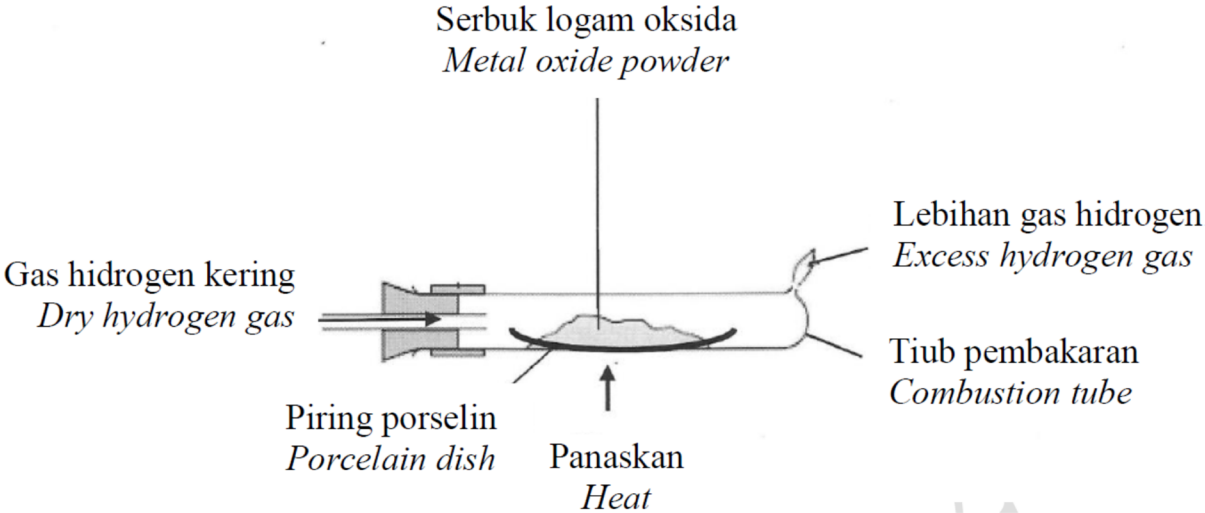


Rajah 4/ *Diagram 4*

Apakah bahan P dan proses X?
What is substance P and process X?

	Bahan X *Substance X*	Bahan Y *Substance Y*	Bahan Z *Substance Z*
A	Natrium *Sodium*	Air *Water*	Asid hidroklorik *Hydrochloric acid*
B	Zink *Zinc*	Asid hidroklorik *Hydrochloric acid*	Air *Water*
C	Kuprum *Copper*	Asid nitric *Nitric acid*	Natrium hidroksida *Sodium hydroxide*
D	Plumbum *Lead*	Asid etanoik *Ethanoic acid*	Air *Water*

[Pahang JUJ Set 2 2023-23] Rajah 5 menunjukkan susunan radas bagi menentukan formula empirik bagi suatu logam oksida.
Diagram 5 shows the apparatus set-up to determine the empirical formula of a metal oxide.



Antara yang berikut, logam manakah yang menggunakan kaedah yang sama untuk menentukan formula empiriknya?
Which of the following metal use the same method to determine its empirical formula?

I Zink
Zinc

II Plumbum
Lead

III Argentum
Silver

IV Aluminium
Aluminium

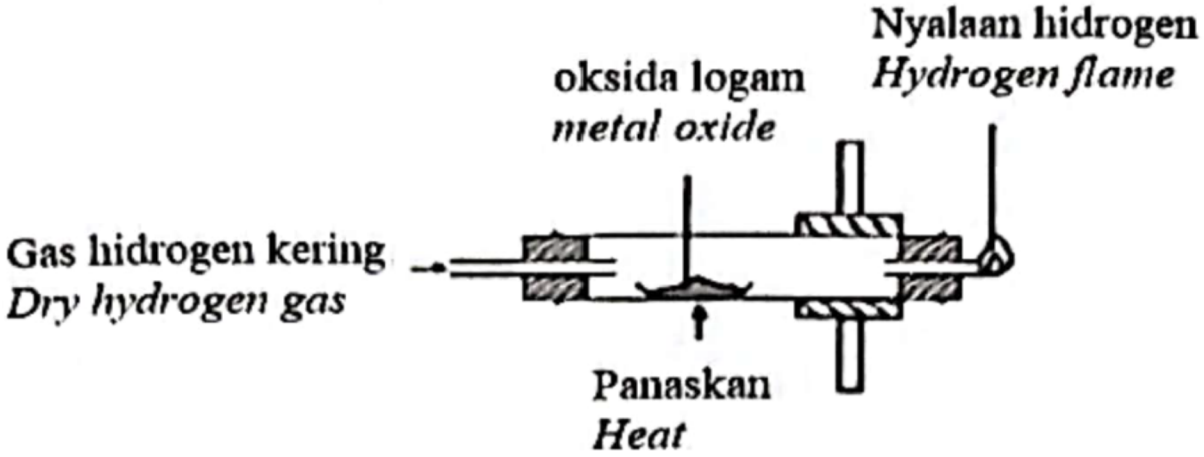
A I dan II
I and II

B I dan IV
I and IV

C II dan III
II and III

D III dan IV
III and IV

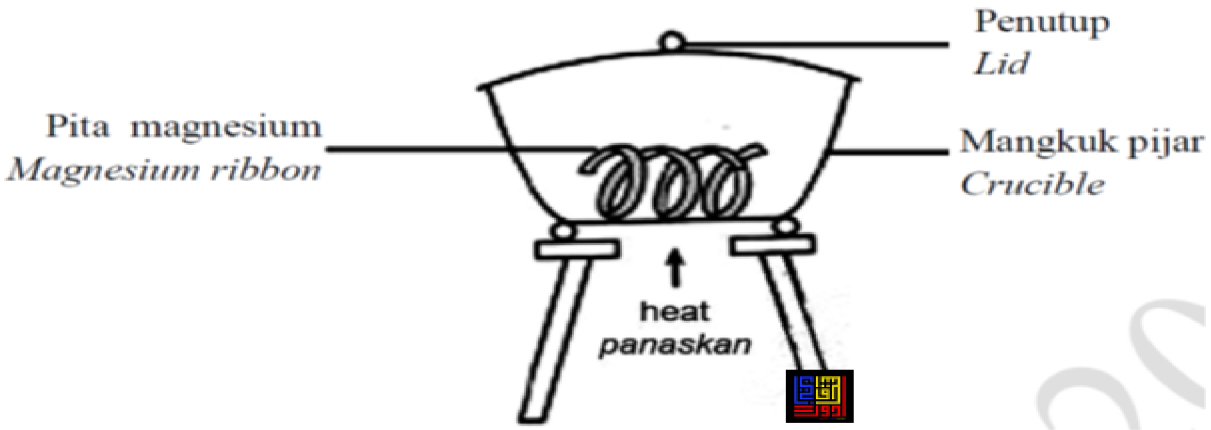
[Johor Bahru 2023-24] Rajah 5 menunjukkan susunan radas untuk menentukan formula empirik suatu oksida logam.
Diagram 5 shows the apparatus set-up to determine the empirical formula of a metal oxide.



Antara yang berikut, oksida logam manakah yang sesuai digunakan dalam eksperimen ini?
Which of the following metal oxides is suitable to be used in this experiment?

A MgO B Al_2O_3 C ZnO D Ag_2O

[Pahang JUJ Set 1 2023-17] Rajah 4 menunjukkan susunan radas untuk menentukan formula empirik bagi suatu logam oksida.
Diagram 4 shows the apparatus set-up to determine the empirical formula of a metal oxide.



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

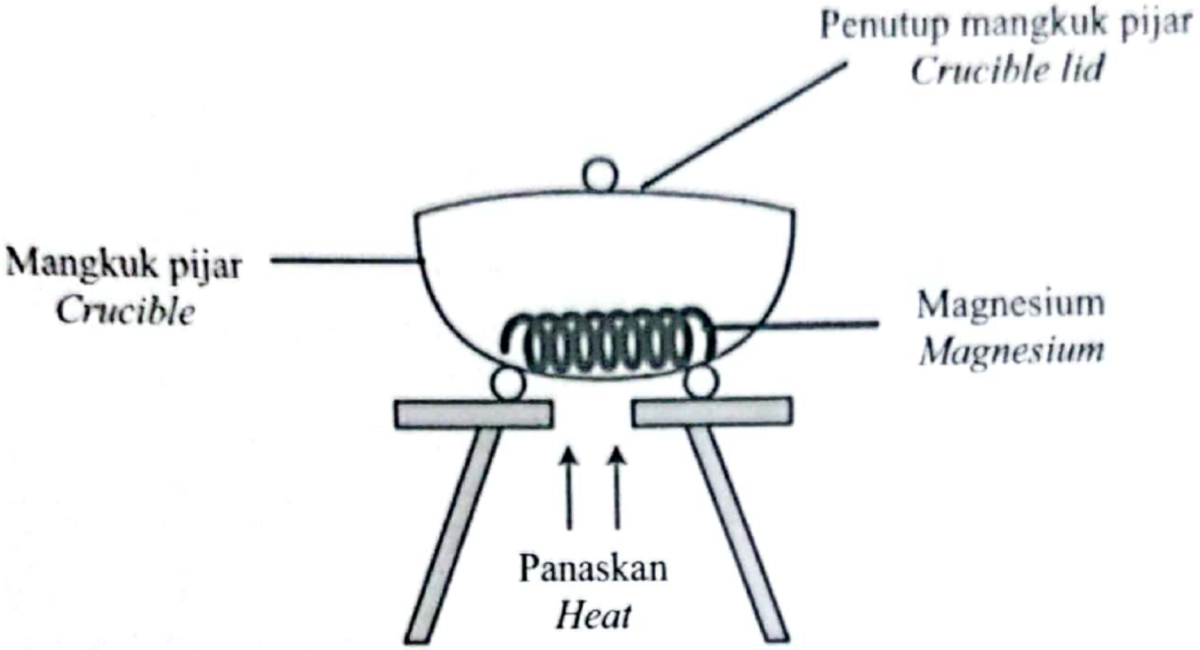
A Zink
Zinc

B Ferum
Iron

C Kuprum
Copper

D Stanum
Tin

[SBP2023-04] Rajah 1 menunjukkan susunan radas untuk menentukan formula empirik satu oksida logam.
Diagram 1 shows the apparatus set-up to determine the empirical formula of a metal oxide.



Apakah tujuan membuka penutup mangkuk pijar sekali-sekala semasa proses pemanasan?
What is the purpose of lifting the crucible lid at interval during heating process?

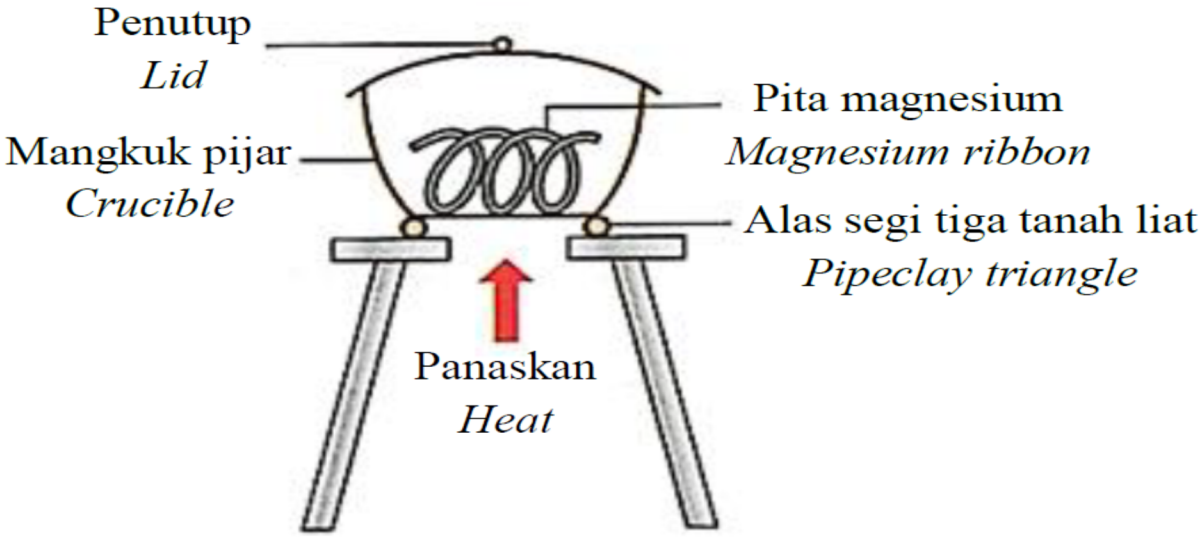
A Memastikan magnesium melebur
Ensure magnesium melt

B Mendapatkan jisim magnesium oksida yang tetap
Obtain a constant mass of magnesium oxide

C Mengelakkan wasap magnesium oksida daripada terbebas
Prevent fume of magnesium oxide from escaping

D Membenarkan oksigen masuk untuk bertindak balas dengan magnesium
Allow oxygen to enter to react with magnesium

[Pahang 2023-17] Rajah 3 menunjukkan suatu eksperimen yang dijalankan oleh seorang pelajar untuk menentukan formula empirik magnesium oksida.
Diagram 3 shows an experiment carried out by a student to determine the empirical formula of magnesium oxide.



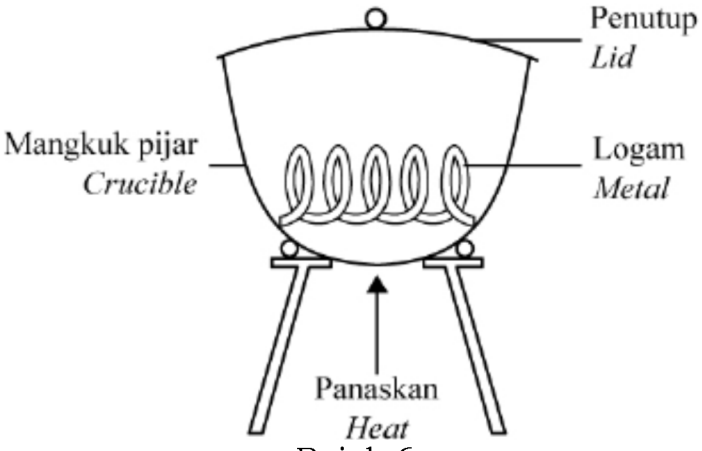
Bagaimanakah pelajar itu dapat memastikan pita magnesium itu terbakar dengan lengkap?
How can the student make sure that the magnesium ribbon burns completely?

A Buka penutup sekali sekala semasa pemanasan
Open the lid occasionally during heating

B Tutup mangkuk pijar dengan penutupnya sebaik sahaja pita magnesium mula terbakar
Close the crucible with its lid when magnesium ribbon starts burn

C Ulang proses pemanasan, penyejukan dan penimbangan sehingga jisim tetap diperolehi
Repeat the heating, cooling and weighing process until a constant mass is obtained

[Selangaor2023 Set 01-20] Rajah 6 menunjukkan susunan radas untuk menentukan formula empirik logam oksida.
Diagram 6 shows the apparatus set-up to determine the empirical formula of metal oxide.



Rajah 6
Diagram 6

Pernyataan yang manakah menerangkan mengapa mangkuk pijar perlu ditutup dengan penutupnya apabila logam mula terbakar?
Which statement explains why the crucible need to be covered by its lid when the metal starts to burn?

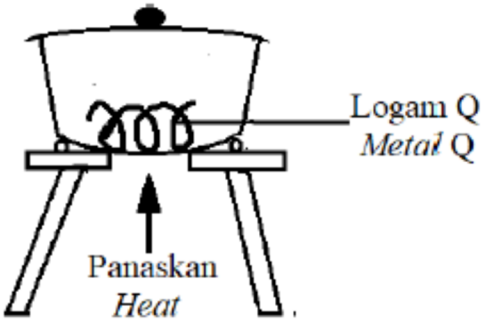
A Untuk mengelakkan wasap logam oksida daripada terbebas
To prevent fumes of metal oxide from escaping

B Untuk membenarkan oksigen bertindak balas dengan logam
To allow oxygen reacts with metal

C Untuk mendapatkan jisim logam oksida yang tetap
To obtain a constant mass of metal oxide

D Untuk mengelakkan logam terbakar dengan berlebihan
To avoid meted from over heating

[MRSM2023-02] Rajah 2 menunjukkan susunan radas untuk menentukan formula empirik bagi oksida logam Q.
Diagram 2 shows the apparatus set-up to determine the empirical formula of metal oxide Q.



Rajah 2 /*Diagram 2*

Apakah logam Q?/ *What is metal Q?*

A Plumbum
Lead

B Argentum
Silver

C Kuprum
Copper

D Magnesium
Magnesium

[Melaka 2023-02] Formula kimia manakah yang dinamakan dengan betul berdasarkan sistem penamaan IUPAC?
Which chemical formula is correctly named according to the IUPAC nomenclature system ?

	Formula kimia *Chemical formula*	Nama *Name*
A	SO_2	Sulfur oksida/ *Sulphur oxide*
B	CCl_3	Karbon tetraklorida/ *Carbon tetrachloride*
C	$Al(NO_3)_2$	Aluminium nitrat/ *Aluminium nitrate*
D	Fe_2O_3	Ferum(II) oksida/ *iron(II) oxide*

3.4 Persamaan Kimia

[Pahang 2023-18] Persamaan kimia manakah yang betul?
Which chemical equation is correct?

A $K + Cl_2 \rightarrow KCl$
B. $Mg + O_2 \rightarrow MgO_2$
C $Zn + HCl \rightarrow ZnCl_2 + H_2$
D $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

[Kedah2023-31] Berikut adalah persamaan bagi suatu tindak balas
The following is an equation for a ronction

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

Antara pernyataan berikut, yang manakah betul?
Which of the following statements Is correct?

A 4 mol atom aluminium bertindak balas dengan 3 mol atom oksigen.
4 mol of aluminium atoms react with 3 mol of oxygen atoms.

B 4 mol atom aluminium bertindak balas dengan 3 mol molekul oksigen
4 mol of aluminium atoms react with 3 mol of oxygen molecules.
C 4 mol atom aluminium bertindak balas dengan 3 mol molekul oksigen menghasilkan 2 mol aluminium oksida.

4 mol of aluminium atoms react with 3 mol of oxygen molecules producing 2 mol of aluminium oxide.

D 4 mol atom aluminium bertindak balas dengan 6 mol molekul oksigen menghasilkan 2 mol aluminium oksida.
4 mol of aluminium atoms react with 6 mol of oxygen molecules producing 2 mol of aluminium oxide.

Pengiraan yang melibatkan nisbah

[Johor Bahru 2023-37] Persamaan kimia berikut mewakili tindak balas di antara gas klorin dengan wul besi panas untuk menghasilkan pepejal X yang berwarna perang.
The following chemical equation represents a reaction between chlorine gas and hot iron wool to produce brown solid X.

$$3Cl_2 + 2Fe \rightarrow 2X$$

Berapakah jisim X yang terbentuk apabila 120 cm^3 gas klorin bertindak balas dengan wul besi panas pada suhu bilik?
What is the mass of X formed when 120 cm^3 of chlorine gas reacted with hot iron wool at room temperature?
[Jisim atom relatif: Cl = 35.5; Fe = 56;
Isi padu molar gas pada suhu bilik = 24 dm^3 mol^{-1}]
[Relative atomic mass: Cl = 35.5; Fc = 56;
Molar volume of gas at room temperature = 24 dm^3 mol^{-1}]

A 0.305 g B 0.542 g C 0.580 g D 0.813 g

[Pahang JUJ Set 1 2023-34] Berapakah jisim logam M yang akan bertindak balas dengan 0.24 g oksigen untuk membentuk suatu sebatian dengan formula empirik M_2O_3.
[Jisim atom relatif O:16, M: 122]
What is the mass of metal M that will react with 0.24 g of oxygen to form a compound with the empirical formula of M_2O_3.
[Relative atomic mass O:16, M : 122]

A 0.16 g B 0.36 g C 1.22 g D 1.83 g

[Pahang JUJ Set 2 2023-38] Topeng oksigen mengandungi kalium oksida, K_2O yang akan bertindak balas dengan air dan karbon dioksida dari udara yang dihembus untuk menghasilkan oksigen.
Oxygen mask contains potassium oxide, K_2O which reacts with water and carbon dioxide from exhaled air to produce oxygen.

$$4K_2O + 2H_2O + 4CO_2 \rightarrow 4KHCO_3 + 3O_2$$

Hitung isipadu gas oksigen pada suhu bilik yang boleh dihasilkan daripada 47 g kalium oksida.
[Jisim atom relatif; O=16, K=39; 1 mol gas menempati isi padu 24 dm^3 pada keadaan bilik]
Calculate the volume of oxygen gas at room temperature that can be produced from 47 g of potassium oxide.
[Relative atomic mass; O=16, K=39; 1 mole of gas occupies a volume of 24 dm^3 at room condition]

A 9 dm^3 B 18 dm^3 C 21 dm^3 D 27 dm^3

[Melaka 2023-31] 4.34 g kalsium karbonat bertindak balas dengan 0.025 mol asid sulfurik untuk membentuk kalsium sulfat sebagai salah satu hasil tindak balas. Tentukan jisim kalsium karbonat yang tinggal selepas tindak balas.
[Jisim atom relatif: H = 1, C = 12, O = 16, S = 32, Ca = 40]
4.34 g of calcium carbonate reacts with 0.025 mol of sulphuric acid to form calcium sulphate as one of the reaction products. Determine the mass of calcium carbonate remaining after the reaction.
[Relative atomic mass :H = 1, C = 12, O = 16, S = 32, Ca = 40]

A 1.84 g B 2.48 g C 3.43 g D 4.24 g

[Kedah2023-32] Persamaan di bawah menunjukkan suatu tindak balas penguraian ganda dua.
The equation below shows a double decomposition reaction.

$$Ca(NO_3)_2 + K_2SO_4 \rightarrow CaSO_4 + 2KNO_3$$

Jika 100 cm^3 larutan kalsium nitrat 0.1 mol dm^{-3} digunakan dalam tindak balas ini, berapakah jisim garam tak terlarut yang dihasilkan?
[Jisim atom relatif: Ca=40, N=14, O=16, K=39, S=32]
If 100 cm^3 of 1 mol dm^{-3} calcium nitrate is used in this reaction, what is the mass of insoluble salt produced?
[Relative atomic mass: Ca=40, N=14, 0=16, K=39, S=32]

A 1.36 g B 13.6 g C 2.02 g D 20.2 g

[Negeri Sembilan 2023-31] Apakah jisim bagi magnesium yang diperlukan untuk bertindak balas dengan asid nitrik berlebihan dan membebaskan 448 cm^3 gas hidrogen pada suhu dan tekanan piawai?
[Jisim atom relatif: Mg = 24; Isi padu molar = 22.4 dm^3 pada STP]
What is the mass of magnesium needed to react with excess nitric acid to produce 448 cm^3 of hydrogen gas at standard temperature and pressure?
[Relative atomic mass: Mg = 24; Molar volume = 22.4 dm^3 at STP]

A 0.240 g B 0.448 g C 0.480 g D 0.960 g

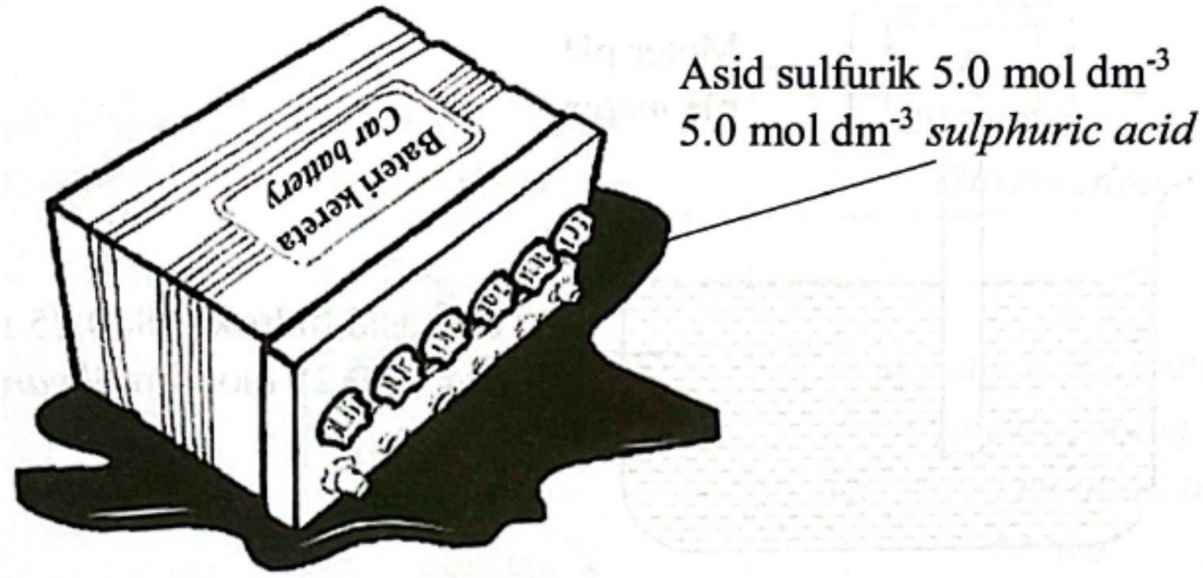
[Negeri Sembilan 2023-34] Persamaan berikut menunjukkan proses penguraian kalium klorat(V).
The following equation shows decomposition process of potassium chlorate(V).

$2KClO_3 \rightarrow 2KC1 + 3O_2$

Apakah jisim kalium klorat(V) yang diperlukan untuk menghasilkan 2.0 mol gas oksigen?
What is the mass of potassium chlorate(V) needed to produce 2.0 mol of oxygen gas?
[Jisim atom relative/ Relative atomic mass: O = 16; Cl = 35.5; K = 39]

A 162.93 g B 245.00 g C 325.85 g D 490.00 g

[Negeri Sembilan 2023-35] Rajah 11 menunjukkan keadaan sebuah bateri kereta di atas lantai garaj.
Diagram 11 shows the condition of a car battery on a garage floor.



Rajah 11/ Diagram 11

500 cm^3 asid daripada bateri kereta telah tertumpah di atas lantai garaj. Serbuk penaik, $NaHCO_3$ digunakan untuk bertindak balas dengan asid menghasilkan natrium sulfat, karbon dioksida dan air.
Berapakah jisim minimum serbuk penaik yang diperlukan?
[Jisim atom relatif: H = 1, C = 12, O = 16, Na = 23]
500 cm^3 of acid from the car battery has been spilled on a garage floor. Baking soda, $NaHCO_3$ can be used to react with the acid to produce sodium sulphate, carbon dioxide and water.
What is the minimum mass of baking soda needed?
[Relative atomic mass: H=1,C=12, 0=16, Na = 23]

A 105 g B 210 g C 420 g D 840 g

[Pahang 2023-34] 9.75 g unsur X bertindak balas dengan 63.5 g unsur Y untuk membentuk suatu sebatian yang mempunyai formula XY_2.
Berapakah jisim atom relatif unsur X?
[Diberi jisim atom relatif Y = 127]
9.75 g of element X reacts with 63.5 g of element Y to form a compound with chemical formula XY_2. What is the relative atomic mass of element X?
[Given that the relative atomic mass of Y = 127]

A 23 B 39 C 40 D 88

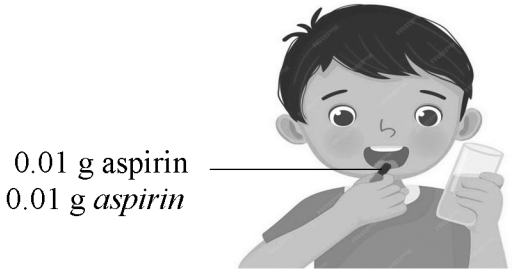
[Perlis 2023-32] Penguraian kalium klorat(V), $KClO_3$ oleh haba selalu digunakan untuk menghasilkan gas oksigen di dalam makmal.
Decomposition of potassium chlorate(V), $KClO_3$ by heat is often used to produce oxygen gas in the laboratory.

$$2KClO_3\ (p/s) \rightarrow 2KCl(p/s) + 3O_2(g)$$

Jika anda seorang pembantu makmal, berapakah jisim kalium klorat(V), $KClO_3$ yang diperlukan untuk menghasilkan 20 dm^3 gas oksigen?
If you are a lab assistant, what are the masses of potassium chlorate(V), $KClO_3$ needed to produce 20 dm^3 of oxygen gas?
[Jisim atom relatif : O = 16, Cl = 35.5, K = 39; Isipadu molar : 24 $dm^3\ mol^{-1}$ pada keadaan bilik]
[Relative atomic mass : O = 16, Cl = 35.5, K = 39; Molar volume : 24 $dm^3\ mol^{-1}$ at room conditions]

A 68.1 g B 102.1 g C 50.68 g D 153.06 g

[Putrajaya2023-32] Rajah 12 menunjukkan seorang pesakit memakan sebiji aspirin.
Diagram 12 show a patient consumes an aspirin.



Hitungkan bilangan molekul dalam aspirin itu.
Calculate the number of molecules in the aspirin.
[Pemalar Avogadro = 6.02×10^{23}, Jisim molekul relatif bagi aspirin = 180]
[Avogadro constant = 6.02×10^{23} Relative molecular mass of asprin = 180]

A 1.17×10^{19} B 3.34×10^{19}
C 1.17×10^{19} D 3.34×10^{20}

[Perlis 2023-34] 4.16 g unsur W bertindak balas dengan 1.92 g oksigen untuk membentuk oksida logam W. Formula empirik bagi oksida logam ini ialah W_2O_3. Berapakah jisim atom relatif W?
4.16 g of element W reacts with 1.92 g of oxygen to form metal oxide W. The empirical formula for this metal oxide is W_2O_3. What is the relative atomic mass of W?
[Jisim atom relative/Relative atomic mass : O = 16]

A 27 B 52 C 56 D 104

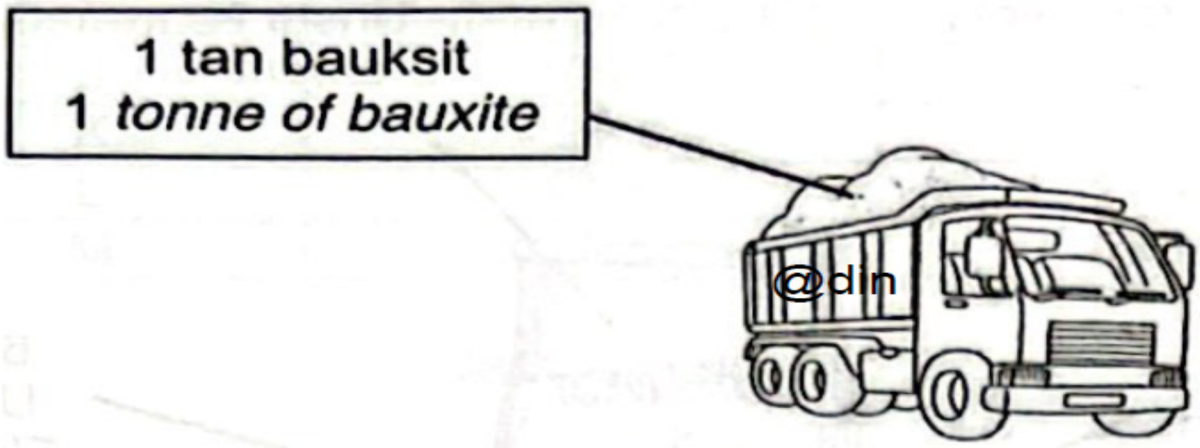
[SBP2023-34] Satu eksperimen lelah dijalankan untuk mengkaji tindak balas antara wul besi dengan gas Y kuning kehijauan daripada Kumpulan 17 dalam Jadual Berkala Unsur. Didapati wul besi terbakar dengan terang dan menghasilkan 1.625 g sebatian berwarna perang.
Apakah isi padu gas Y yang digunakan semasa tindak balas?
[Jisim atom relatif: Fe = 56, Y = 35.5;
Isi padu molar pada keadaan bilik = 24 dm^3 mol^{-1}]
An experiment was conducted to investigate a reaction between iron wool with greenish yellow gas Y from Group 17 in The Periodic Table of Elements. It is found that iron wool burns brightly and produces 1.625 g of brown compound.What is the volume of gas Y used during the reaction?
[Relative atomic mass: Fe = 56, Y = 35.5;
Molar volume at room conditions = 24 dm^3 mol^{-1}]

A 240 cm^3 B 310 cm^3 C 360 cm^3 D 470 cm^3

[SBP2023-35] Glukosa, $C_6H_{12}O_6$ digunakan dalam proses penapaian untuk menghasilkan etanol dan gas P yang menukarkan air kapur menjadi keruh. Sebanyak x g glukosa telah digunakan dalam proses penapaian itu dan membebaskan 8.4 dm^3 gas P. Berapakah x?
[Jisim atom relatif: H = 1, C = 12, O = 16, Isi padu molar gas = 24 dm^3 mol^{-1} pada keadaan bilik]
Glucose, $C_6H_{12}O_6$ is used in fermentation process to pivduce ethanol and gas P which turns limewater cloudy. x g of glucose is used in the fermentation process and releasing 8.4 dm^3 of gas P. What is x?
[Relative atomic mass: H = 1, C = 12, O = 16,
Molar volume of gas = 24 dm^3 mol^{-1} at room conditions]

A 15.40 g B 31.50 g C 63.00 g D 126.00 g

[Terengganu2023-23] Rajah 23 menunjukkan sebuah lori membawa bauksit ke kilang untuk mengestrak aluminium daripada bijihnya.
Figure 23 shows a lorry carrying bauxite to the factory to extract aluminum from its ore.



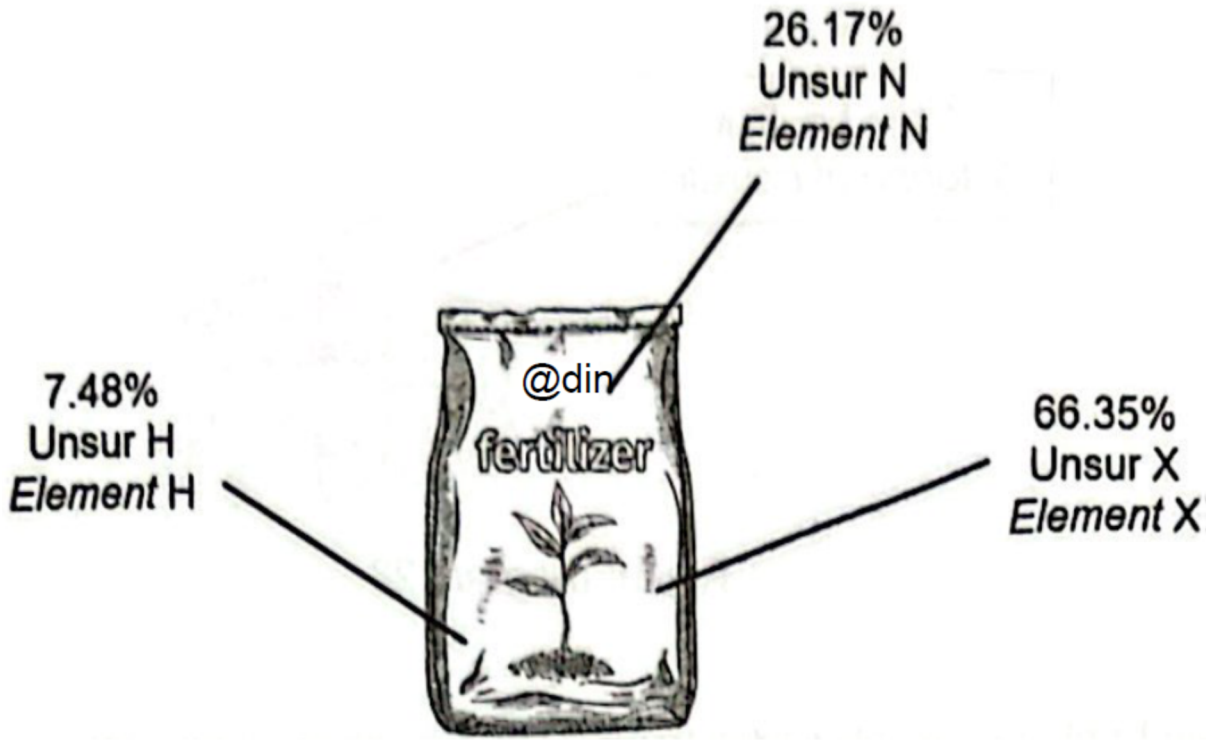
Persamaan berikut mewakili tindak balas pengekstrakan aluminium
The following equation represents the reaction extraction of aluminium.

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

Apakah jisim aluminium yang diekstrak?
What is the mass of aluminium extracted?
[Jisim atom relatif: O = 16, Al = 27; 1 tan = 1000 kg]
[Relative atomic mass: O = 16, Al = 27; 1 tonne = 1000 kg]

A 235 kg B 264 kg C 529 kg D 1058 kg

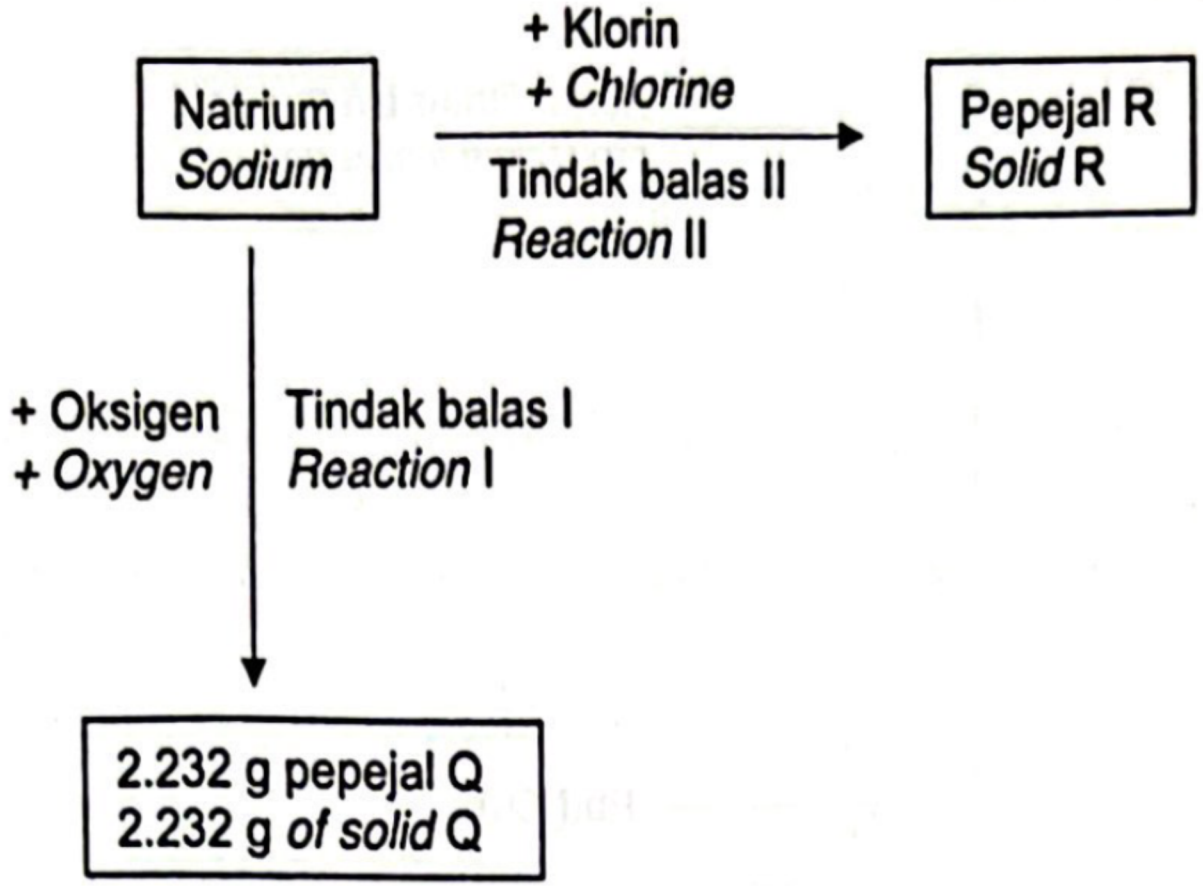
[Terengganu2023-24] Rajah 24 menunjukkan peratusan komposisi jisim untuk baja R.
Diagram 24 show the percentage of mass composition of fertiliser R.



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?
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?
[Jisim atom relatif: H =1, N = 14, X = 35.5]
[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

[Terengganu2023-36] Rajah 36 menunjukkan dua tindak balas berbeza suatu logam.
Diagram 36 shows two different reactions of a metal.



Rajah/ Diagram 36

Berapakah jisim pepejal R yang terbentuk apabila jisim natrium yang sama digunakan dalam tindak balas I dan tindak balas II?
What is the mass of solid R formed when the same mass of sodium is used in reaction I and reaction II?
[Jisim atom relatif/ Relative atomic mass = Na = 23,0 = 16, Cl = 35.5J

A 0.828 g B 1.656 g C 4.212 g D 8.424 g

BAB 4 Jadual Berkala Unsur

4.1 Perkembangan Jadual Berkala Unsur

[Perlis 2023-15] Apakah prinsip asas yang digunakan dalam penyusunan unsur dalam Jadual Berkala Unsur?
What is the basic principle used in the arrangement of elements in the Periodic Table of Elements?

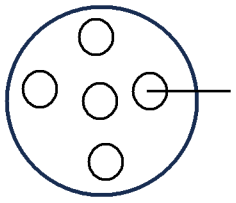
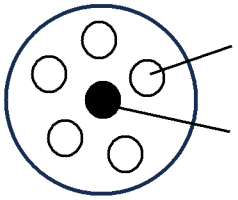
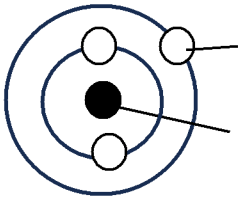
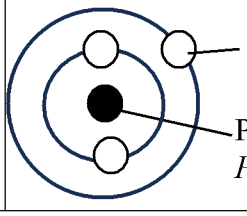
A Peningkatan nombor nukleon
Ascending nucleon number

B Peningkatan jisim atom relatif
Ascending relative atomic mass

C Peningkatan nombor proton
Ascending proton number

D Peningkatan bilangan elekton
Ascending number of electron

[Putrajaya2023-01] Antara yang berikut, model manakah yang dikemukakan oleh Neils Bohr?
Which of the following atomic models was presented by Neils Bohr?

A		**B**	
C		**D**	

[Terengganu2023-03] Pernyataan berikut merujuk kepada sumbangan seorang ahli sains dalam membangunkan Jadual Berkala Unsur.
The following statement refer the contribution of scientist in developing Periodic Table of Element.

• Memplot graf isi padu atom melawan jisim atom unsur.
Plotted the graph of the atomic volume against the atomic mass the elements.

• Unsur-unsur yang berada di kedudukan yang setara pada lengkung graf mempunyai sifat kimia yang serupa.
Elements at equivalent positions on the curve of the graph had similar chemical properties.

Siapakah ahli sains itu?
Who was the scientist?

A Lothar Meyer
B Henry Moseley
C John Newlands
D Dmitri Mendelev

4.2 Susunan Unsur dalam Jadual Berkala Unsur Moden

[Melaka 2023-17] Atom Q mempunyai bilangan proton 11 dan bilangan neutron 12. Di manakah kedudukan atom Q di dalam Jadual Berkala Unsur?
Atom Q has the number of protons 11 and the number of neutrons 12. Where is the position of atom Q in the Periodic Table of Elements?

	Kumpulan/ *Group*	Kala/ *Period*
A	2	3
B	1	3
C	13	2
D	15	4

[Melaka 2023-32] Maklumat berikut adalah mengenai atom P dan atom Q.
The following information is about P atom and Q atom.

• Unsur P adalah suatu logam.
Element P is a metal.

• Nombor proton atom Q ialah 12.
The proton number of the Q atom is 12.

• Unsur P berada di atas unsur Q dalam kumpulan yang sama dalam Jadual Berkala Unsur.
Element P is above element Q in the same group in the Periodic Table of Elements.

Antara berikut, yang manakah menunjukkan susunan elektron bagi atom P?
Which of the following shows the electron arrangement of the P atom?

A 2.2 B 2.3 C 2.8.1 D 2.8.2

4.3 Unsur dalam Kumpulan 18

[Terengganu2023-04] Gas helium mempunyai sifat lengai. Antara berikut, penerangan manakah yang betul mengenai sifat itu?
Helium gas had inert properly. Which of the following statement is correct of the property?

A Mempunyai ketumpatan yang rendah
Has low density

B Wujud sebagai gas monoatom
Exists as monoatomic gas

C Berada dalam Kumpulan 18 dalam Jadual Berkala Unsur
Placed in Group 18 in the Periodic Table of Elements

D Mencapai susunan elektron yang stabil
Achieved stable electron arrangement

[Selangaor2023 Set 01-15] Rajah 3 menunjukkan lampu papan iklan yang diisi dengan bahan X.
Diagram 3 shows advertisement light board filled with substance X.

Rajah 3/ Diagram 3

Dalam kumpulan manakah X terletak dalam Jadual Berkala Unsur? In *which group is X located in the Periodic Table of Elements?*

A Kumpulan 1
Group 1

B Kumpulan 18
Group 18

C Kumpulan 17
Group 17

D Kumpulan 15
Group 15

[Kedah2023-02] Antara pernyataan berikut, yang manakah benar tentang helium?
Which of the following statement is true about helium?

A Wujud sebagai molekul dwiatom
Exists as diatomic molecule

B Tidak larut di dalam air
Does not dissolve in water

C Takat lebur dan takatd idih tinggi
High melting and boiling point

D Mempunyai susunan elektron oktet
Has octet electron arrangement

[Johor Bahru 2023-03] Antara yang berikut, unsur manakah yang terletak dalam Kumpulan 18?
Which of the following elements is located in Group 18?

A Helium
Helium

B Litium
Lithium

C Kalsium
Calcium

D Magnesium
Magnesium

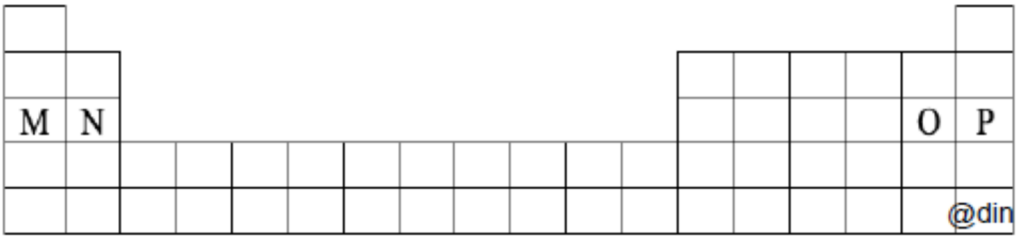
[Pahang JUJ Set 1 2023-03] Gas neon digunakan di dalam lampu papan iklan kerana bersifat lengai. Antara yang berikut, yang manakah penjelasan terbaik mengenai sifat tersebut?
Neon gas is used in advertising board lights because of its inert property.
Which of the following best explains the property?

A Gas monoatom
Monoatom gas

B Wujud sebagai gas dwiatom
Exists as diatomic gas

C Mencapai susunan elektron oktet yang stabil
Achieved stable octet electron arrangement

[MRSM2023-03] Rajah 3 menunjukkan sebahagian daripada Jadual Berkala Unsur. M, N, O dan P tidak mewakili simbol sebenar unsur.
Diagram 3 shows part of Periodic Table of Elements. M, N, O and P do not represent the actual symbols of the elements.



Antara yang berikut, manakah yang betul menunjukkan kumpulan bagi M, N, O dan P?
Which of the following shows correctly the groups for M, N, O and P?

	Gas adi *Noble gas*	Logam alkali bumi *Alkaline earth metal*	Halogen *Halogen*	Logam alkali *Alkali metal*
A	M	O	N	P
B	N	P	O	M
C	P	N	M	O
D	P	N	O	M

[MRSM2023-18] Unsur T dan xenon terletak dalam kumpulan yang sama dalam Jadual Berkala Unsur. Antara yang berikut, manakah ciri-ciri bagi unsur T?
Element T and xenon are located in the same group as in the Periodic Table of Elements. Which of the following are the characteristics of element T?

I Cecair pada suhu bilik
Liquid at room temperature

II Terdiri daripada zarah monoatom
Consists of monoatomic particle

III Mengkonduksi elektrik
Conduct electricity

IV Lengai secara kimia
Chemically inert

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

[Negeri Sembilan 2023-22] Atom Q mempunyai susunan elektron 2.8.4. Antara yang berikut, yang manakah mewakili kedudukan unsur Q dalam Jadual Berkala Unsur?
Atom Q has an electron arrangement of2.8.4
Which of the following represents the positions of element Q in the Periodic Table of Elements?

	Kumpulan *Group*	Kala *Period*
A	3	4
B	4	3
C	13	4
D	14	3

4.4 Unsur dalam Kumpulan 1

[Putrajaya2023-21] Rajah 7 menunjukkan pemerhatian bagi tindak balas apabila sekeping logam X dan logam Y dengan saiz yang sama dimasukkan ke dalam bikar yang berisi air sejuk.
Diagram 7 shows the observation of the reaction when a piece of metal X and metal Y of the same size are put into a beaker filled with cold water.

Antara yang [illegible] manakah menerangkan pemerhatian itu?
Which of the following explains the observation?

A Ketumpatan logam Y lebih tinggi daripada logam X.
The density of metal Y is higher than metal X

B Atom logam Y mempunyai lebih banyak proton daripada atom logam X.
Atoms of metal Y have more protons than atoms of metal X.

C Atom logam Y lebih mudah melepaskan elektron daripada atom logam X.
Y metal atoms give up electrons more easily than X metal atoms

D Keelektropositifan atom logam X lebih tinggi daripada atom logam Y.
Electropositivity of X metal atom is higher than Y metal atom.

[Putrajaya2023-05] Ciri manakah yang betul tentang unsur-unsur dalam kumpulan 1 dalam Jadual Berkala Unsur apabila menuruni kumpulan?
Which characteristics is correct about elements in Group 1 in the Periodic Table as going down the group?

I Kecenderungan menderma elektron bertambah
The tendency to donate electron increases

II Kekerasan logam meningkat
Hardness of metal increases

III Kekonduksian haba berkurang
Heat conductivity decreases

IV Takat lebur berkurang
Melting point decreases

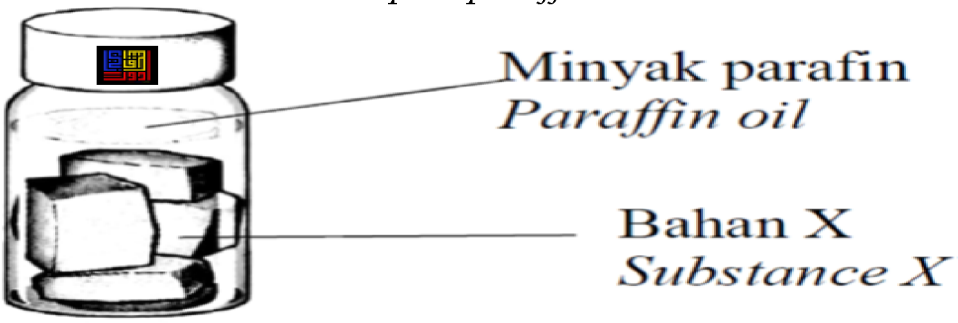
A I dan III
I and III

B I dan IV
I and IV

C II dan III
II and III

D II dan IV
II and IV

[Pahang JUJ Set 1 2023-01] Rajah 1 menunjukkan bahan X disimpan dalam minyak parafin.
Diagram 1 shows substance X kept in paraffin oil.



Apakah bahan X?/ *What is substance X?*

A Ferum
Iron

B Litium
Lithium

C Magnesium
Magnesium

D Aluminium
Aluminium

4.5 Unsur dalam Kumpulan 17

[Selangaor2023 Set 01-09] Takat didih bromin lebih tinggi daripada klorin. Pernyataan manakah menerangkan fenomena ini dengan tepat?
The boiling point of bromine is higher than chlorine.
Which statement exactly explains this phenomenal?

A Ikatan kovalen antara molekul bromin adalah lebih kuat
The covalent bond between bromine molecules are stronger

B Daya tarikan Van der Waals antara molekul bromin adalah lebih kuat
Van der Waals attraction forces between bromine molecules are stronger

C Saiz atom bromin adalah lebih kecil
The atomic size of bromine is smaller

D Nombor proton bromin adalah lebih besar
The proton number of bromine is bigger

[Negeri Sembilan 2023-06] Antara yang berikut, unsur manakah terletak dalam Kumpulan 17 dalam Jadual Berkala Unsur?
Which of the following elements is located in Group 17 of the Periodic Table of Elements?

A Magnesium
Magnesium

B Helium
Helium

C Litium
Lithium

D Klorin
Chlorine

[Kelantan 2023-12] Sifat fizik manakah yang sama bagi unsur-unsur dalam Kumpulan 17 Jadual Berkala Unsur?
Which physical properties is same for elements in Group 17 in the Periodic Table of the Elements.

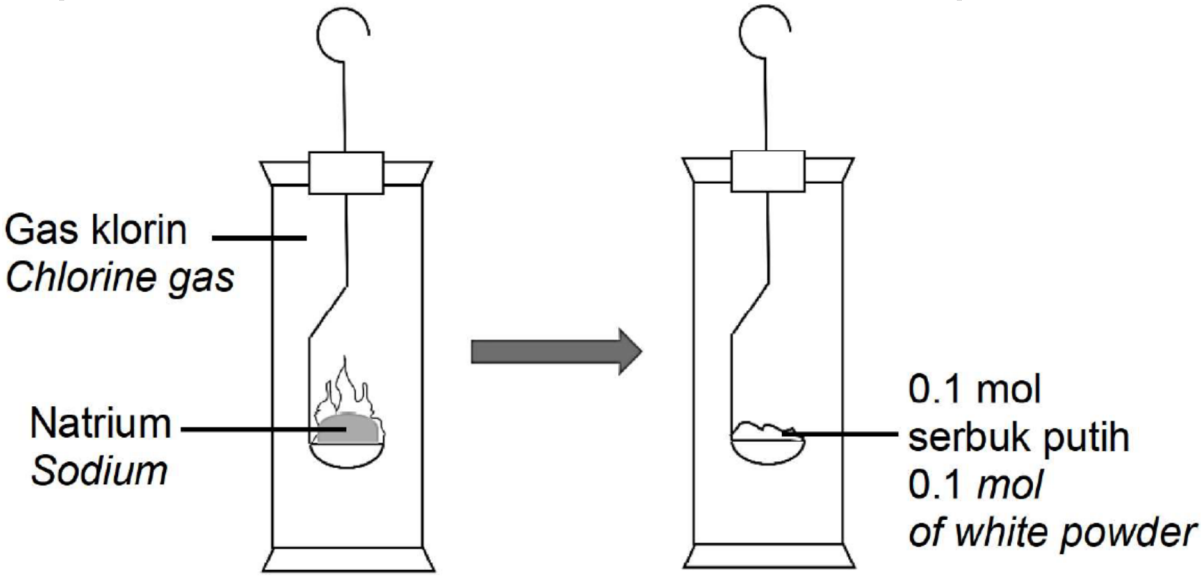
A. Warna
Colour

B. Saiz atom
Atomic size

C. Tidak mengkonduksi arus elektrik
Does not conduct electricity

D. Bertindak balas dengan natrium
React with sodium

[Kelantan 2023-28] Rajah 12 menunjukkan tindak balas antara natrium dengan gas klorin.
Diagram 12 shows the reaction between sodium and chlorine gas



Berapakah isipadu gas klorin yang telah digunakan dalam tindak balas tersebut ?
[Isipadu molar gas pada keadaan bilik = 24 dm^3 mol^{-1}]
What volume of chlorine gas was used in the reaction?
[molar volume of gas at room condition = 24 dm^3 mol^{-1}]

A. 0.05 dm^3 B. 0.1 dm^3 C. 1.2 dm^3 D. 2.4 dm^3

[Kedah2023-26] Bromin ialah unsur dalam kumpulan 17. Antara pernyataan berikut, yang manakah benar mengenai bromin?
Bromine is a Group 17 elements. Which of the following statement is true about bromine?

A Oksida bromin bersifat bes
Oxide of bromine has basic properties

B Bromin wujud sebagai gas pada suhu bilik
Bromine exists as gas at room temperature

C Bromin larut di dalam air untuk menghasilkan larutan beralkali
Bromine dissolved in water to form alkaline solution

D Bromin bertindak balas dengan wul ferum untuk menghasilkan ferum(III) bromida
Bromine reacts with iron wool to form iron (III) bromide

[Kedah2023-34] Persamaan kimia berikut menunjukkan tindak balas antara klorin, Cl_2 dan air, H_2O.
The chemical equation below shows the reaction of chlorine,Cl_2 and water, H_2O.

$$Cl_2 (g) + H_20(ce) \rightarrow X (ak) + Y (ak)$$
$$Cl_2 (g) + H_20 (0 \rightarrow X (aq) + Y (aq)$$

Apakah formula bagi bahan X dan bahan Y?
What is the formula of substances X and Y?

	X	Y
A	HCl	HOCl
B	HCl	H_2
C	HOCl	ClO_2
D	HOCl	HCl_2

[Pahang JUJ Set 2 2023-16] Antara yang berikut, pernyataan manakah menerangkan mengapa kereaktifan unsur Kumpulan 17 berkurang apabila menuruni kumpulan?
Which statement explains why the reactivity of Group 17 elements decreases when going down the group?

A Saiz atom unsur meningkat
The atomic size of the elements increases

B Takat lebur dan takat didih meningkat
The melting point and boiling points increases

C Daya tarikan nukleus terhadap elektron berkurang
Attraction force of nucleus towards electrons decreases

D Keadaan fizik berubah daripada gas kepada cecair kemudian kepada pepejal pada suhu bilik
The physical state changes from gas to liquid then to solid at room temperature

4.6 Unsur dalam Kala 3

[Terengganu2023-26] Jadual 26 menunjukkan tiga unsur dan susunan elektron masing-masing. Huruf yang digunakan bukan simbol sebenar bagi unsur itu.
Table 26 shows three elements and their electron arrangement respectively. The letters used are not the actual symbol of the elements.

Unsur Element	Susunan elektron Electron arranqement
P	2.8.1
Q	2.8.4
R	2.8.7

Antara yang berikut, yang manakah betul tentang ketiga-tiga unsur itu mengikut urutan P, Q dan R?
Which of the following is correct about the three elements according to the sequence, P, Q andR?

A Jejari atom bertambah
Atomic radius decreases

C Sifat kelogaman bertambah
Metallic properties increases

B Takat lebur bertambah
Melting point increases

D Keelektronegatifan bertambah
Electronegativity decreases

[SBP2023-18] Berikut adalah sifat bagi tiga unsur Kala 3 dalam Jadual Berkala Unsur.
The following are the properties of three elements in Period 3 of the Periodic Table of Elements.

P : Logam yang mempunyai takat didih yang linggi
Metal which has high boiling point

Q : Gas yang memberikan atmosfera lengai untuk kimpalan pada suhu tinggi
Gas that provides an inert atmosphere for welding at high temperature

R : Separa logam yang digunakan untuk membuat semikonduktor
Semi-metal used to make semiconductor

Antara yang berikut, susunan manakah yang betul bagi unsur-unsur itu mengikut tertib pertambahan saiz atom dalam Jadual Berkala Unsur?
Which of the following arrangement is correct for the elements in ascending order of atomic size in The Periodic Table of Elements'?

A P, Q, R B P, R, Q C Q, R,P D R, P,Q

[Perlis 2023-29] Antara yang berikut, yang manakah betul mengenai perubahan sifat unsur apabila merentasi kala dalam Jadual Berkala Unsur?
Which of the following is the correct change in the property of elements across the period in the Periodic Table of Elements?

A Jejari atom meningkat
The atomic radius increases

B Bilangan proton dalam setiap atom meningkat
The number of protons in each atom increases

C Bilangan elektron valens dalam setiap atom berkurang
The number of valence electrons in each atom decreases

[Johor Skudai2023-06] Antara berikut, pernyataan manakah yang benar tentang perubahan sifat unsur yang berlaku apabila merentasi Kala 3 dalam Jadual Berkala Unsur?
Which of the following statements is correct about the changes in properties of elements across Period 3 in the Periodic Table of Element?

A Jejari atom semakin bertambah
The atomic radius is increasing

B Keelektronegatifan unsur semakin berkurang
The electronegativity of the elements is decreasing

C Daya tarikan nukleus terhadap elektron semakin bertambah
Nucleus attraction force to the electron is increasing

D Sifat oksida berubah daripada oksida asid kepada amfoterik kepada oksida bes
The properties of oxides change from acidic oxides to amphoteric to base oxides

[Pahang JUJ Set 1 2023-19] Jadual 1 menunjukkan oksida bagi unsur-unsur dalam Kala 3 dalam Jadual Berkala Unsur.
Table 1 show the oxide of elements in the Period 3 in the Periodic Table of Elements.

Oksida unsur dalam Kala 3 *Oxides of element in Period 3*
P_2O_3
QO
R_2O

Antara berikut manakah susunan yang betul mengikut pertambahan nombor proton bagi unsur-unsur tersebut?
Which of the following is the correct arrangement in increasing proton number of the elements?

A P,Q,R B P,R,Q C R,P,Q D R,Q,P

[Melaka 2023-18] Antara berikut, yang manakah benar tentang sifat oksida unsur dalam kala 3?
Which of the following is true about the properties of oxide of elements in period 3?

A Na_2O mempunyai nilai pH 14
Na_2O has a pH value of 14

B AI_2O_3 mempunyai nilai pH 3
AI_2O_3 has a pH value of 3

C CI_2O_7 mempunyai nilai pH 9
CI_2O_7 has a pH value of 9

D SO_2 mempunyai nilai pH 13
SO_2 has a pH value of 13

[Pahang JUJ Set 2 2023-31] Jadual 1 menunjukkan sifat-sifat oksida bagi unsur-unsur R, S dan T yang terletak dalam Kala 3 Jadual Berkala Unsur.
Table 1 shows the properties of the oxide of elements R, S and T which are located in Period 3 of the Periodic Table of Element.

Unsur *Element*	Sifat oksida yang terbentuk *Property of the oxide formed*
R	▪ Oksida R bertindak balas dengan asid nitrik *Oxide R reacts with nitric acid* ▪ Oksida R tidak bertindak balas dengan larutan natrium hidroksida *Oxide R does not react with sodium hydroxide solution*
S	▪ Oksida S bertindak balas dengan larutan natrium hidroksida *Oxide S reacts with sodium hydroxide solution* ▪ Oksida S tidak bertindak balas dengan asid nitrik *Oxide S does not react with nitric acid*
T	▪ Oksida T bertindak balas dengan larutan natrium hidroksida *Oxide T reacts with sodium hydroxide solution* ▪ Oksida T bertindak balas dengan asid nitrik *Oxide T reacts with nitric acid*

Jadual 1/ Table 1

Apakah susunan unsur-unsur R, S dan T dari kiri ke kanan Kala 3 dalam Jadual Berkala Unsur?
What is the arrangement of elements R, S and T from left to right in Period 3 of the Periodic Table of Elements?

A R, S, T B R, T, S C S, T, R

[MRSM2023-19] Jadual 1 menunjukkan keputusan apabila tiga oksida unsur dalam Kala 3 dalam Jadual Berkala Unsur ditambah kepada larutan natrium hidroksida, NaOH dan asid nitrik, HNO_3.
Table 1 shows the results when three oxides of elements in Period 3 in the Periodic Table of Elements are added to sodium hydroxide, NaOH solution and nitric acid, HNO_3.

Oksida bagi unsur dalam Kala 3 *Oxide of elements in Period 3*	Ditambah NaOH *Added to NaOH*	Ditambah HNO_3 *Added to HNO_3*
Oksida Q *Oxide of Q*	✓	✓
Oksida R *Oxide of R*	✓	✗
Oksida T *Oxide of T*	✗	✓

✓ = Tindak balas berlaku *Reaction occurs*	✗ = Tindak balas tidak berlaku *Reaction does not occur*

Susun unsur Q, R dan T mengikut urutan menurun saiz atom.
Arrange element Q, R and T according to the descending order of the atomic size.

A Q, R, T B T, Q, R C Q, T, R D R, T, Q

4.7 Unsur Peralihan

[Perlis 2023-01] Proses industri manakah yang menggunakan ferum sebagai mangkin?
Which industrial process uses iron as a catalyst?

A Pembuatan asid sulfurik
Manufacture of sulphuric acid

B Pembuatan marjerin
Manufactured of margarine

C Pembuatan ammonia
Manufactured of ammonia

D Pembuatan asid nitrik
Manufactured of nitric acid

[SBP2023-05] Berikut adalah ciri-ciri bagi unsur Q dan R.
The following ore the characteristics of elements Q unit K.

♦ Membentuk ion kompleks/ *Form complex ion*
♦ Membentuk sebatian berwarna/ *Form coloured compound*
♦Mempunyai lebih daripada satu nombor pengoksidaan
Has more than one oxidation number

Apakah Q dan R?/ *What are Q and R?*

I Kromium
Chromium

II Ferum
Iron

III Sesium
Caesium

IV Barium
Barium

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

[Perlis 2023-05] Antara yang berikut, yang manakah ciri istimewa bagi logam peralihan?
Which of the following is the special characteristic of transition metals?

A Pepejal lembut
Soft solid

B Larut dalam air
Soluble in water

C Takat lebur rendah
Low melting point

D Membentuk ion berwarna
Form coloured ions

[Melaka 2023-04] Antara berikut, unsur peralihan manakah yang digunakan dalam proses pembuatan marjerin dan proses Ostwald?
Which of the following transition elements is used in the process of making margarine and the Ostwald process ?

A Nikel
Nickel

B Ferum
Iron

C Platinum
Platinum

D Kromium
Chromium

[Pahang 2023-03]

Bertindak sebagai mangkin
Act as a catalyst

Berupaya membentuk ion berwarna
Able to form coloured ions

Mempunyai lebih dari satu nombor pengoksidaan
Has more than one oxidation number

Membentuk ion kompleks
Forms complex ions

Pernyataan di atas menunjukkan sifat-sifat unsur dalam Jadual Berkala Unsur. Antara berikut, unsur Kumpulan manakah yang menepati ciri-ciri di atas?
The statement above shows the properties of elements in the Periodic Table of Elements. Among the following, which Group of element are suitable to the above characteristics?

A Unsur Kumpulan 1
Group 1 element

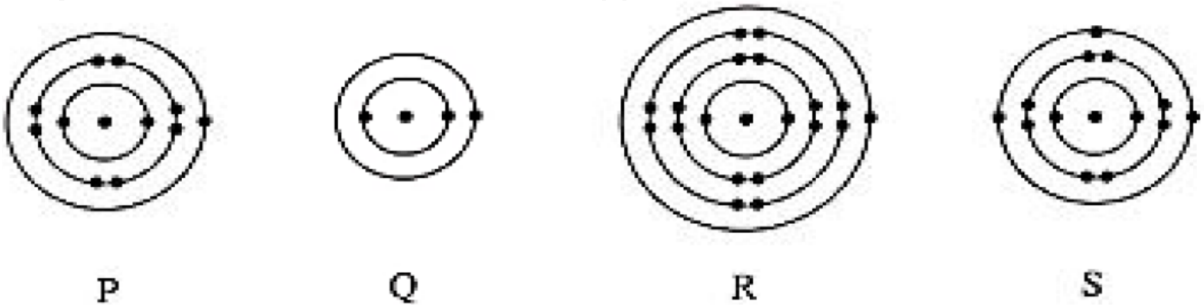
B Unsur Kumpulan 17
Group 17 element

C Unsur Kumpulan 18
Group 18 element

D Unsur Kumpulan Peralihan
Transition element

Gabungan

[Johor PPD Tangkak 2023-06] Rajah 2 di bawah menunjukkan struktur bagi empat atom.
Diagram 2 below shows the structure of four atoms.

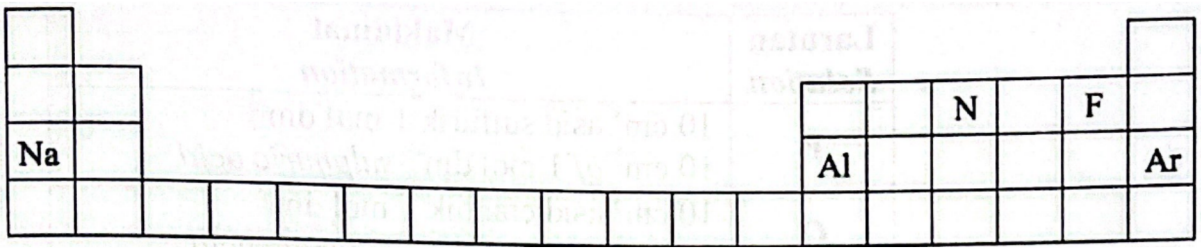


Rajah 2/ Diagram 2

Antara berikut, dalam turutan manakah atom-atom tersebut disusun dalam Jadual Berkala?
Which of the following sequence will the atoms be arranged in the Periodic Table?

A P, Q, R, S
B R, P, S, Q
C Q, P, S, R
D S, R, P, Q

[Negeri Sembilan 2023-26] Rajah 6 menunjukkan sebahagian Jadual Berkala Unsur.
Diagram 6 shows a part of Periodic Table of Elements



Antara yang berikut, susunan manakah yang betul menunjukkan tertib menaik saiz atom?
Which of the following arrangements shows the correct ascending order of atomic size?

A N, F, Na, Al, Ar
B F, N, Ar, Al, Na
C Na, Al, N, F, Ar
D Ar, F, N, Al, Na

[Pahang 2023-11] Maklumat berikut menunjukkan sifat-sifat unsur X.
The following information shows the properties of element X.

Logam yang lembut
Soft metal

Larut dalam air dan menghasilkan larutan hidroksida X
Dissolves in water and produces hydroxide solution X

Antara berikut, Kumpulan yang manakah unsur X terletak dalam Jadual Berkala Unsur?
Which of the following Group is the element X located in Periodic Table Of Elements?

A Kumpulan 1 *Group 1*	B Kumpulan 17 *Group 17*	C Kumpulan 18 *Group 18*

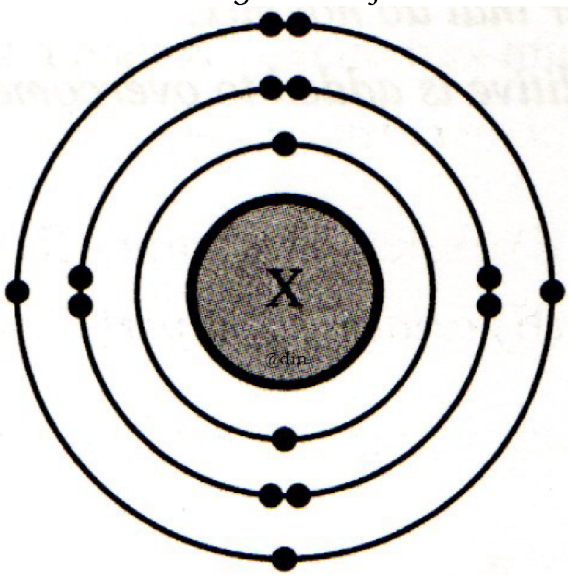
[Pahang 2023-39] Jadual 3 menunjukkan sifat oksida bagi unsur M, N, P dan Q.
Table 3 shows the property of oxide of elements M, N, P and Q.

Unsur Element	Sifat oksida Property of oxide
M	Tidak membentuk oksida Does not form oxide
N	Berasid Acidic
P	Amfoterik Amphotheric
Q	Berbes Basic

Antara yang berikut, yang manakah kedudukan yang betul bagi unsur M, N, P dan Q dalam Jadual Berkala Unsur?
Which of the following is the correct position of elements M, N, P and Q in the Periodic Table of Elements?

	Unsur M *Element M*	Unsur N *Element N*	Unsur P *Element P*	Unsur Q *Element Q*
A	Kumpulan 1 *Group 1*	Kumpulan 17 *Group 17*	Kumpulan 13 *Group 13*	Kumpulan 18 *Group 18*
B	Kumpulan 13 *Group 13*	Kumpulan 1 *Group 1*	Kumpulan 17 *Group 17*	Kumpulan 18 *Group 18*
C	Kumpulan 17 *Group 17*	Kumpulan 18 *Group 18*	Kumpulan 1 *Group 1*	Kumpulan 13 *Group 13*
D	Kumpulan 18 *Group 18*	Kumpulan 17 *Group 17*	Kumpulan 13 *Group 13*	Kumpulan 1 *Group 1*

[Selangor2023 Set 1-09] Rajah 2 menunjukkan susunan elektron bagi atom X.
Diagram 2 shows the electron arrangement of an atom X.



Rajah 2/ Diagram 2

Antara berikut, yang manakah kedudukan unsur X dalam Jadual Berkala Unsur?
Which of the following is the position of element X in the Periodic Table of Elements?

	Kumpulan *Group*	Kala *period*
A	5	2
B	5	3
C	15	2
D	15	3

BAB 5 Ikatan Kimia

5.1 Asas Pembentukan Sebatian

[Selangaor2023 Set 01-03] Terdapat banyak jenis ikatan kimia yang berbeza-beza yang wujud dalam bahan-bahan yang berbeza.
Ikatan kimia yang manakah terbentuk daripada pemindahan elektron?
There are many different types of chemical bonds that exist in different substances.
Which chemical bond is formed from the transfer of electrons?

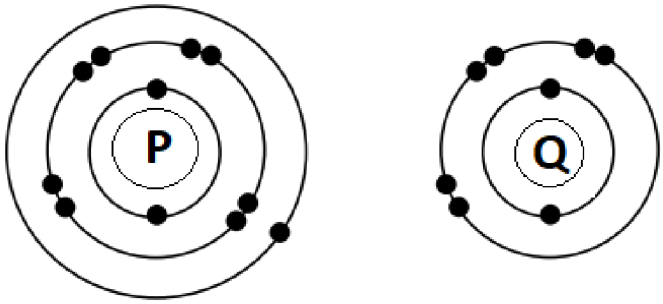
A Ikatan ion
Ionic bond

B Ikatan datif
Dative bond

C Ikatan logam
Metallic bond

D Ikatan kovalen
Covalent bond

[Putrajaya2023-19] Rajah 6 menunjukkan susunan elektron bagi atom P dan Q,
Diagram 6 shows the electron arrangements of atoms P and Q.



Rajah 6/ *Diagram 6*

Antara berikut, yang manakah benar apabila P bertindak balas dengan Q?
Which of the following is true when P react with Q?

A Atom P dan atom Q berkongsi elektron
Atom P and atom Q share the electrons

B Sebatian terbentuk mempunyai takat lebur lebih rendah
The compound formed has lower melting point

C Sebatian terbentuk mempunyai formula PQ_2
The compound formed has a formula of PQ_2

D Sebatian terbentuk terdiri daripada ion
The compound formed is made up of ions

[Johor PPD Tangkak 2023-01] Jadual 1 menunjukkan bilangan proton dan bilangan neutron bagi tiga atom X, Y dan Z.
Table 1 shows the number of protons and number of neutrons for three atoms X, Y and Z.

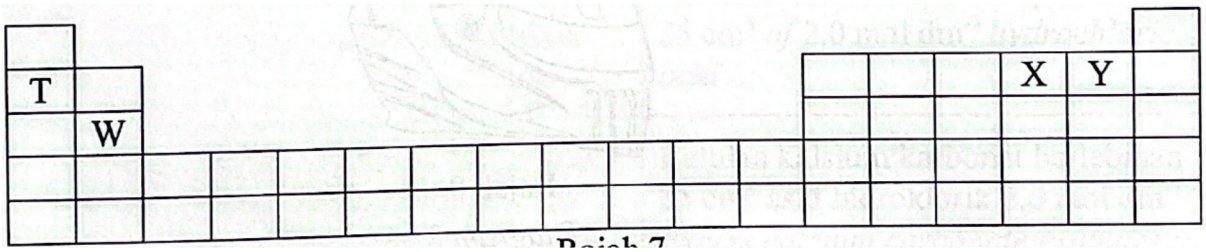
Atom *Atom*	Bilangan proton *Number of proton*	Bilangan neutron *Number of neutron*
W	10	10
X	11	12
Y	12	12
Z	17	18

Jadual 1/ *Table 1*

Berdasarkan maklumat yang terdapat dalam Jadual 1, atom yang manakah boleh membentuk ion negatif?
Based on information in Table 1, which atom that can form a negative ion?

A W B X C Y D Z

[Negeri Sembilan 2023-25] Rajah 7 menunjukkan kedudukan unsur-unsur T, W, X dan Y dalam Jadual Berkala Unsur. T, W, X dan Y bukan simbol sebenar bagi unsur-unsur itu.
Diagram 7 shows the positions of elements T, W, X and Y in the Periodic Table of Element. T, W, X and Y are not the actual symbol of the elements.



Rajah 7/ Diagram 7

Antara pasangan-pasangan unsur berikut, yang manakah bertindak balas untuk membentuk sebatian ion?
Which of the following pairs of elements react to form an ionic compound?

I T, W
II X, Y
III T, Y
IV W, X

A I dan II
I and II

C III dan IV
III and IV

B II dan III
II and III

D I dan IV
I and IV

[Pahang JUJ Set 1 2023-24] Rajah 9 menunjukkan perwakilan piawai bagi atom X dan atom Y.
Diagram 9 shows the standard representation of atom X and atom Y.

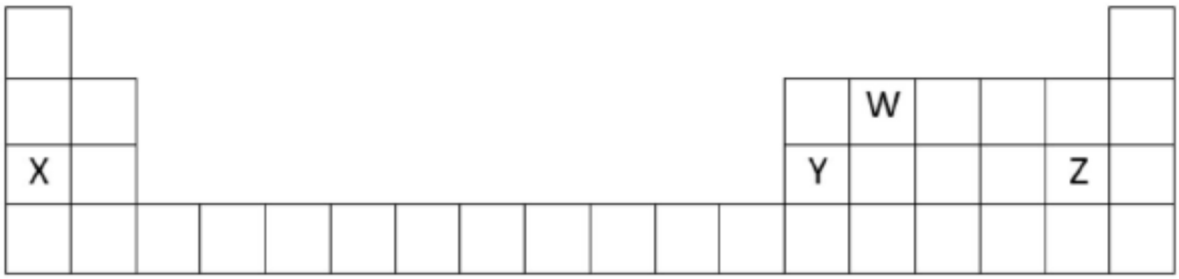
12 6	X		16 8	Y

Rajah 9 / Diagram 9

Apakah formula kimia dan jenis sebatian yang terbentuk di antara kedua dua atom?
What is the chemical formula and type of compound formed between both atoms?

	Formula kimia *Chemical formula*	Jenis sebatian *Type of compound*
A	XY	Ion / *Ionic*
B	XY_2	Kovalen/ *Covalent*
C	X_2Y	Kovalen/ *Covalent*
D	X_2Y	Ion/ *Ionic*

[Melaka 2023-19] Rajah 4 menunjukkan Jadual Berkala Unsur yang terdiri daripada unsur W, X, Y dan Z.
Diagram 4 shows the Periodic Table of Elements consisting of elements W, X, Y and Z.



Rajah 4 / Diagram 4

Antara berikut, unsur manakah yang membentuk sebatian yang boleh dijadikan elektrolit dal am sel elektrolisis?
Which of the following elements forms a compound that can be used as an electrolyte in an electrolytic cell?

A W dan Z
W and Z

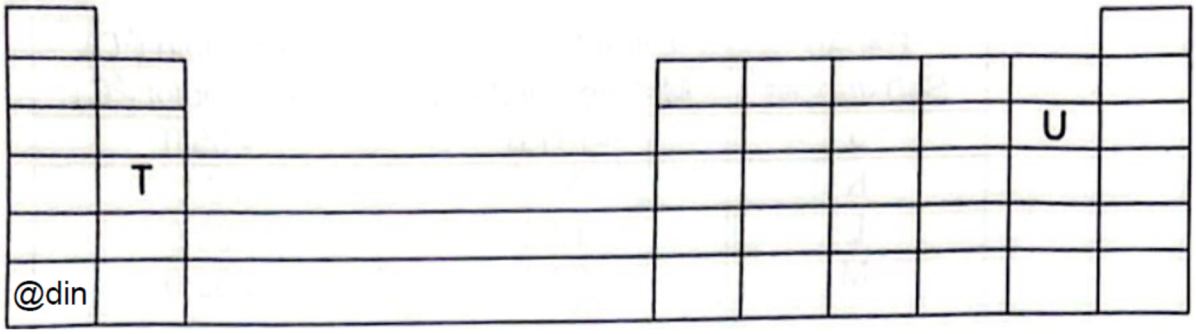
B W dan Y
W and Y

C X dan Z
X and Z

D X dan Y
X and Y

5.2 Ikatan Ion

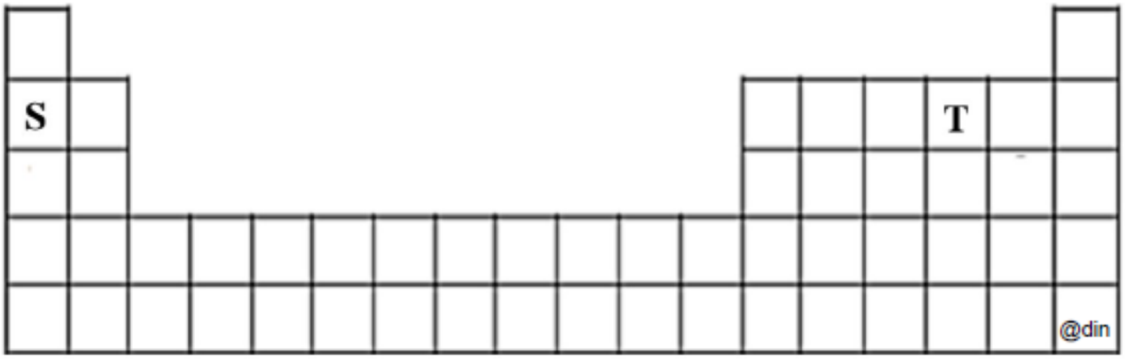
[Terengganu2023-27] Rajah 27 menunjukkan kedudukan unsur T dan U di dalam Jadual Berkala Unsur.
Diagram 27 shows the position of element of T and U in the Periodic Table of Element.



Manakah antara berikut merupakan formula kimia bagi sebatian yang terbentuk apabila unsur T bertindak balas dengan unsur U?
Which of the following is the formula of compound formed when element T reacts with element U?

A TU_2 B T_2U C T_2U_3 D T_3U_2

[Melaka 2023-06] Rajah 2 menunjukkan kedudukan unsur S dan T dalam Jadual Berkala Unsur.
Diagram 2 shows the position of elements S and T in the Periodic Table of Elements.



Antara berikut yang manakah benar dari segi formula kimia dan jenis ikatan yang terbentuk antara S dan T.
Which of the following is true in terms of the chemical formula and the type of bond formed between S and T.

	Formula/ *Formula*	Jenis ikatan/ *Type of bond*
A	S_2T	Ion/ *Ionic*
B	ST_2	Kovalen/ *Covalent*
C	S_2T_3	Ion/ *Ionic*
D	S_2T_3	Kovalen/ *Covalent*

[Johor Bahru 2023-20] Unsur K dan unsur S terletak dalam Kumpulan 13 dan Kumpulan 16 Jadual Berkala Unsur. Unsur K bertindak balas dengan unsur S untuk membentuk satu sebatian.
Apakah formula kimia bagi sebatian tersebut?
Element K and clement S arc located in Group 13 and Group 16 of the Periodic Table of Elements. Element K reacts with element S to form a compound.
What is the chemical formula of the compound formed?

A KS B KS_2 C K_2S D K_2S_3

[Terengganu2023-05] Antara berikut yang manakah sebatian ion?
Which of the following is an ionic compound?

A Butana
Butane

B Glukosa
Glucose

C Kalsium oksida
Calsium oxide

D Silikon dioksida
Silicon dioxide

[Melaka 2023-05] Bahan manakah adalah satu sebatian ion?
Which substance is an ionic compound?

A Etana, C_2H_6
Ethane, C_2H_6

B Etanol, C_2H_5OH
Ethanol, C_2H_5OH

C Etil etanoat, $CH_3COOC_2H_5$
Ethyl ethanoate, $CH_3COOC_2H_5$

D Natrium etanoat, CH_3COONa
Sodium ethanoate, CH_3COONa

[Johor Bahru 2023-01] Apakah jenis ikatan kimia dalam natrium karbonat?
What is the type of chemical bond in sodium carbonate?

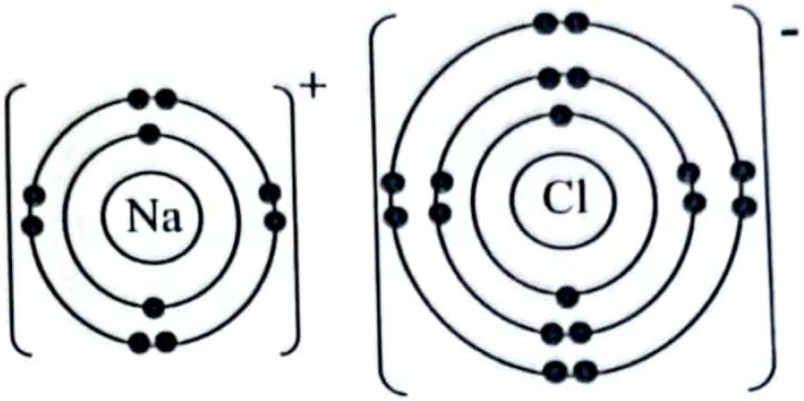
A Ikatan datif
Dative bond

B Ikatan logam
Metallic bond

C Ikatan kovalen
Covalent bond

D Ikatan ion
Ionic bond

[SBP2023-20] Rajah 4 menunjukkan susunan elektron bagi satu sebatian.
Diagram 4 shows the electron arrangement of a compound.+



Rajah 4 / *Diagram 4*

Antara yang berikut, unsur manakah yang boleh bertindak balas dengan klorin untuk menghasilkan satu sebatian lain yang mempunyai jenis zarah berbeza dengan sebatian itu?
Which of the following elements can react with chlorine to produce another compound which has different type of particles with the compound?

I Litium
Lithium

II Berilium
Beryllium

III Carbon
Karbon

IV Hidrogen
Hydrogen

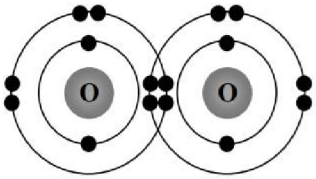
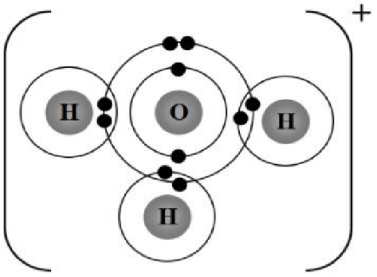
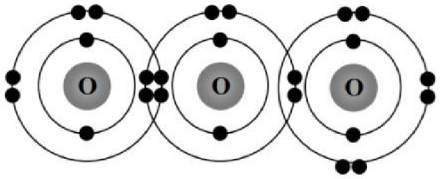
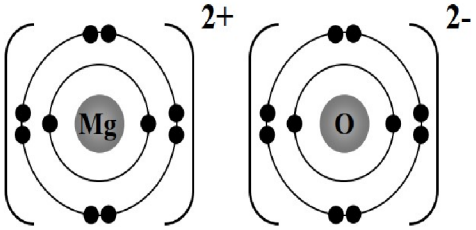
A I dan II
I and II

B I dan IV
I and IV

C II dan III
II and III

D III dan IV
III and IV

[Johor Skudai2023-11] Antara berikut, yang manakah rajah susunan elektron bagi pembentukan sebatian ion?
Which of the following is the electron arrangement diagram for the formation of ionic compound?

A	A 
B	B 
C	C 
D	D 

5.3 Ikatan Kovalen

[Pahang JUJ Set 2 2023-03] Apakah maksud ikatan kovalen?
What is the meaning of covalent bond?

A Ikatan yang terbentuk oleh daya Van der Waals yang lemah di antara atom-atom bukan logam.
A bond formed by weak Van der Waals forces between the non-metal atoms.

B Ikatan yang terbentuk apabila satu atom logam memindahkan elektron ke satu atom bukan logam
A bond formed when a metal atom transfers electron to a non-metal atom.

C Ikatan yang terbentuk apabila satu atom bukan logam memindahkan elektron ke satu atom bukan logam
A bond formed when a non-metal atom transfers electron to a non-metal atom.

D Ikatan yang terbentuk apabila atom-atom bukan logam berkongsi elektron untuk mencapai susunan elektron yang stabil.
A bond formed when non-metal atoms share electrons to achieve a stable electron arrangement.

[Negeri Sembilan 2023-07] Apakah maksud ikatan kovalen?
What is the meaning of covalent bond?

A Ikatan yang terbentuk apabila atom-atom logam menyumbang elektron antara satu sama lain untuk mencapai satu susunan elektron yang stabil
A bond formed when metal atoms contribute electrons to each other to achieve a stable electron arrangement

B Ikatan yang terbentuk apabila atom-atom bukan logam berkongsi elektron untuk mencapai satu susunan elektron yang stabil
A bond formed when non-metal atoms share electrons to achieve a stable electron arrangement

C Ikatan yang terbentuk apabila satu atom logam memindahkan satu elektron ke satu atom bukan logam
A bond formed when a metal atom transfers an electron to a non-metal atom

D Ikatan yang terbentuk oleh daya van der Waals yang lemah antara atom-atom bukan logam
A bond formed by weak van der Waals forces between the non-metal atoms

[Kedah2023-11] Manakah antara berikut adalah benar tentang pembentukan ikatan kovalen?
Which of the following are true about the formation of covalent bond?

I Dibentuk antara atom logam dan bukan logam
Form between metal and non-metal atoms.

II Dibentuk antara atom-atom bukan logam.
Form between non-metal atoms.

III Melibatkan perkongsian elektron.
Involve sharing of election.

IV Ion-ion terbentuk.
Ions ore formed.

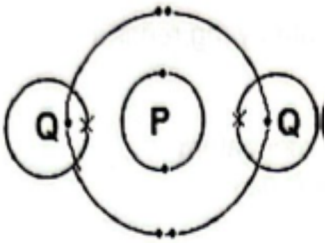
A I dan II
I and II

B I dan III
I and III

C II dan III
II and III

D III dan IV
III and IV

[Terengganu2023-06] Rajah 6 menunjukkan susunan elektron dalam sebatian PQ_2.
Diagram 6 shows the electron arrangement in compound PQ_2.



Rajah/ Diagram 6

Unsur manakah yang diwakili oleh P dan Q?
[Proton number: H=1, C=6, 0=8, Cl = 17]
Which elements are represented by P and Q?
[Proton number. H=1, C=6,0=8, Cl = 17]

	P	Q
A	Karbon/ *Carbon*	Oksigen/ *Oxygen*
B	Oksigen/ *Oxygen*	Hidrogen/ *Hydrogen*
C	Hidrogen/ *Hydrogen*	Klorin/ *Chlorine*
D	Karbon/ *Carbon*	Klorin/ *Chlorine*

[Selangaor2023 Set 01-21] Jadual 2 menunjukkan nombor proton bagi lima unsur, J, K, L, M dan N.
Table 2 shows the proton number of five elements, J, K, L, M and N.

Unsur *Element*	J	K	L	M	N
Nombor proton *Proton number*	2	6	11	12	17

Antara pasangan unsur berikut, yang manakah bertindak balas untuk membentuk ikatan kovalen?
Which of the following pairs of elements read to form covalent bond?

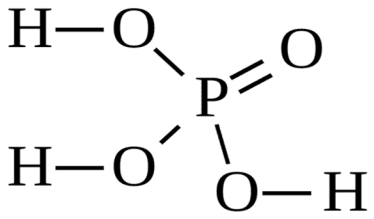
A J dan K
J and K

B K dan L
K and L

C K dan N
K and N

D M dan N
M and N

[Perlis 2023-25] Rajah 6 menunjukkan molekul asid fosforik.
Diagram 6 shows a phosphoric acid molecule.



Berapakah bilangan elektron yang terlibat dalam pembentukan semua ikatan kovalen dalam satu molekul asid fosforik?
How many electrons are involved in the formation of all covalent bonds in the phosphoric acid molecule?

A 7 B 8 C 12 D 16

[Perlis 2023-16] Sebatian manakah merupakan sebatian kovalen?
Which compound is covalent compound?

I Magnesium oksida, MgO/ *Magnesium oxide, MgO*
II Litium klorida, LiCl/ *Lithium chloride, LiCl*
III Butana, C_4H_{10} /*Butane, C_4H_{10}*
IV Tetraklorometana, CCl_4 / *Tetrachloromethane, CCl_4*

A I dan II
I and II

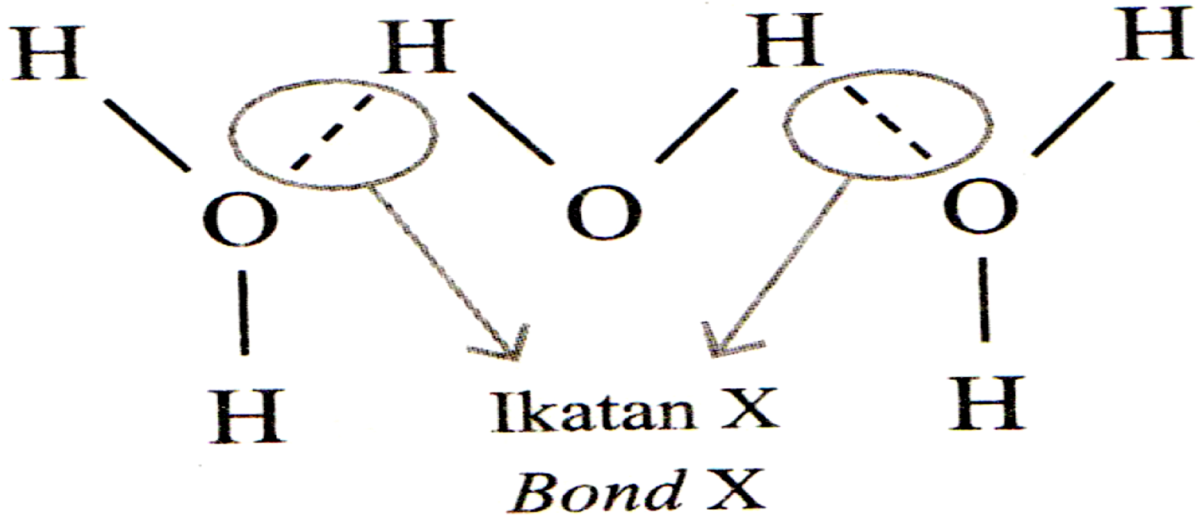
B I dan IV
I and IV

C II dan III
II and III

D III dan IV
III and IV

5.4 Ikatan Hidrogen

[Selangor2023 Set 1-35] Rajah 10 menunjukkan ikatan yang terbentuk dalam air.
Diagram 10 shows the bond formed in water.



Rajah 10 / Diagram 10

Apakah ikatan X? / What is bond X?

A Ikatan datif
Dative bond

B Ikatan hidrogen
Hydrogen bond

C Ikatan kovalen
Covalent bond

D Ikatan ion
Ionic bond

[Selangaor2023 Set 01-35] Antara berikut, yang manakah kelebihan ikatan hidrogen yang terbentuk molekul-molekul etanol?
Which of the following is the advantage of hydrogen bonds formed between molecules?

A Etanol wujud sebagai cecair yang mudah meruap
Ethanol exists as a volatile liquid

B Etanol melarut dalam pelarut organik
Ethanol dissolves in organic solvents

C Etanol boleh mengkonduksikan elektrik
Ethanol could conduct electricity

D Etanol melarut dalam air
Ethanol is soluble in water

[] 4. Antara sebatian berikut, yang manakah boleh membentuk ikatan hidrogen?
Which of the following compound can form hydrogen bond?

A Hidrogen klorida, HCl
Hydrogen chloride, HCl

B Hidrogen fluorida, HF
Hydrogen fluoride, HF

C Gas hidrogen, H_2
Hydrogen gas, H_2

D Metana, CH_4
Methane, CH_4

[Johor PPD Tangkak 2023-08] Yang manakah berikut pernyataan yang benar bagi ikatan hidrogen?
Which of the following statements is true for hydrogen bond?

A Kertas yang basah akan melekat sesama sendiri disebabkan pembentukan ikatan hidrogen
Wet paper stick together when wet because of the hydrogen bond form

B Ikatan hidrogen terbentuk antara molekul-molekul hidrogen klorida.
Hydrogen bond will formed between hydrogen chloride molecules

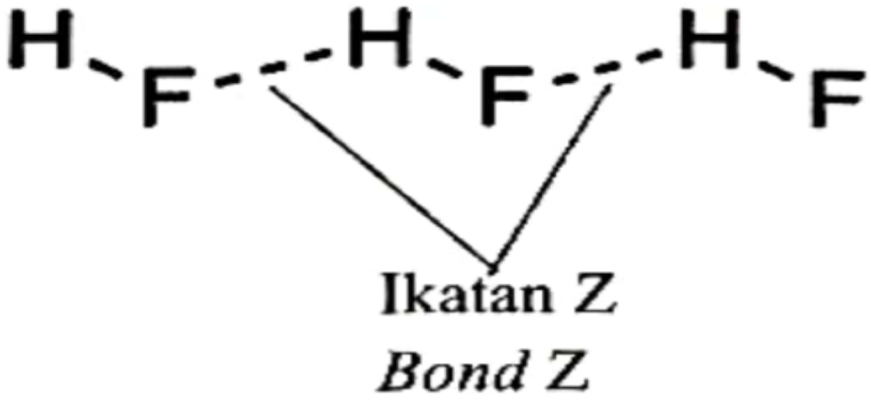
C Etana mempunyai takat didih yang lebih tinggi berbanding etanol kerana etana dapat membentuk ikatan hidrogen antara molekulnya
Ethane has higher boiling point than ethanol because ethane able to form hydrogen bond between its molecules

D Ikatan hidrogen terbentuk antara atom hidrogen yang mempunyai ikatan dengan atom yang tinggi keelektronegatifan seperti atom bromin.
Hydrogen bond formed between hydrogen atom bonded with an atom of high electronegativity such as bromine

[Pahang JUJ Set 1 2023-04] Antara bahan berikut, yang manakah boleh membentuk ikatan hidrogen di antara molekul-molekulnya?
Which of the following substances can form hydrogen bonds among its molecules?

A HCl B NH_3 C CH_4 D HBr

[Johor Bahru 2023-19] Rajah 3 menunjukkan satu sebatian dengan ikatan Z.
Diagram 2 shows a compound with bond Z.



Apakah ikatan Z?/ *What is bond Z?*

A Kovalen
Covalent

C Hidrogen
Hydrogen

B Datif
Dative

D Logam
Metallic

[Johor Skudai2023-10] Antara aktiviti berikut, yang manakah melibatkan pembentukan ikatan hidrogen?
Which of the following activities involve formation of hydrogen bond?

I	II	III
		

A I dan II
I and II

C II dan III
II and III

B I dan III
I and III

D I, II dan III
I, II and III

[Kedah2023-37] Pernyataan di bawah adalah tentang salah satu aplikasi bagi satu ikatan kimia.
Below is about one of the application of a chemical bond.

Kertas yang basah akan melekat sesama sendiri.
Wet papers would stick to each others.

Antara yang berikut, yang manakah menerangkan situasi di atas ?
Which of the following explain the situation above ?

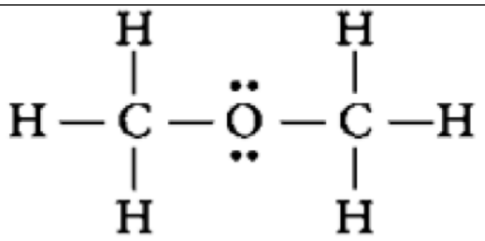
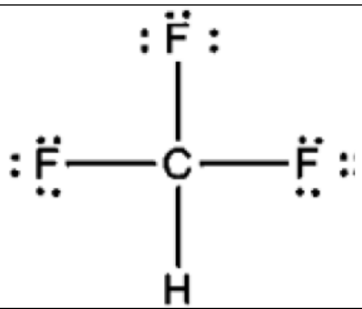
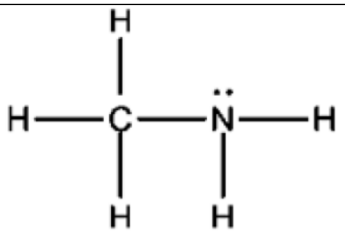
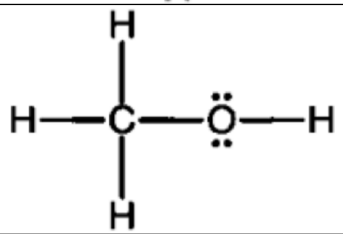
A Molekul selulosa di dalam kertas membentuk ikatan dengan molekul air.
Cellulose molecule in the paper form a bond with water molecule.

B Pasangan elektron bebas dalam molekul air dikongsikan dengan ion hidrogen pada kertas.
The lone pair of electrons in the water molecules is shared with hydrogen ion on the paper.

C Elektron yang bergerak bebas di dalam kertas dinyahsetempatkan bagi membentuk lautan elektron.
Free moving electrons in the paper is delocalised to form sea of electrons.

D Molekul selulosa di dalam kertas menyerap air apabila basah dan menyebabkan saiz molekul selulosa bertambah.
Cellulose molecules in the paper absorb water when wet and causes the molecular size of protein increase.

[Johor PPD Tangkak 2023-09] Rajah 4 di bawah menunjukkan beberapa jenis sebatian.
Diagram 4 below shows some types of compounds.

I		II	
III		IV	

Rajah 4 /Diagram 4

Sebatian yang manakah boleh larut dalam air?
Which compound soluble in water?

A I dan II
I and II

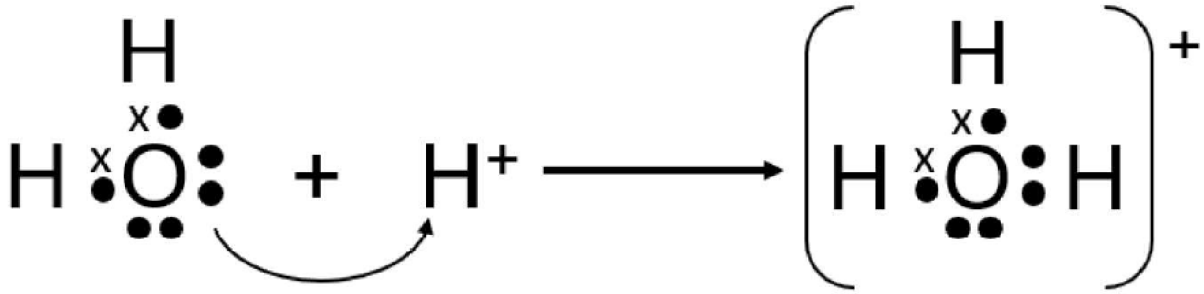
B I dan IV
I and IV

C II dan III
II and III

D III dan IV
III and IV

5.5 Ikatan Datif

[Kelantan 2023-06] Rajah 2 menunjukkan bagaimana suatu ikatan kimia terbentuk.
Diagram 2 shows how a chemical bond is formed.



Antara pernyataan berikut, yang manakah paling tepat mendefinisikan ikatan kimia yang ditunjukkan dalam Rajah 2
Which of the following statements most accurately defines the chemical bond shown in Diagram 2

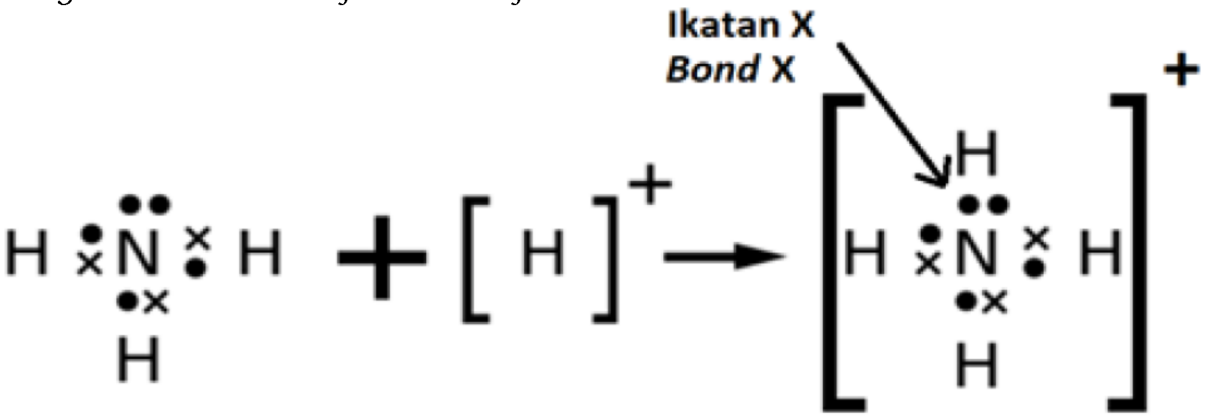
A. Ikatan terbentuk melalui pemindahan elektron valens antara molekul dan ion yang bercas positif.
Bonds are formed through the transfer of valence electrons between positively charged molecules and ions.

B. Ikatan terbentuk adalah ikatan kovalen yang mana pasangan elektron yang dikongsi berasal dari satu atom sahaja.
The bond formed is a covalent bond which the shared electron pair comes from only one atom.

C. Ikatan kimia yang terbentuk apabila atom hidrogen tertarik kepada atom yang lebih elektronegatif
The chemical bond formed hydrogen atom attract to more electronegative atom.

D. Ikatan kimia yang terbentuk apabila ion hidrogen menderma elektron valens kepada satu molekul air.
The chemical bond formed when hydrogen ion donates valence electron to one molecule of water.

[Pahang JUJ Set 2 2023-19] Rajah 2 menunjukkan pembentukan bagi ikatan X. Apakah ikatan X?
Diagram 2 shows the formation of bond X. What is bond X?

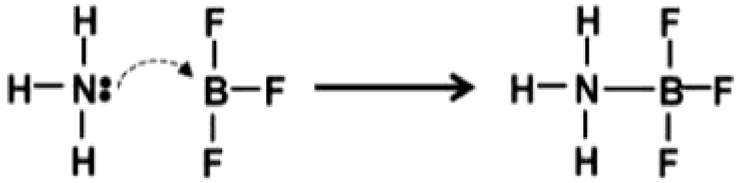


A Ikatan ion
Ionic bond

B Ikatan datif
Dative bond

C Ikatan hidrogen
Hydrogen bond

[Putrajaya2023-06] Rajah 1 menunjukkan pembentukkan ammonia boron trifluorida apabila ammonia NH_3 bertindak balas dengan boron trifluorida BF_3.
Diagram 1 shows the formation of ammonia boron trifluoride when ammonia NH_3 reacts with boron trifluoride BF_3.



Apakah jenis ikatan yang terbentuk?
What type of bond formed?

A Ikatan datif
Dative bond

B Ikatan ion
Ionic bond

C Ikatan kovalen
Covalent bond

D Ikatan hydrogen
Hydrogen bond

5.6 Ikatan Logam

[Pahang 2023-23] Sifat logam boleh dijelaskan dari segi struktur logam dan ikatan. Apakah asas bagi ikatan logam?
Properties of metal can be explained in terms of metallic structure and bonding. What is the basis of metallic bond?

A Daya tarikan antara atom-atom logam
The attraction between metal atoms

B Daya antara proton dan neutron
The attraction between protons and neutrons
C Daya tarikan antara ion logam positif dan lautan elektron
The attraction between positive metal ions and sea of electrons

D Daya antara ion logam positif dan elektron yang saling terikat
The attraction between positive metal ions and interlocking electrons

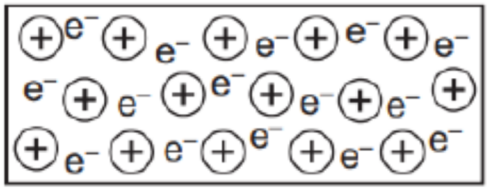
[Johor Bahru 2023-21] Jadual 1 menunjukkan susunan elektron bagi empat unsur.
Table 1 shows the electron arrangement of four elements.

Unsur *Element*	Susunan elektron *Electron arrangement*
R	2.8
S	2.8.2
T	2.8.4
U	2.8.6

Antara yang berikut, unsur manakah yang akan membentuk ikatan logam?
Which of the following elements will form metallic bond?

A R B S C T D U

[MRSM2023-21] Rajah 10 menunjukkan struktur kekisi bagi unsur X
Diagram 10 shows a lattice structure of element X.



Antara pernyataan berikut, manakah yang benar tentang unsur X?
Which of the following statements are true about element X?

I Wujud sebagai gas pada keadaan bilik
Exist as a gas at room conditions

II Mempunyai takat lebur yang tinggi/ *Has high melting point*

III Larut dalam air/*Dissolves in water*

IV Mengalirkan arus elektrik dalam keadaan pepejal
Conducts electricity in solid state

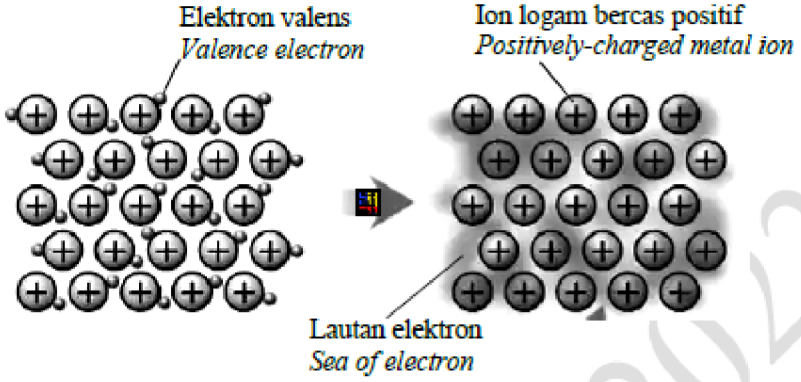
A I dan II
I and II

C I dan III
I and III

B II dan IV
II and IV

D III dan IV
III and IV

[Pahang JUJ Set 1 2023-23] Rajah 8 menunjukkan pembentukan suatu ikatan.
Diagram 8 shows formation of a bond.



Pernyataan manakah yang betul bagi pembentukan ikatan tersebut?
Which statements is correct for the formation of the bond?

A Perkongsian elekron antara atom atom bukan logam
Sharing of electrons between non-metal

B Pemindahan elektron between bukan logam dan logam
Transfer of electrons between non-metal and metal

C Daya tarikan logam antara ion logam bercas positif dan elektron valens
The metallic force of attraction between the positively-charged metal ion and valence electron

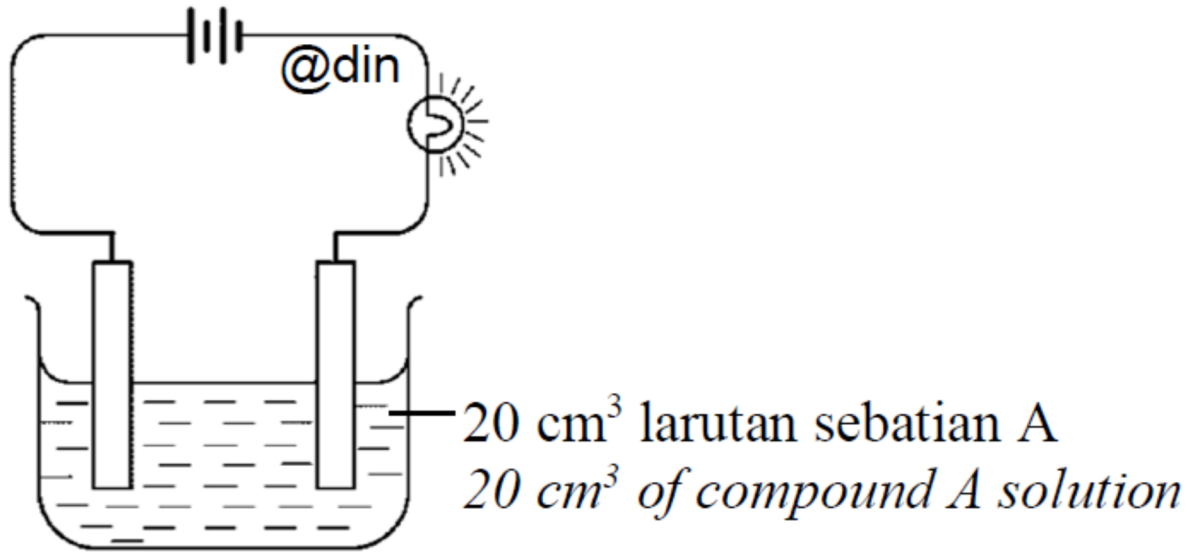
D Daya tarikan elektrostatik antara lautan elektron dengan ion logam bercas positif
The electrostatic attraction forces between the sea of electron and the positively-charged metal ion

[SBP2023-05] Antara yang berikut, padanan manakah yang betul?
Which of the following is matched correctly?

	Sebatian *Compound*	Jenis sebatian *Type of compound*
A	Gliserol, $C_3H_5(OH)_3$ *Glycerol, $C_3H_5(OH)_3$*	Kovalen *Covalent*
B	Kloropikrin, CCl_3NO_2 *Chloropicrin, CCl_3NO_2*	Ion *Ionic*
C	Natrium klorat(V), $NaClO_3$ *Sodium chlorate(V), $NaClO_3$*	Kovalen *Covalent*
D	Parasetamol, $C_8H_9NO_2$ *Paracetamol, $C_8H_9NO_2$*	Ion *Ionic*

5.7 Sebatian Ion dan Sebatian Kovalen

[Johor PPD Tangkak 2023 10] Rajah 5 menunjukkan susunan radas dan pemerhatian bagi kekonduksian elektrik sebatian A.
Diagram 5 shows apparatus set-up and observation for the electrical conductivity of compound A.



Manakala Jadual 2 menunjukkan maklumat bagi unsur X, Y dan Z.
Meanwhile Table 2 shows the information for elements X, Y and Z.

Unsur *Element*	K	L	M	N
Kedudukan unsur dalam Jadual Berkala Unsur *Position in Periodic Table of Elements*	Kala 2 *Period 2* Kumpulan 14 *Group 14*	Kala 3 *Period 3* Kumpulan 2 *Group 2*	Kala 3 *Period 3* Kumpulan 17 *Group 17*	Kala 2 *Period 2* Kumpulan 18 *Group 18*

Berdasarkan Rajah 5 dan Jadual 2, pilih unsur-unsur yang boleh bertindak balas untuk membentuk sebatian A.
Based on Diagram 5 and Table 2, choose the elements that can react to form compound A.

A K dan N
K and N

B L dan N
L and N

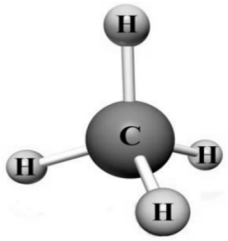
C K dan M
K and M

D L dan M
L and M

[Johor Skudai2023-08] Antara berikut, yang manakah pasangan sifat fizik yang benar tentang magnesium klorida?
Which of the following pair of physical properties is correct about magnesium chloride?

	Keterlarutan dalam air *Solubility in water*	Kekonduksian elektrik dalam keadaan leburan *Electrical conductivity in molten state*
A	Larut *Soluble*	Mengkonduksi *Conducting*
B	Larut *Soluble*	Tidak mengkonduksi *Not conducting*
C	Tidak larut *Insoluble*	Mengkonduksi *Conducting*
D	Tidak larut *Insoluble*	Tidak mengkonduksi *Not conducting*

[Perlis 2023-06] Rajah 1 menunjukkan model atom satu sebatian.
Diagram 1 shows the atom model of a compound.



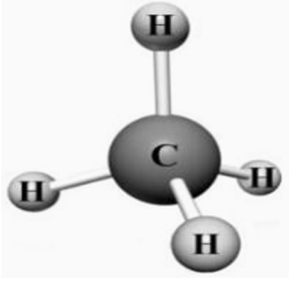
Antara berikut, yang manakah sifat sebatian itu?
Which of the following is the property of the compound?

A Larut dalam air/ *Dissolves in water*
B Larut dalam pelarut organik/ *Dissolve in organic solvent*

C Takat lebur dan takat didih yang tinggi
High melting and boiling points

D Boleh mengkonduksikan elektrik dalam keadaan leburan
Able to conduct electricity in molten state

[Johor Skudai2023-09] Rajah 9 menunjukkan model atom satu sebatian.
Diagram 9 shows the atom model of a compound.



Rajah 9/ Rajah 9

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

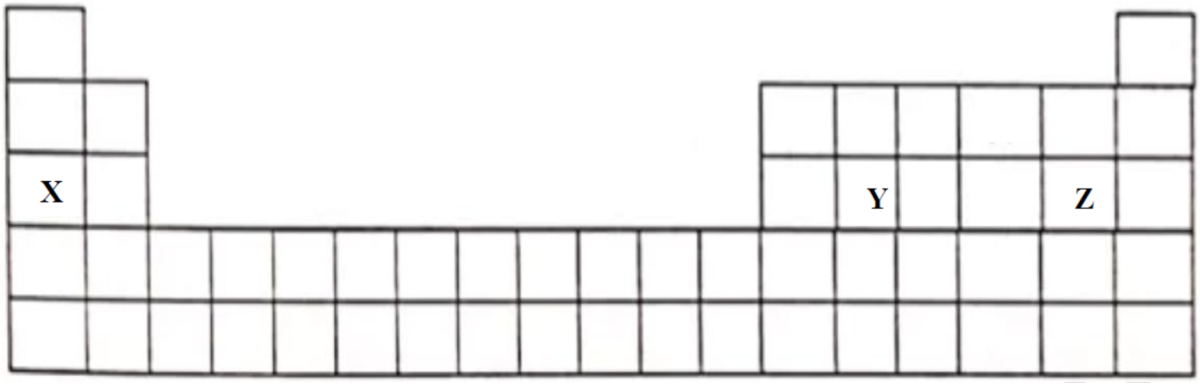
A Larut dalam air
Dissolves in water

B Larut dalam pelarut organik
Dissolve in organic solvent

C Takat lebur dan takat didih yang tinggi
High melting and boiling points

D Boleh mengkonduksikan elektrik dalam keadaan leburan
Able to conduct electricity in molten state

[Pahang JUJ Set 2 2023-39] Rajah 11 menunjukkan sebahagian daripada Jadual Berkala Unsur.
Diagram 11 shows part of a Periodic Table of Elements.



Rajah 11
Diagram 11

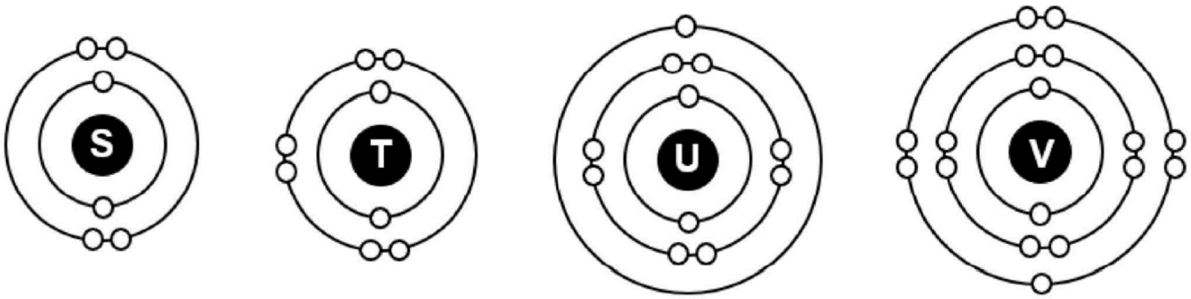
Berikut ialah sifat-sifat bagi bahan I dan bahan II yang terbentuk daripada unsur X, Y dan Z?
The following are the characteristics of substance I and substance II which formed from elements X, Y dan Z?

Sifat bahan I *Characteristic of substance I*	Sifat bahan II *Characteristic of substance II*
▪ Boleh mengkonduksikan elektrik dalam keadaan leburan atau akueus *Can conduct electricity in molten state or aqueous solution* ▪ Mempunyai takat didih yang tinggi *Has high boiling point* ▪ Larut dalam air *Soluble in water*	▪ Tidak boleh mengkonduksi elektrik dalam semua keadaan *Cannot conduct electricity in any state* ▪ Mempunyai takat didih yang rendah *Has low boiling point* ▪ Tdak larut dalam air *Insoluble in water*

Yang manakah antara berikut adalah formula yang betul bagi bahan I dan bahan II?
Which of the following is the correct formula of substance I and substance II?

	Bahan I/ *Substance I*	Bahan II/ *Substance II*
A	X	Z_2
B	XZ	YZ_4
C	YZ_4	XZ

[Kelantan 2023-18] Rajah 6 menunjukkan susunan elektron bagi atom-atom S, T, U dan V. S, T, U dan V adalah bukan simbol sebenar bagi unsur-unsur tersebut.
Diagram 6 shows the electrons arrangements of atoms S, T, U and V.
S, T, U and V are not the actual symbols of the elements.



Pasangan unsur-unsur manakah yang membentuk suatu sebatian yang boleh menyalakan mentol dalam keadaan akueus?
Which pair of elements forms a compound that is bulb light up when molten state?

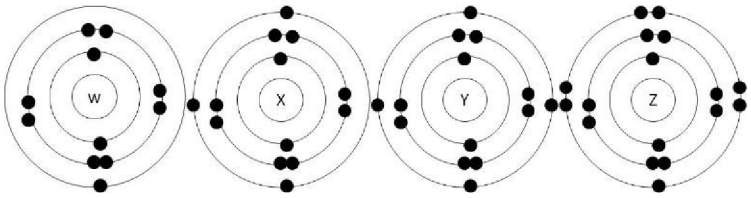
A. S dan T
S and T

B. S dan U
S and U

C. V dan S
V and S

D. U dan V
U and V

[Johor Skudai2023-07] Rajah 7 menunjukkan susunan elektron bagi atom-atom W, X, Y dan Z. W, X, Y dan Z adalah bukan simbol sebenar bagi unsur-unsur tersebut.
Diagram 7 shows the electrons arrangements of atoms W, X, Y and Z. W, X, Y, and Z are not the actual symbols of the elements.



Pasangan unsur-unsur manakah yang membentuk suatu sebatian yang tak larut dalam air?
Which pair of elements forms a compound that is insoluble in water?

A W dan Z
W and Z

C W dan Y
W and Y

B X dan Z
X and Z

D Y dan Z
Y and Z

[Selangor2023 Set 1-21] Jadual 1 menunjukkan nombor proton bagi empat unsur.
Table 1 shows the proton number of four elements.

Unsur/ *Element*	Nombor proton/ *Proton number*
W	3
X	13
Y	6
Z	17

Jadual 1 / *Table 1*

Antara pasangan unsur-unsur berikut, yang manakah membentuk sebatian yang tak terlarut dalam air?
Which of the following pair of elements forms a compound that is insoluble in water?

A W dan Z
W and Z

C Y dan Z
Y and Z

B X dan Z
X and Z

D W dan Y
W and Y

[MRSM2023-31] Jadual 2 menunjukkan nombor proton bagi lima unsur V, W, X, Y dan Z yang merupakan bukan simbol unsur yang sebenar.
Table 2 shows the proton number for five elements V, W, X, Y and Z which are not the actual symbol of elements.

Unsur *Element*	V	W	X	Y	Z
Nombor proton *Proton number*	1	6	9	11	16

Jadual 2/ *Table 2*

Antara pasangan unsur berikut, yang manakah membentuk sebatian yang boleh mengkonduksi elektrik dalam larutan akueus?
Which of the following pairs of elements forms a compound that can conduct electricity in aqueous solution?

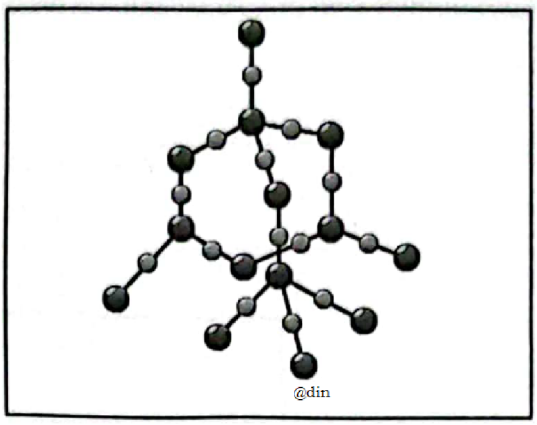
A V dan W
V and W

B X dan Z
X and Z

C X dan Y
X and Y

D W dan Z
W and Z

[Kedah2023-20] Rajah di bawah menunjukkan struktur molekul bagi silikon dioksida, SiO_2.
Diagram below shows a molecular structure of silicon dioxide, SiO_2



Antara berikut yang manakah benar tentang ciri-ciri molekul di atas?
Which of the following is true about the characteristic of the molecule above?

A Struktur yang kecil dan ringkas dan boleh didapati dalam keadaan pepejal, cecair dan gas.
Small and simple structures and can be found in solid, liquid and gas state.

B Tiada daya tarikan Van der Waals yang wujud antara molekul.
No Van der Waals attraction force exists between the molecules.

C Daya tarikan Van der Waals antara molekul adalah lemah.
Van der Waals attraction force between the molecules are weak

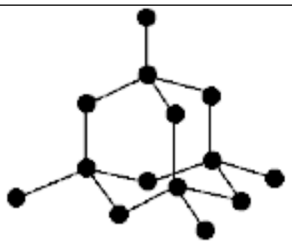
[Pahang 2023-04] Silikon dioksida, SiO_2 adalah sebatian kovalen yang mempunyai struktur molekul gergasi. Antara berikut yang manakah merupakan sifat silikon dioksida, SiO_2?
Silicon dioxide, SiO_2 is a covalent compound with a giant molecular structure. Which of the following is a property of silicon dioxide, SiO_2?

A Struktur yang kecil dan ringkas
Small and simple structure

B Takat lebur dan takat didih yang tinggi
High melting point and boiling point

C Ikatan kovalen yang kuat di dalam molekul dan daya tarikan yang lemah antara molekul
Strong covalent bonds in molecule and weak forces of attraction between molecules

[MRSM2023-20] Rajah 9 menunjukkan struktur dua sebatian kovalen.
Diagram 9 shows the structure of two covalent compounds.

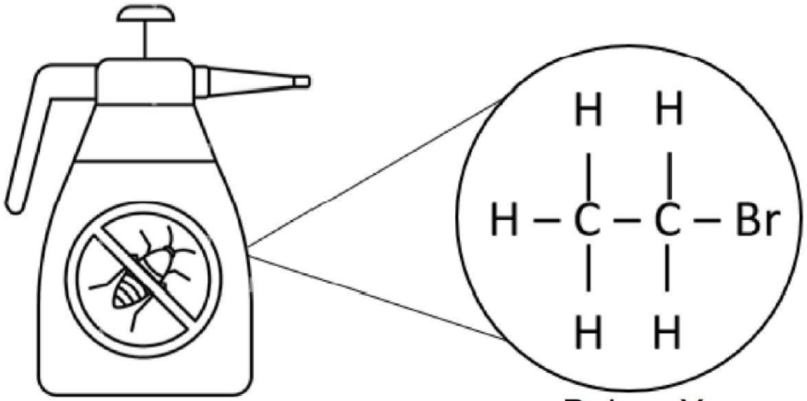
	
Karbon dioksida/ *Carbon dioxide*	Berlian / *Diamond*

Rajah 9/ Diagram 9

Antara pernyataan berikut, yang manakah benar tentang sebatian tersebut?
Which of the following statement is true about the compounds?

	Karbon dioksida *Carbon dioxide*	Berlian *Diamond*
A	Mempunyai ikatan kovalen yang lemah *Has weak covalent bond*	Mempunyai ikatan kovalen yang kuat *Has strong covalent bond*
B	Tidak mengkonduksikan elektrik *Cannot conduct electricity*	Boleh mengkonduksikan elektrik *Can conduct electricity*
C	Mempunyai takat lebur yang rendah *Has low melting point*	Mempunyai takat lebur yang rendah *Has low melting point*
D	Mempunyai daya tarikan Van der Waals yang lemah antara molekul *Has weak Van der Waals attraction force between molecules*	Tidak mempunyai daya tarikan Van der Waals antara molekul *No Van der Waals attraction force between molecules*

[Kelantan 2023-29] F4 Bab 05
29. Rajah 13 menunjukkan formula struktur bahan X yang digunakan dalam racun serangga.
Figure 13 shows the structural formula of substance X used in insecticides.



Bahan X
Substance X

Antara berikut, yang manakah ciri-ciri bahan X.
Which of the following is a property of substance X

A. Mudah meruap
Volatile easily

B. Larut dalam air
Soluble in water

C. Mempunyai takat lebur yang tinggi
Has a high melting point

[MRSM2023-0] Antara yang berikut, bahan manakah akan mengalami perubahan kimia apabila arus elektrik dialirkan melaluinya?
Which of the following substance will undergo chemical changes when electricity is passed through it?

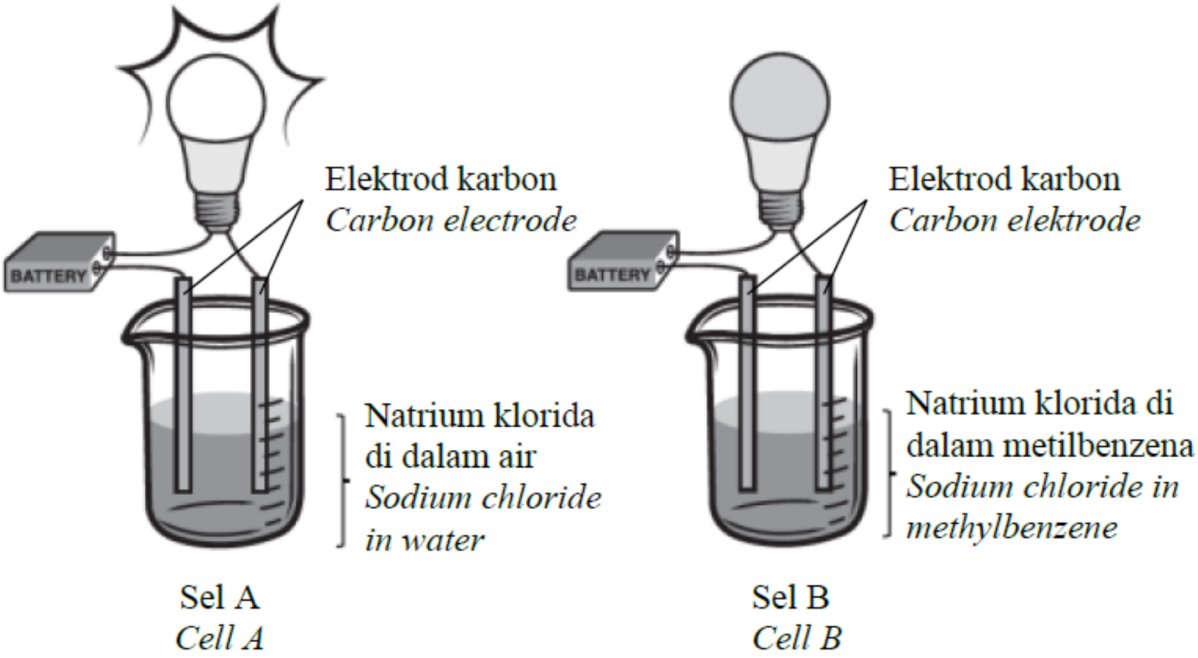
A Leburan naftalena
Molten naphthalene

B Larutan glukosa
Glucose solution

C Pepejal plumbum(II) bromida
Solid lead(II) bromide

D Larutan kalium nitrat
Potassium nitrate solution

[Pahang 2023-35] Dua eksperimen dijalankan untuk mengkaji keterlarutan natrium klorida di dalam air dan metilbenzena. Larutan yang terbentuk itu kemudiannya digunakan sebagai elektrolit. Rajah 12 menunjukkan susunan radas untuk menunjukkan kekonduksian elektrik bagi larutan yang terbentuk.
Two experiments are conducted to study the solubility of sodium chloride in water and methylbenzene. The solutions produced are then used as electrolytes. Diagram 12 shows the apparatus set-up of the experiments to show the electrical conductivity of the solutions produced.



Rajah 12/ Diagram 12

Selepas 20 minit, hanya mentol dalam sel A menyala. Antara berikut, yang manakah adalah inferens bagi eksperimen itu?
After 20 minutes, only the bulb in cell A lights up. Which of the following is the inference for the experiment?

A Natrium klorida wujud sebagai ion di dalam air
Sodium chloride exists as ions in water

B Natrium klorida wujud sebagai molekul di dalam air
Sodium chloride exists as molecules in water

C Natrium klorida wujud sebagai ion di dalam metilbenzena
Sodium chloride exists as ions in metylbenzene

D Natrium klorida wujud sebagai atom di dalam metilbenzena
Sodium chloride exists as atoms in metylbenzene

[Putrajaya2023-20] Antara yang berikut, padanan sebatian manakah yang betul dengan jenis sebatiannya?
Which of the following compounds and its type is correctly matched?

	Sebatian/ *Compound*	**Jenis sebatian/ *Type of compound***
A	Batu kapur/ *Limestone*	Kovalen/ *Covalent*
B	Garam biasa/ *Table salt*	Kovalen/ *Covalent*
C	Asetamida/ *Acetamide*	Ion/ *Ionic*
D	Silikon dioksida/ *Silicon dioxide*	Kovalen/ *Covalent*

[Selangor2023 Set 1-03] Bahan G merupakan konduktor haba dan elektrik yang baik dalam keadaan pepejal dan leburan. Antara ikatan kimia berikut, yang manakah terdapat dalam bahan G?
Substance G is a good heat and electrical conductor in solid and molten states. Which of the following chemical bond is found in substance G?

A Ikatan datif
Dative bond

C Ikatan kovalen
Covalent bond

B Ikatan ion
Ionic bond

D Ikatan logam
Metallic bond

[SBP2023-21] Antara yang berikut, penyataan manakah yang betul untuk menerangkan mengapa pepejal natrium klorida tidak boleh mengkonduksikan elektrik tetapi leburan natrium klorida boleh mengkondusikan elektrik?
Which of the following statements is correct to describe why solid sodium chloride cannot conduct electricity but molten sodium chloride able to conduct electricity?

A ion-ion dalam pepejal natrium klorida tidak dapat bergerak bebas tetapi dapat bergerak bebas apabila dileburkan
The ions in solid sodium chloride cannot move freely hut con move freely when melted

B Terdapat daya tarikan elektrostatik yang kuat dalam pepejal natrium klorida tetapi menjadi lemah apabila dileburkan
There is a strong electrostatic force of attraction in solid sodium chloride hut becomes weaker when melted

C Tenaga kinetik dalam natrium klorida adalah rendah dalam keadaan pepejal tetapi semakin tinggi apabila dileburkan
The kinetic energy in solid sodium chloride is low in solid state hut higher when melted

D Susunan zarah-zarah dalam pepejal natrium klorida adalah padat dan teratur tetapi menjadi tidak teratur apabila dileburkan
The arrangement of particles in solid sodium chloride arc closely packed in orderly manner but become in orderly manner when melted

BAB 6 Asid, Bes dan Garam

6.1 Peranan Air dalam Menunjukkan Keasidan dan Kealkalian

[Pahang 2023-05] Antara bahan berikut, yang manakah bersifat asid?
Which of the following substances is acidic?

A Ammonia
Ammonia

C Karbon dioksida
Carbon dioxide

B Kalium oksida
Potassium oxide

D Natrium hidroksida
Sodium hydroxide

[Terengganu2023-07] Apakah ion yang terhasil apabila ion hidrogen berpadu dengan molekul air?
What ion is produced when a hydrogen ion combines with a water molecule?

A Ion oksida
Oxide ion

C Ion ammonium
Ammonium ion

B Ion hidroksida
Hydroxide ion

D Ion hidroksonium
Hydroxonium ion

[Perlis 2023-30] Antara berikut, yang manakah ciri gas hidrogen klorida yang membolehkan sifat keasidan dapat ditunjukkan?
Which of the following is the characteristic of hydrogen chloride gas that enables its acidic properties to be shown?

A Mengion di dalam air
Ionise in water

B Melarut di dalam air
Dissolve in water

C Mengandungi ion hidrogen dalam molekul
Contains hydrogen ion in its molecule

D Mengion dalam air dan menghasilkan ion hidrogen
Ionise in water and produce hydrogen ion

[Putrajaya2023-07] Antara berikut, terminologi manakah yang betul bagi bahan kimia yang mengion separa dalam air untuk menghasilkan kepekatan ion hidroksida yang rendah?
Which of the following is the correct terminology for chemical substance that ionises partially in water to produce low concentration of hydroxide ions?

A Asid kuat
Strong acid

B Asid lemah
Weak acid

C Alkali kuat
Strong alkali

D Alkali lemah
Weak alkali

Negeri Sembilan 2023-09] Dalam satu eksperimen, kertas litmus biru lembap menjadi merah apabila dimasukkan ke dalam tabung uji yang mengandungi gas X. Antara yang berikut, penyataan manakah yang betul tentang X?
In an experiment, damp blue litmus paper turns red when insert into a test tube containing gas X. Which of the following statements is correct about X?

A Larut dalam air dan mengion menghasilkan ion hidrogen
Dissolve in water and ionise to form hydrogen ion

B Larut dalam air menghasilkan kepekatan ion hidroksida yang tinggi
Dissolve in water to produce high concentration of hydroxide ion

C Terhasil daripada tindak balas antara asid dan alkali
Produced from the reaction between acid and alkali

[Putrajaya2023-18] Mengapakah gas ammonia, NH_3 dapat menunjukkan sifat kealkalian di dalam air?
Why does ammonia gas, NH_3 able to shows its alkalinity in water?

A Boleh larut di dalam air untuk membentuk ion ammonium dan ion hidroksida
Can dissolve in water to form ammonium ions and hydroxide ions

B NH_3 adalah gas yang kurang tumpat dengan 3 atom hidrogen per molekul
NH_3 is less dense gas with 3 hydrogen atoms per molecule

C Mempunyai pasangan elektron bebas untuk membentuk ikatan datif dengan molekul air
Having a free electron pair to form a dative bond with water molecules

D Merupakan sebatian kovalen yang larut di dalam air dan juga pelarut organik
Is a covalent compound that dissolves in water and organic solvents

[Pahang JUJ Set 2 2023-09] Antara pernyataan berikut yang manakah benar tentang alkali?
Which of the following is true about an alkali?

A Alkali tidak mengakis
Alkali is not corrosive

B Alkali ialah bes yang larut dalam air
Alkali is base that is soluble in water

C Alkali lemah mempunyai nilai pH yang tinggi
Weak alkali has a high pH value

D Alkali lemah ialah alkali yang mempunyai darjah pengionan yang tinggi
Weak alkali is alkali that has a high degree of ionization

[Pahang JUJ Set 1 2023-05] Antara ion berikut, yang manakah menunjukkan sifat alkali?
Which of the following ion shows alkaline properties?

A Ion oksida *Oxide ion*	B Ion hidrogen *Hydrogen ion*	C Ion hidroksida *Hydroxide ion*

[Kedah2023-21] Antara yang berikut yang manakah tidak benar apabila air ditambahkan kepada larutan ammonia ?
Which of the following is not true when water is added to an ammonia solution?

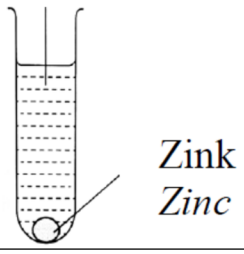
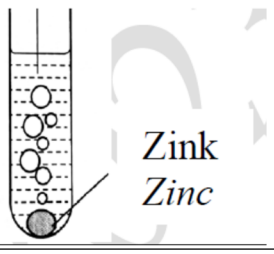
A Nilai pH berkurang
The pH value decreases

B Nilai pOH bertambah
The pOH value increases

C Darjah pengionan berkurang
The degree of ionisation decreases

D Kepekatan ion hidroksida berkurang
The concentration of hydroxide ions decreases

[Pahang JUJ Set 2 2023-22] Rajah 4 menunjukkan pemerhatian tindak balas antara serbuk zink dengan hydrogen klorida dalam dua jenis bahan.
Diagram 4 shows the reaction between zinc powder with hydrogen chloride in two types of substances.

Tabung uji 1/ *Test tube I*	Tabung uji II/ *Test tube II*
Hidrogen klorida dalam propanon *Hydrogen chloride in propanone*  	Hidrogen klorida dalam air *Hydrogen chloride in water* 
Tiada gelembung gas *No bubbles*	Gelembung gas dibebaskan. *Bubbles are released*

Antara berikut, pernyataan yang manakah menerangkan pemerhatian ini?
Which of the following statements explain the observations?

I Hidrogen klorida dalam propanon tidak mengion
Hydrogen chloride in propanone does not ionise

II Hidrogen klorida dalam air wujud sebagai molekul
Hydrogen chloride in water exists as molecule

III Hidrogen klorida menunjukkan sifat keasidan apabila larut dalam air
Hydrogen chloride shows its acidic property when dissolve in water

IV Hidrogen klorida menunjukkan sifat kealkalian apabila larut dalam propanon
Hydrogen chloride shows its alkaline property when dissolve in propanone

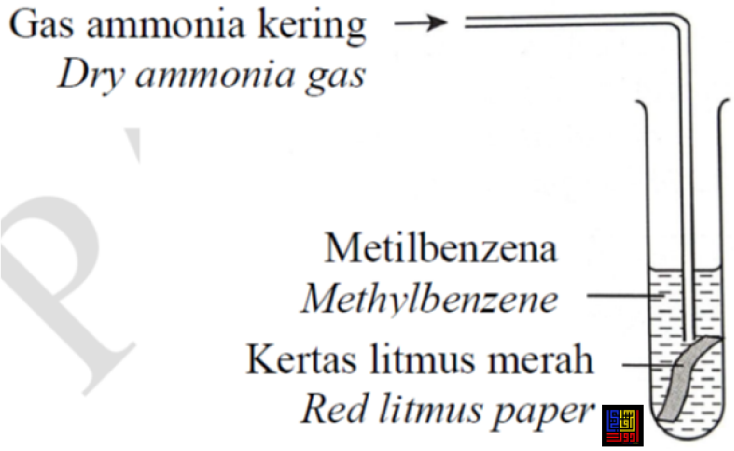
A I dan II
I and II

B I dan III
I and III

C II dan III
II and III

D III dan IV
III and IV

[Pahang JUJ Set 1 2023-20] Rajah 5 di bawah menunjukkan gas ammonia kering sedang dialirkan ke dalam metilbenzena.
The diagram 5 below shows dry ammonia gas being flowed into methylbenzene.



Tiada perubahan yang diperhatikan pada kertas litmus. Apakah yang patut dilakukan untuk kertas litmus bertukar warna ?
No changes are observed on the litmus paper. What should be done in order to make the litmus paper change colour?

A Tutup tabung uji dengan gabus
Put stopper to the test tube

B Ganti metilbenzena dengan air
Replace methylbenzene with water

C Gantikan kertas litmus merah dengan kertas litmus biru.
Substitute the red litmus paper with blue litmus paper

6.2 Nilai pH

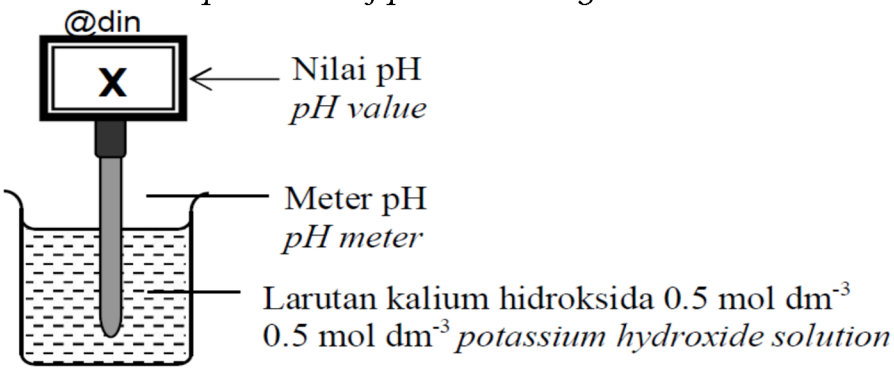
[Terengganu2023-28] Berapakah nilai pH bagi larutan kalium hidroksida, KOH yang mengandungi kepekatan ion hidroksida, OH^- 0.1 mol dm^{-3}?
How much is the pH value of a solution of potassium hydroxide, KOH that contains a concentration of hydroxide ions, OH^- 0.1 mol dm^{-3}?

A 14 B 13 C 10 D 1

[Pahang JUJ Set 2 2023-36] Apakah nilai pH bagi asid sulfurik dengan kepekatan ion hidrogen, H+ 0.2 mol dm^{-3}?
What is the pH value of sulphuric acid with the hydrogen ion concentration, H+ of 0.2 mol dm^{-3} ?

A 0.3 B 0.4 C 0.7 D 1.0

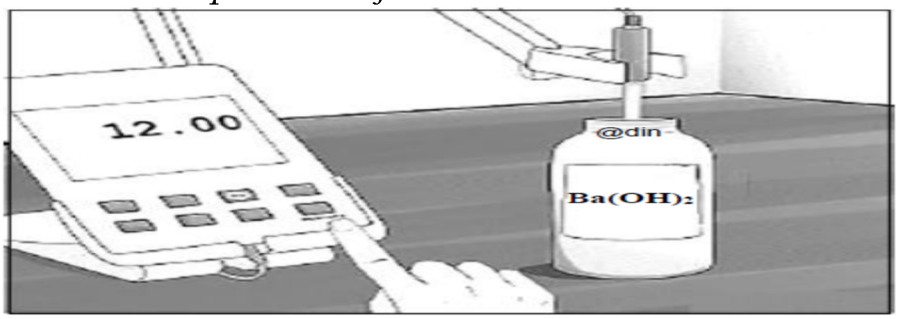
[Johor PPD Tangkak 2023 32] Rajah 16 menunjukkan nilai pH larutan kalium hidroksida.
Diagram 16 shows the pH value of potassium hydroxide solution.



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

A 0.3 B 1.5 C 8.1 D 13.7

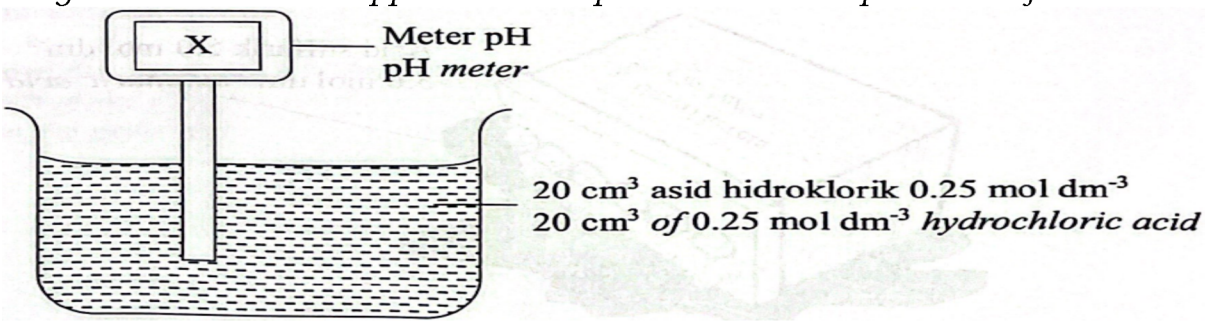
[MRSM2023-32] Rajah 13 menunjukkan nilai pH satu larutan.
Diagram 13 shows the pH value of a solution.



Apakah kemolaran larutan itu?/ *What is the molarity of the solution?*

A 0.005 mol dm^{-3}
B 0.010 mol dm^{-3}
C 0.020 mol dm^{-3}
D 0.200 mol dm^{-3}

[Negeri Sembilan 2023-36] Rajah 12 menunjukkan susunan radas untuk mengukur nilai pH asid.
Diagram 12 shows an apparatus set-up to measure the pH value of an acid.



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

A 0.30 B 0.60 C 1.15 D 2.30

[SBP2023-07] Bahan manakah yang mempunyai nilai pH lebih daripada 3?
Which substance has the pH value more than 3?

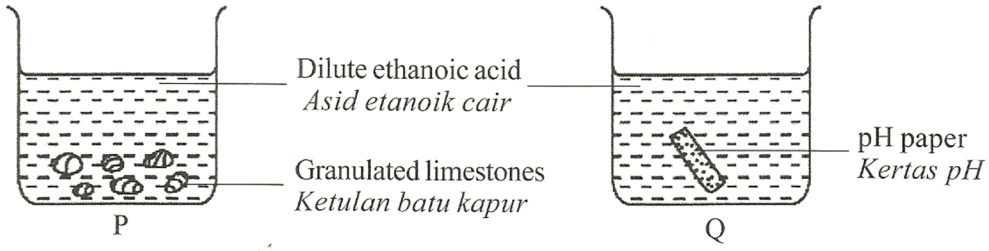
A Asid yang digunakan dalam bateri
Acid which is used in batteries

B Asid yang digunakan dalam pembuatan jeruk
Acid that is used in the making of pickles

C Asid yang terdapat dalam lemon
Acid present in the lemon

D Asid yang terdapat dalam jus gastrik
Acid present in the gastric juice

[Johor Skudai2023-12] Rajah 12 menunjukkan dua bikar, P dan Q yang mengandungi ketulan batu kapur, $CaCO_3$ dan kertas pH masing-masing dalam asid etanoik cair.
Diagram 12 shows two beakers, P and Q that contain granulated limestones, $CaCO_3$ and pH paper respectively in dilute ethanoic acid.



Rajah 12/ Diagram 12

Pemerhatian yang manakah betul
Which observation is correct?

	P	Q
A.	Gas bubbles released *Gelembung gas terbebas*	pH value = 1 *nilai pH = 1*
B.	Gas bubbles released *Gelembung gas terbebas*	pH value = 4 *nilai pH = 4*
C.	Solution turns cloudy *Larutan menjadi keruh*	pH value = 4 *nilai pH = 4*
D.	No change *Tiada perubahan*	pH value = 1 *nilai pH = 1*

[Johor PPD Tangkak 2023 13] Alif telah menjalankan satu kajian ke atas dua larutan di makmal sekolahnya. Larutan A biasa digunakan oleh ibunya di dapur manakala larutan B diperoleh dalam bateri kereta bapanya. Berikut adalah keputusan yang diperoleh daripada kajiannya.
Alif carried out a study on two solutions in his school laboratory. Solution A is often used by his mother in the kitchen while solution B is found in his father's car battery. The following are the result obtained from his study.

Sifat Larutan A *Properties of solution A*	Sifat Larutan B *Properties of solution B*
□ nilai pH 5/ *pH value 5* □ rasa masam/ *sour taste* □ menukar kertas litmus biru ke merah *turns blue litmus paper to red*	□ nilai pH 1/ *pH value 1* □ bau masam/ *sour smell* □ menukar kertas litmus biru ke merah *turns blue litmus paper to red*

Terangkan mengapa terdapat perbezaan terhadap nilai pH larutan sedangkan sifat-sifat lain adalah sama?
Why there is a different in pH value of the solutions while other properties are the same?

A Larutan A lebih tumpat
Solution A is denser

B Larutan A ialah asid kuat
Solution A is a stronger acid

C Larutan B ialah asid monoprotik
Solution B is a monoprotic acid

D Larutan B mengion lengkap dalam air
Solution B ionised completely in water

[Selangaor2023 Set 01-10] Jadual 1 menunjukkan nilai pH bagi dua larutan dengan kepekatan yang sama.
Table 1 shows the pH values of two solutions with the same concentration.

Larutan/ *Solution*	pH
X	8
Y	13

Jadual 1/ *Table 1*

Pernyataan manakah yang menerangkan perbezaan antara nilai pH itu?
Which statement explains the differences in the pH values?

A X mengion lengkap dalam air manakala Y mengion separa dalam air
X ionises completely in water whereas Y ionises partially in water

B Bilangan mol ion hidroksida dalam X adalah lebih tinggi daripada Y
The number of moles of hydroxide ion in X is higher than Y

C Darjah pengionan Y adalah lebih tinggi daripada X.
The degree of ionisation of Y is higher than X

D Kepekatan ion hidroksida dalam X adalah lebih daripada Y
The concentration of hydroxide ion in X is more than Y

6.3 Kekuatan Asid dan Alkali

[Terengganu2023-081] Apakah maksud kebesan asid?
What does acid basicity mean?

A Bilangan ion hidrogen, H^+ yang boleh dihasilkan oleh satu molekul asid yang mengion di dalam air.
The number of hydrogen ions, H^+ that can be produced by one molecule acid that ionizes in water.

B Bilangan ion hidroksida, OH^- yang boleh dihasilkan oleh satu molekul asid yang mengion di dalam air.
The number of hydroxide ions, OH^- that can be produced by one molecule acid that ionizes in water.

C Bilangan ion ammonium, NH_4^+ yang boleh dihasilkan oleh satu molekul asid yang mengion di dalam air.
The number of ammonium ions, NH_4^+ that can be produced by one molecule acid that ionizes in water.

D Bilangan ion hidroksonium, H_3O^+ yang boleh dihasilkan oleh satu molekul asid yang mengion di dalam air.
The number of hydroxonium ions, H_3O^+ that can be produced by one molecule acid that ionizes in water.

[Perlis 2023-17] Asid yang mempunyai nilai kebesan 2 ialah
Acid which has a basicity value of 2 is

A asid karbonik.
carbonic acid.

B asid etanoik.
ethanoic acid.

C asid hidroklorik.
hydrochloric acid.

D asid nitrik.
nitric acid.

[Perlis 2023-07] Antara yang berikut, yang manakah asid lemah?
Which of the following is weak acid?

A Asid hidroklorik
Hydrochloric acid

C Asid sulfurik
Sulphuric acid

B Asid nitrik
Nitric acid

D Asid fosforik
Phosphoric acid

[MRSM2023-05] Antara yang berikut, manakah asid lemah?
Which of the following is a weak acid?

A Asid hidroklorik
Hydrochloric acid

C Asid etanoik
Ethanoic acid

B Asid sulfurik
Sulphuric acid

D Asid nitrik
Nitric acid

[Kelantan 2023-09] Antara berikut, yang manakah asid lemah?
Which of the following is a weak acid?

A. Asid nitrik
Nitric acid

C. Asid sulfurik
Sulphuric acid

B. Asid etanoik
Ethanoic acid

D. Asid hidroklorik
Hydrochloric acid

[Negeri Sembilan 2023-26] Jadual 2 menunjukkan maklumat tentang tiga larutan P, Q dan R.
Table 2 shows information of three solutions P, Q and R.

Larutan *Solution*	Maklumat *Information*
P	10 cm^3 asid sulfurik 1 mol dm^{-3} *10 cm^3 of mol dm^{-3} sulphuric acid*
Q	10 cm^3 asid etanoik 1 mol dm^{-3} *10 cm^3 of mol dm^{-3} ethanoic acid*
R	10 cm^3 asid hidroklorik 1 mol dm^{-3} *10 cm^3 of 1 mol dm^{-3} hydrochloric acid*

Antara yang berikut, susunan manakah yang betul menunjukkan tertib menaik kepekatan ion hidrogen bagi larutan tersebut?
Which of the following shows the correct arrangement in ascending order of concentration of hydrogen ions of the solutions?

A P, Q, R B Q, R, P C R, P, Q D Q, P, R

8. Antara berikut, yang manakah alkali lemah?
Which of the following is a weak alkali?

A Aluminium hidroksida, $Al(OH)_3$
Aluminium hydroxide, $Al(OH)_3$

B Ammonium hidroksida, NH_4OH
Ammonium hydroxide, NH_4OH

C Barium hidroksida, $Ba(OH)_2$
Barium hydroxide, $Ba(OH)_2$

D Kalium hidroksida, KOH
Potassium hydroxide, KOH

[Negeri Sembilan 2023-08] Jadual 1 menunjukkan nilai pH bagi empat larutan alkali.
Table 1 shows the pH values of four alkaline solutions.

Larutan/ *Solution*	pH value/ *Nilai pH*
W	8.0
X	9.0
Y	11.0
Z	13.0

Larutan manakah yang mempunyai kepekatan ion hidroksida yang paling tinggi? Which solutions has the highest concentration of hydroxide ions?

A W B X C Y D Z

[MRSM2023-16] Larutan XOH dan YOH dengan kepekatan yang sama mempunyai nilai pH 10.0 dan 13.0 masing-masing. Antara berikut, yang manakah paling tepat menerangkan tentang larutan XOH dan YOH?
Solution XOH and YOH with same concentration have pH value of 10.0 and 13.0 respectively. Which of the following best explain about solutions XOH and YOH?

	Jenis alkali *Type of alkali*		Darjah penceraian *Degree of dissociation*	
	XOH	YOH	XOH	YOH
A	Strong alkali *Alkali kuat*	Weak alkali *Alkali lemah*	Tinggi *High*	Rendah *Low*
B	Weak alkali *Alkali lemah*	Strong alkali *Alkali kuat*	Tinggi *High*	Rendah *Low*
C	Strong alkali *Alkali kuat*	Weak alkali *Alkali lemah*	Rendah *Low*	Tinggi *High*
D	Weak alkali *Alkali lemah*	Strong alkali *Alkali kuat*	Rendah *Low*	Tinggi *High*

[Kedah2023-03] Jadual menunjukkan nilai pH empat larutan alkali yang mempunyai kepekatan yang sama.
The table shows the pH values of four alkali solutions that have the same concentration.

Larutan / *Solution*	U	V	W	X
pH	9	10	12	14

Larutan alkali manakah mempunyai darjah pengionan yang paling tinggi ?
Which alkali solution has the highest degree of ionization?

A U B V C W D X

[Johor Skudai2023-13] Asid manakah yang mengandungi bilangan ion hidrogen yang paling tinggi?
Which acid contains the highest number of hydrogen ions?

A. 25 cm^3 asid nitrik 1 mol dm^{-3}
25 cm^3 of 1 mol dm^{-3} nitric acid

B. 25 cm^3 asid etanoik 1 mol dm^{-3}
25 cm^3 of 1 mol dm^{-3} ethanoic acid

C. 25 cm^3 asid sulfurik 1 mol dm^{-3}
25 cm^3 of 1 mol dm^{-3} sulphuric acid

D. 25 cm^3 asid hidroklorik 1 mol dm^{-3}
25 cm^3 of 1 mol dm^{-3} hydrochloric acid

[Johor Bahru 2023-16] Antara yang berikut, pasangan manakah yang betul menunjukkan nilai pH dan darjah pengionan bagi asid sulfurik, H_2SO_4?
Which of the following pairs correctly shows the pH value and the degree of ionisation for sulphuric acid, H_2SO_4?

	Nilai pH/ *pH value*	Darjah pengionan/ *Degree of dissociation*
A	1	Tinggi/ *High*
B	1	Rendah/ *Low*
C	5	Rendah/ *Low*
D	5	Tinggi / *High*

[Kelantan 2023-25] Antara larutan yang berikut, yang manakah mempunyai bilangan ion hidrogen, H+ yang sama seperti dalam 50 cm^3 asid sulfurik H_2SO_4 0.1 mol dm^{-3}? [Pemalar Avogadro = 6.02 x 10^{23}]
Which of the following solutions have the same number of hydrogen ions, H+, as in 50 cm^3 of 0.1 mol dm^{-3} H_2SO_4? [Avogadro constant = 6.02 x 10^{23}]
I. 100 cm^3 asid etanoik, CH_3COOH 0.1 mol dm^{-3}
100 cm^3 of 0.1 mol dm^{-3} ethanoic acid, CH_3COOH

II. 50 cm^3 asid fosforik, H_3PO_4 0.1 mol dm^{-3}
50 cm^3 of 0.1 mol dm^{-3} phosphoric acid, H_3PO_4

III. 100 cm^3 asid hidroklorik, HCl 0.1 mol dm^{-3}
100 cm^3 of 0.1 mol dm^{-3} hydrochloric acid, HCl

IV. 50 cm^3 asid nitik, HNO_3 0.2 mol dm^{-3}
50 cm^3 of 0.2 mol dm^{-3} nitric acid, HNO_3

A. I dan II
I and II

C. II dan IV
II and IV

B. I dan III
I and III

D. III dan IV
III and IV

6.4 Sifat-sifat Kimia Asid dan Alkali

[Johor PPD Tangkak 2023 40] Dhia telah menerima sepucuk surat jemputan perkahwinan daripada rakan baiknya. Surat yang diterimanya berwarna putih tanpa tulisan padanya. Terdapat satu nota yang disisipkan sebagai panduan.
Dhia received a letter of wedding invitation from her best friend. The letter is white in colour without any writing on it. There is a note enclosed as a guide.

Kepada sahabat, Dakwat yang digunakan ialah larutan X. Untuk membaca surat ini, semburkan satu larutan fenolftalein yang akan menghasilkan tulisan berwarna merah jambu.	*Dear friend,* *The ink used was Solution X.* *To read this letter, spray a phenolphthalein solution that will produce pink writing.*

Larutan manakah yang perlu disembur bagi membolehkan Dhia membaca surat tersebut.
Which solution should be sprayed to enable Dhia to read the letter?

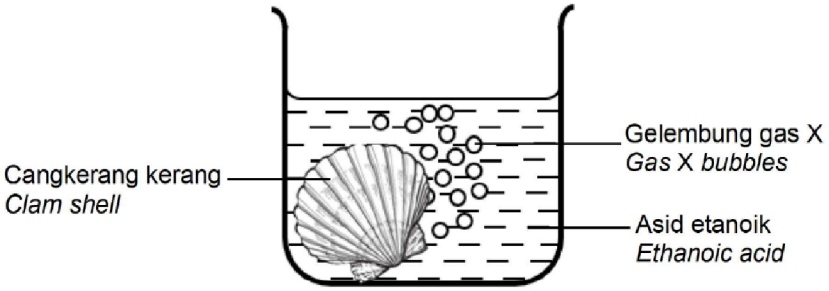
A Zink sulfat
Zinc sulphate

C Magnesium nitrat
Magnesium nitrate

B Barium hidroksida
Barium hydroxide

D Asid sulfurik cair
Dilute sulphuric acid

[Kelantan 2023-19] Rajah 7 menunjukkan satu pemerhatian apabila cengkerang kerang dimasukkan ke dalam bikar yang mengandungi asid etanoik ?
Diagram 7 shows an observation when a cockle shell is put in the beaker contain ethanoic acid?



Apakah X?/ *What is X?*

A. Oksigen
Oxygen

C. Karbon dioksida
Carbon dioxide

B. Hidrogen
Hydrogen

D. Nitrogen dioksida
Nitrogen dioxide

6.5 Kepekatan Larutan Akueus

[Kedah2023-10] Unit manakah yang betul untuk suatu isi padu molar?
Which unit is correct for a molar volume?

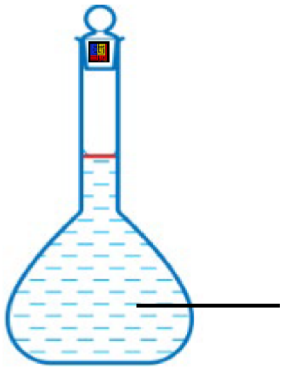
A g mol^{-2} B g mol^{-3} C dm^3 mol^{-2} D dm^3 mol^{-1}

6.6 Larutan Piawai

[Pahang 2023-36] Berapakah isi padu air suling yang perlu ditambah kepada 5.7 g magnesium klorida untuk menghasilkan larutan dengan kepekatan 0.3 mol dm^{-3}? [Jisim atom relatif: Mg = 24, Cl = 35.5]
What is the volume of distilled water that needed to be added to 5.7 g of magnesium chloride to obtain a solution with concentration of 0.3 mol dm^{-3}? [Relative atomic mass: Mg = 24, Cl = 35.5]

A 100 cm^3 B 200 cm^3 C 250 cm^3 D 300 cm^3

[Pahang JUJ Set 1 2023-36] Rajah 18 menunjukkan satu larutan magnesium nitrat 0.25 mol dm^{-3} di dalam sebuah kelalang volumetrik.
Diagram 18 shows a 0.25 mol dm^{-3} of magnesium nitrate solution in a volumetric flask.

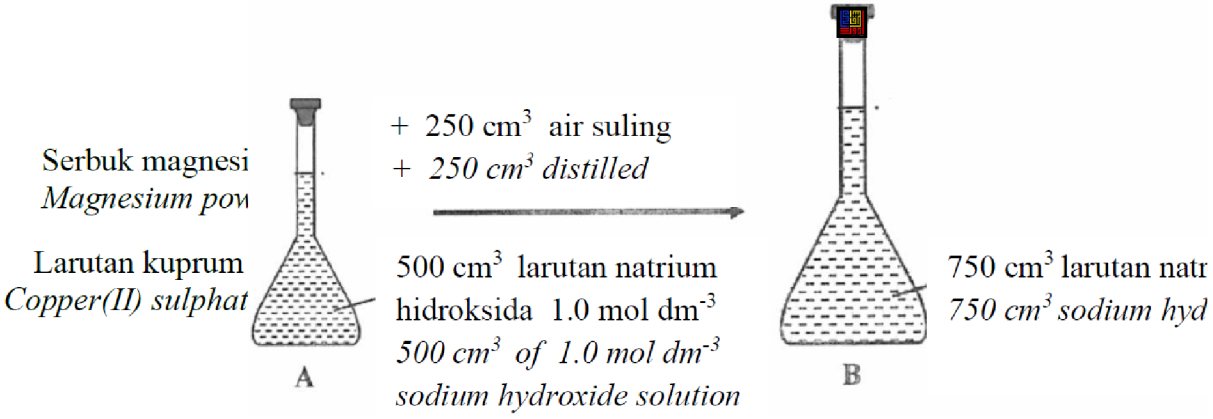


500 cm^3 larutan magnesium nitrat
500 cm^3 magnesium nitrate solution

Berapakah jisim magnesium nitrat yang digunakan?
[Jisim atom relatif: Mg=24, N=14, O=16]
What is the mass of magnesium nitrate used?
[Relative atomic mass: Mg=24, N=14, O=16]

A 10.75 g B 18.50 g C 21.50 g D 37.00 g

[Pahang JUJ Set 1 2023-35] Rajah 17 menunjukkan satu penyediaan larutan natrium hidroksida.
Diagram 17 shows a preparation of sodium hydroxide solution.



Apakah nilai pH larutan selepas di tambah air suling?
What is the pH value of the solution after added with distilled water?

A 0.17 B 1.00 C 13.00 D 13.83

Pencairan

[Melaka 2023-33] Rajah 8 menunjukkan larutan stok kuprum (II) sulfat.
Diagram 8 shows a stock solution of copper(II) sulphate.

Jika Amsyar hendak menyediakan 250 cm^3 larutan kuprum (II) sulfat 0.5 mol dm^{-3} daripada larutan stok larutan, berapakah isipadu larutan stok yang diperlukan?
If Amsyar wants to prepare 250 cm^3 of 0.5 mol dm^{-3} copper (II) sulphate solution from a stock solution, what is the volume of stock solution ?

A 25 cm^3
B 50 cm^3
C 125 cm^3
D 150 cm^3

[Melaka 2023-07] Seorang murid telah menambahkan 25 cm^3 air suling ke dalam sebuah bikar yang berisi 50 cm^3 0.5 mol dm^{-3} larutan kuprum(II) klorida, $CuCl_2$. Hitungkan kemolaran larutan kuprum(II) klorida yang baharu.
A student has added 25 cm^3 of distilled water into a beaker containing 50 cm^3 of 0.5 mol dm^{-3} copper(II) chloride solution, $CuCl_2$. Calculate the molarity of the new copper(II) chloride solution.

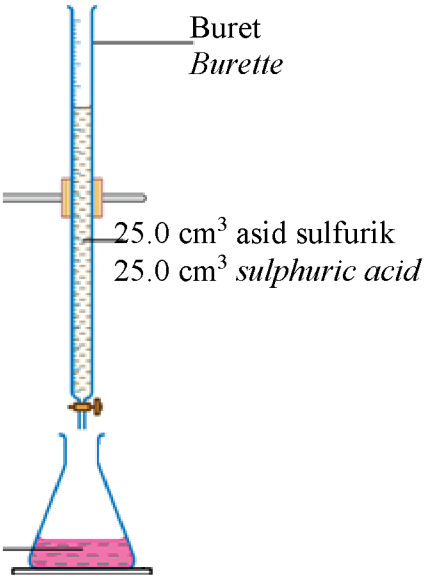
A 0.25 mol dm^{-3}
B 0.33 mol dm^{-3}
C 0.03 mol dm^{-3}
D 0.05 mol dm^{-3}

6.7 Peneutralan

[Selangaor2023 Set 01-28] Apakah isi padu air suling yang perlu ditambahkan kepada 10 cm^3 larutan piawai natrium hidroksida 2.0 mol dm^{-3} supaya kepekatannya berkurang kepada 0.5 mol dm^{-3}?
What is the volume of distilled water that is needed to be added to 10 cm^3 standard solution of sodium hydroxide 2.0 mol dm^{-3} so that its concentration is reduced to 0.5 mol dm^{-3}?

A 10 cm^3
B 20 cm^3
C 30 cm^3
D 40 cm^3

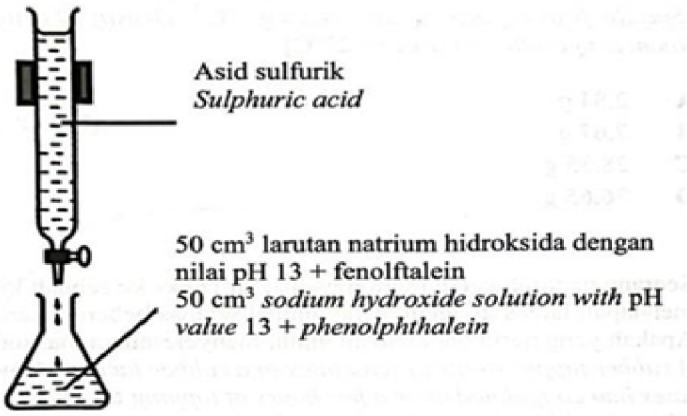
[Putrajaya2023-34] Rajah 13 menunjukkan susunan radas bagi satu tindak balas peneutralan.
Diagram 13 shows the apparatus set-up for a neutralisation reaction.



Apakah kepekatan asid sulfurik?
What is the concentration of the sulphuric acid?

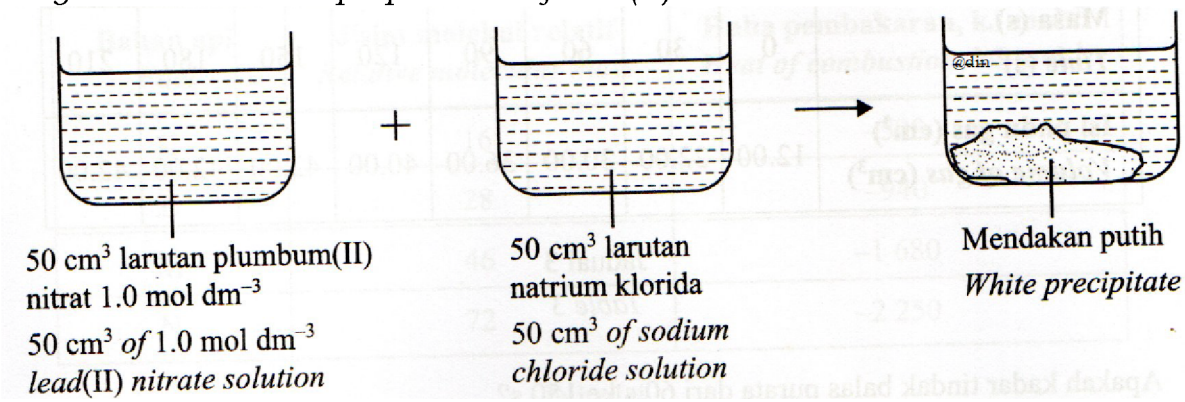
A 0.10 mol dm^{-3}
B 0.15 mol dm^{-3}
C 0.20 mol dm^{-3}
D 0.40 mol dm^{-3}

[SBP2023-36] Rajah 9 menunjukkan susunan radas yand digunakan dalam satu eksperimen untuk menentukkan takat akhir bagi satu titratan asid dan alkali. Didapati 50.0 cm^3 aid sulfurik diperlukan untuk menukar warna fenolftalein pada takat akhir. Apakah kepekatan asid sulfurik yang digunakan?
Diagram 9 shows the set-up of apparatus used in an experiment to determine the end point of asid and alkali titration. It was found that 50.0 cm^3 of sulphuric acid is needed to change the colour of phenolphthalein at the end point. What is the concentration of the sulphuric acid used?



A 0.025 mol dm^{-3}
B 0.050 mol dm^{-3}
C 0.100 mol dm^{-3}
D 0.200 mol dm^{-3}

[Selangor2023 Set 1-29] Rajah 8 menunjukkan penyediaan plumbum(II) klorida.
Diagram 8 shows the preparation of lead(U) chloride.



Berapakah kepekatan larutan natrium klorida yang diperlukan untuk bertindak balas lengkap dengan larutan plumbum(II) nitrat?
What is the concentration of sodium chloride solution needed to react completely with lead(II) nitrate solution?

A 0.5 mol dm^{-3}
B 1.0 mol dm^{-3}
C 1.5 mol dm^{-3}
D 2.0 mol dm^{-3}

[Selangor2023 Set 1-28] Seorang pelajar memperoleh 0.05 mol magnesium nitrat melalui tindak balas antara pita magnesium berlebihan dengan 50 cm3 asid nitrik. Tindak balas yang berlaku diwakili persamaan berikut.
A student obtained 0.05 moles magnesium nitrate from the reaction between excess magnesium ribbon with 50 cm3 nitric acid. The reaction that occurred is represented by the following equation.

$$Mg + 2HNO_3 \rightarrow Mg(NO_3)_2 + H_2$$

Apakah kemolaran asid nitrik yang digunakan?
What is the molarity of the nitric acid used?

A 0.5 mol dm^{-3}
B 1.0 mol dm^{-3}
C 2.0 mol dm^{-3}
D 4.0 mol dm^{-3}

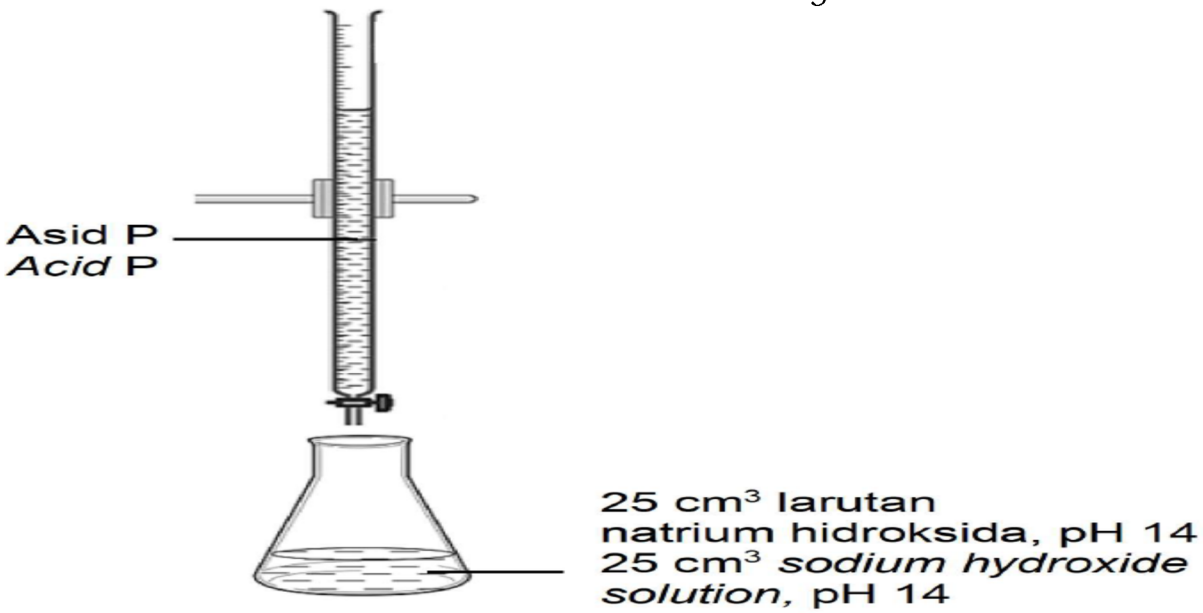
[Selangaor2023 Set 01-26] Persamaan berikut mewakili tindak balas logam X dengan asid sulfurik.
The following equation represents the reaction of metal X with sulphuric acid.

$$2X + H_2SO_4 \rightarrow X_2SO_4 + H_2$$

Berapakah jisim logam X yang diperlukan untuk bertindak balas dengan 100 cm^3 asid sulfurik 0.5 mol dm^{-3}? [Jisim atom relatif: X = 23]
What is the mass of metal X is needed to react with 100 cm^3 of 0.5 mol dm^{-3} sulphuric acid P. [Relative atomic mass: X = 23]

A 2.3 g
B 23 g
C 1.15 g
D 1150 g

[Kelantan 2023-34] Rajah 16 menunjukkan susunan radas yang digunakan untuk tindak balas peneutralan antara asid P dan larutan natrium hidroksida.
Diagram 16 shows the arrangement of the apparatus used for the neutralization reaction between acid P and sodium hydroxide solution.



Antara berikut yang manakah mungkin asid P supaya larutan natrium hidroksida dapat dineutralkan sehingga lengkap.
Which of the following can be acid P so that the sodium hydroxide solution can be neutralized completely.

A. 12.5 cm^3 asid hidroklorik 1.0 mol dm^{-3}
12.5 cm^3 of 1.0 mol dm^{-3} hydrochloric acid

B. 12.5 cm^3 asid sulfurik 0.5 mol dm^{-3}
12.5 cm^3 of 0.5 mol dm^{-3} sulphuric acid

C. 25.0 cm^3 asid etanoik 1.0 mol dm^{-3}
25.0 cm^3 of 1.0 mol dm^{-3} ethanoic acid

D. 25.0 cm^3 asid nitrik 1.0 mol dm^{-3}
25.0 cm^3 of 1.0 mol dm^{-3} nitric acid

[Johor Bahru 2023-13] Asid formik, HCOOH ialah sejenis asid yang digunakan dalam penggumpalan Iateks. Antara yang berikut, pernyataan manakah yang betul tentang asid itu?
Formic acid, HCOOH is a type of acid used in latex coagidation.
Which of the following statements is true about the acid?

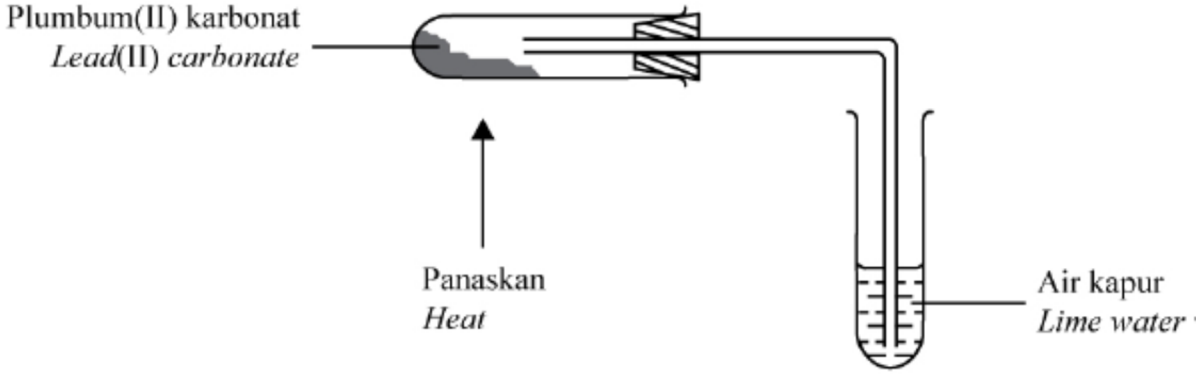
A Mengion Iengkap dalam air/ *Ionises completely in water*

B Menghasilkan hanya satu ion H+ per molekul dalam air
Produces only one H+ ion per molecule in water

C Menghasilkan kepekatan ion H+ yang tinggi
Produces high concentration of II+ ions

D Mempunyai nilai pH 1/ *Has pH value 1*

[Selangaor2023 Set 01-29] Rajah 9 menunjukkan susunan radas untuk mengkaji kesan haba ke atas garam.
Diagram 9 shows the set-up of apparatus to investigate the effect of heat on salt.



Berapakah isi padu gas yang terbebas apabila 24 g plumbum(II) karbonat digunakan pada keadaan bilik?
[Jisim atom relatif: Pb = 207, C = 12, O = 16, isi padu molar gas = 24 dm^3 mol^{-1} pada keadaan bilik]
What is the volume of gas released when 24 g of lead(II) carbonate is used at room condition?
[Relative atomic mass: Pb = 207, C = 12,0= 16, molar volume of gas = 24 dm^3 mol^{-1} at room condition]

A 1.10 dm_3
B 2.01 dm_3
C 2.16 dm_3
D 3.24 dm_3

[Selangor2023 Set 1-10] Antara tindak balas berikut, yang manakah tindak balas peneutralan?
Which of the following reactions is a neutralisation reaction?

A Asid hidroklorik + Kalsium karbonat → Kalsium klorida + Air + Karbon dioksida
Hydrochloric acid + Calcium carbonate → Calcium chloride + Water + Carbon dioxide

B Asid sulfurik + Kuprum(II) oksida → Kuprum(II) sulfat + Air
Sulphuric acid + Copper(II) oxide → Copper(II) sulphate + Water

C Asid hidroklorik + Kalium manganat(VII) → Kalium klorida + Mangan(II) klorida + Klorin + Air
Hydrochloric acid + Potassium manganate(VII) → Potassium chloride + Manganese(VII) chloride + Chlorine + Water

D Asid sulfurik + Zink → Zink sulfat + Gas hidrogen
Sulphuric acid + Zinc → Zinc sulphate + Hydrogen gas

[Selangor2023 Set 1-27] Tindak balas antara logam zink dan asid hidroklorik menghasilkan garam zink klorida dan gas hidrogen.
Apakah jisim logam zink yang perlu bertindak balas dengan asid hidroklorik berlebihan untuk mendapat 2.72 g garam zink klorida?
[Jisim atom relatif: Zn = 65, Cl = 35.5]
The reaction between zinc metal and hydrochloric acid produces zinc chloride salt and hydrogen gas. What is the mass of zinc metal that needs to react with excess hydrochloric acid to obtain 2.72 g of zinc chloride salt?
[Relative atomic mass: Zn = 65, Cl = 35.5]

A 0.65 g B 1.30 g C 1.95 g D 2.60 g

Kegunaan peneutralan

[Johor Bahru 2023-28] Antara yang berikut, yang manakah betul tentang kegunaan peneutralan dalam kehidupan harian?
Which of the following is correct about the use of neutralisation in daily life?

A Susu magnesia meredakan kesakitan dada
Milk of magnesia relieves chest pain

B Kapur mati mengurangkan keasidan tanah
Slaked lime reduces the acidity of soil

C Cuka meredakan kesakitan sengatan lebah
Vinegar relieves the pain of bee sting

D Ubat gigi mengurangkan kesakitan sengatan obor-obor
Toothpaste reduces the pain of jelly fish sting

6.8 Garam, Hablur dan Kegunaan dalam Kehidupan Harian

[Pahang JUJ Set 1 2023-06] Antara garam berikut, yang manakah merupakan garam tak terlarut?
Which of the following salts is an insoluble salt?

I Barium sulfat
Barium sulphate

II Natrium klorida
Sodium chloride

III Plumbum (II) klorida
Lead (II) chloride

IV Ammonium karbonat
Ammonium carbonate

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

[Pahang 2023-06] Batu kapur adalah sejenis garam tak terlarutkan. Antara garam berikut, yang manakah sama jenis dengan batu kapur?
Limestone is an insoluble salt. Which of the following salts is in the same type as limestone?

A Kalium karbonat
Potassium carbonate

C Magnesium karbonat
Magnesium carbonate

B Natrium karbonat
Sodium carbonate

D Ammonium karbonat
Ammonium carbonate

[Melaka 2023-08] Antara yang berikut, bahan manakah adalah garam tak terlarutkan?
Which of the following substances are insoluble salts?

I Barium sulfat
Barium sulphate

III Argentum klorida
Silver chloride

II Magnesium klorida
Magnesium chloride

IV Zink sulfat
Zinc sulphate

A I dan II
I and II

C I dan IV
I and IV

B I dan III
I and III

D III dan IV
III and IV

6.9 Penyediaan Garam

[SBP2023-19] Antara yang berikut, bahan manakah yang perlu ditambah kepada larutan asid propanoik untuk menghasilkan garam natrium propanoat?
Which of the following substances need to be added to propanoic acid solution to produce sodium propanoate salt?

A Pepejal natrium
Sodium solid

C Larutan natrium hidroksida
Sodium hydroxide solution

B Pepejal natrium karbonat
Sodium carbonate solid

D Larutan natrium nitrat
Sodium nitrate solution

[Selangaor2023 Set 01-16] Antara yang berikut, yang manakah garam tak terlarutkan?
Which of the following is an insoluble salt?

A Natrium karbonat
Sodium carbonate

B Kalsium klorida
Calcium chloride

C Plumbum(II) sulfat
Lead(II) sulphate

D Argentum nitrat
Silver nitrate

Larut

[Perlis 2023-37] Persamaan kimia di bawah mewakili tindak balas kimia bagi penyediaan garam terlarutkan, zink sulfat.
The chemical equation below represents the chemical reaction for the preparation of a soluble salt, zinc sulphate.

$$Zn(p/s) + H_2SO_4(ak/aq) \rightarrow ZnSO_4(ak/aq) + H_2(g)$$

3.5 g serbuk zink ditambah ke dalam 50 cm^3 asid sulfurik 0.60 mol dm^{-3}. Berapakah jisim bagi serbuk zink yang tidak bertindak balas?
[Jisim atom relatif : Zn = 65]
3.5 g of zinc powder is added to 50 cm^3 of 0.60 mol dm^{-3} sulphuric acid. What is the mass of unreacted zinc powder?
[Relative atomic mass : Zn = 65]

A 0.43 g B 0.75 g C 1.55 g D 1.95 g

Tak larut

[Melaka 2023-20] Antara yang berikut, manakah akan menghasilkan mendakan apabila dicampurkan?
Which of the following will produce precipitate when mixed?

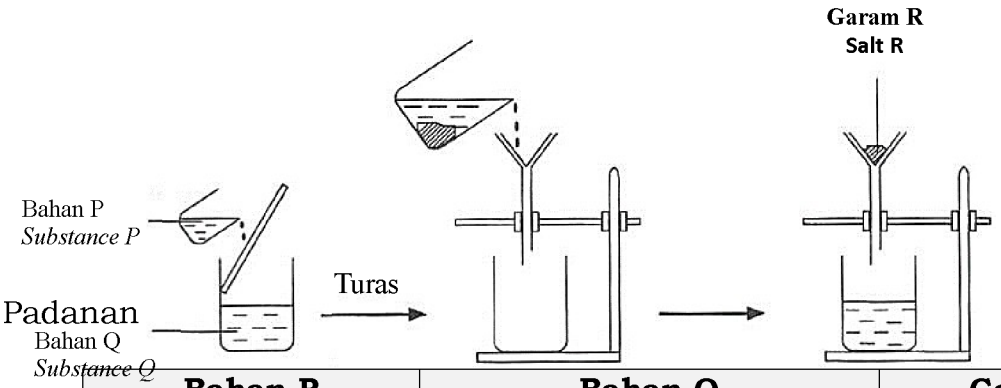
A Asid hidroklorik dan natrium hidroksida
Hydrochloric acid and sodium hydroxide

B Asid hidroklorik dan kuprum(II) oksida
Hydrochloric acid and copper(II) oxide

C Asid sulfurik dan barium hidroksida
Sulphuric acid and barium hydroxide

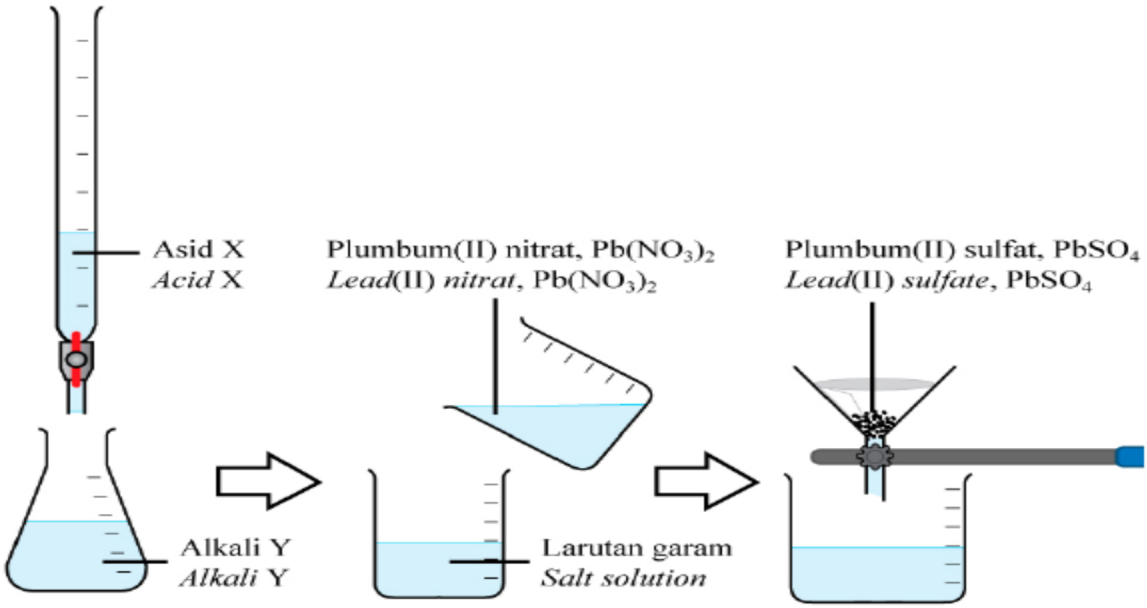
D Asid sulfurik dan zink
Sulphuric acid and zinc

[Johor Skudai2023-32] Rajah 32 menunjukkan susunan radas untuk menyediakan suatu garam.
Diagram 32 shows the apparatus set-up to prepare a salt.



	Bahan P ***Substance P***	**Bahan Q** ***Substance Q***	**Garam R** ***Salt R***
A.	Magnesium nitrat *Magnesium nitrate*	Kalsium sulfat *Calcium sulphate*	Magnesium sulfat *Magnesium sulphate*
B.	Barium nitrat *Barium nitrate*	Natrium sulfat *Sodium sulphate*	Barium sulfat *Barium sulphate*
C.	Kalium sulfat *Potassium sulphate*	Argentum nitrat *Silver nitrate*	Kalium nitrat *Potassium nitrate*
D.	Asid sulfurik *Sulphuric acid*	Larutan natrium hidroksida *Sodium hydroxide solution*	Natrium sulfat *Sodium sulphate*

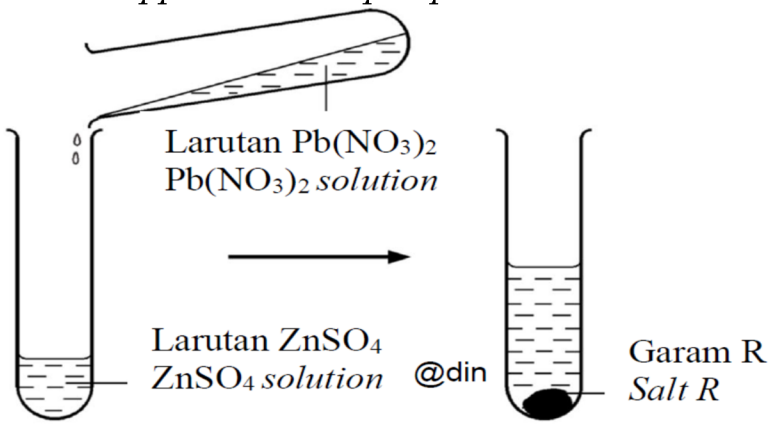
[Selangaor2023 Set 01-37] Rajah II menunjukkan langkah untuk menyediakan garam plumbum(II) sulfat.
Diagram II shows the preparation steps oflead(W) sulphate salt.



Apakah asid dan alkali yang boleh digunakan untuk menyediakan garam plumbum(II) sulfat?
What are the acid and alkali that can he used to prepare the lead(II) sulphate salt?

	Asid X/ *Acid X*	Alkali Y/ *Alkali Y*
A	Asid sulfurik *Sulphuric acid*	Natrium klorida *Sodium chloride*
B	Asid sulfurik *Sulphuric acid*	Natrium hidroksida *Sodium hydroxide*
C	Asid hidroklorik *Hydrochloric acid*	Natrium hidroksida *Sodium hydroxide*
D	Argentum nitrat *Silver nitrate*	Natrium hidroksida *Sodium hydroxide*

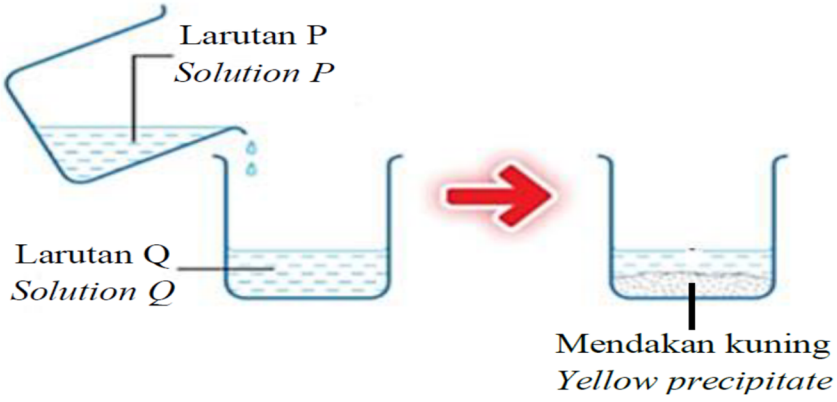
[Johor PPD Tangkak 2023 14] Rajah 6 menunjukkan susunan radas untuk menghasilkan garam R.
Diagram 6 shows the apparatus set-up to produce salt R.



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

A $Ca(NO_3)_2$ B $Cu(NO_3)_2$ C $Fe(NO_3)_2$ D $Mg(NO_3)_2$

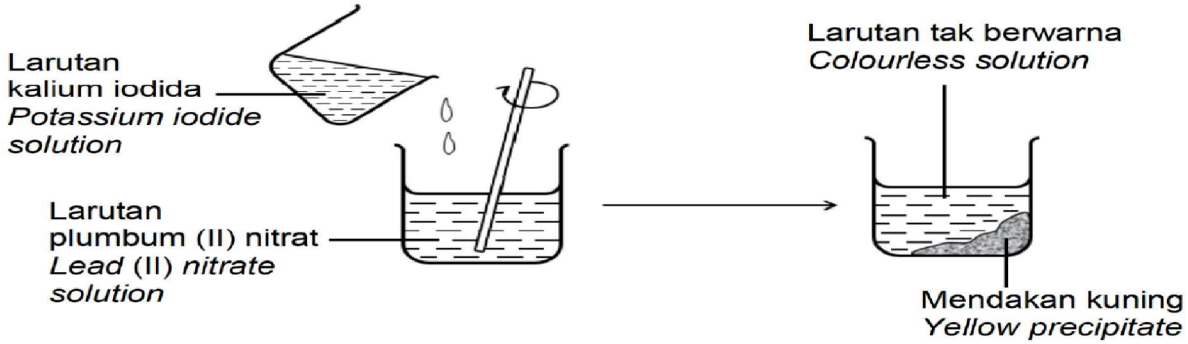
[Pahang 2023-20] Rajah 5 menunjukkan mendakan kuning terbentuk apabila larutan P dan larutan Q dicampurkan.
Diagram 5 shows a yellow precipitate formed when solution P and solution Q are mixed.



Antara yang berikut, yang manakah paling sesuai mewakili larutan P dan larutan Q?
Which of the following best represents solution P and solution Q ?

	Larutan P/ *Solution P*	Larutan Q/ *Solution Q*
A	$CaCl_2$	Na_2SO_4
B	$Pb(NO_3)_2$	KI
C	$Zn(NO_3)_2$	K_2CO_3
D	$Mg(NO_3)_2$	Na_2CO_3

[Kelantan 2023-17] Rajah 5 menunjukkan pemerhatian satu eksperimen yang telah dijalankan oleh seorang pelajar dalam makmal.
Diagram 5 shows the observation of an experiment that has been carried out by a student in the laboratory.



Berdasarkan Rajah 4, pernyataan yang manakah paling tepat untuk menerangkan eksperimen tersebut secara kualitatif dan kuantitatif.
Based on Diagram 4, which statement is most accurate to describe the experiment qualitatively and quantitatively.

A. 1 mol larutan plumbum (II) nitrat bertindak balas dengan 1 mol larutan kalium iodida menghasilkan 1 mol mendakan plumbum (II) iodida dan 1 mol larutan kalium nitrat.
1 mole of lead (II) nitrate solution reacts with 1 mole of potassium iodide solution to produce 1 mole of lead (II) iodide precipitate and 1 mole of potassium nitrate solution.

B. 1 mol larutan plumbum (II) nitrat bertindak balas dengan 2 mol larutan kalium iodida menghasilkan 1 mol mendakan plumbum (II) iodida dan 2 mol larutan kalium nitrat.
1 mole of lead (II) nitrate solution reacts with 2 mole of potassium iodide solution to produce 1 mole of lead (II) iodide precipitate and 2 mole of potassium nitrate solution.

C. 2 mol larutan plumbum (II) nitrat bertindak balas dengan 1 mol larutan kalium iodida menghasilkan 2 mol mendakan plumbum (II) iodida dan 1 mol larutan kalium nitrat.
2 mole of lead (II) nitrate solution reacts with 1 mole of potassium iodide solution to produce 2 mole of lead (II) iodide precipitate and 1 mole of potassium nitrate solution.

[MRSM2023-36] Persamaan kimia berikut menunjukkan tindak balas antara larutan kalium iodida dan larutan plumbum(II) nitrat:
The following chemical equation shows the reaction between potassium iodide solution and lead(II) nitrate solution:

$$Pb(NO_3)_2 + 2KI \rightarrow PbI_2 + 2KNO_3$$

Hitungkan jisim maksimum mendakan yang terbentuk apabila larutan plumbum(II) nitrat berlebihan ditambah ke dalam 50 cm^3 larutan kalium iodida 0.2 mol dm^{-3}.
[Jisim atom relatif: N = 14, O = 16, K = 39, I = 127, Pb = 207]
Calculate the maximum mass of precipitate formed when excess lead(II) nitrate solution is added to 50 cm^3 of 0.2 mol dm^{-3} potassium iodide solution.
[Relative atomic mass: N = 14, O = 16, K = 39, I = 127, Pb = 207]

A 1.010 g B 2.020 g C 2.305 g D 4.610 g

6.10 Tindakan Haba ke atas Garam

[Terengganu2023-29] Garam X terurai apabila dipanaskan dengan kuat. Gas perang terbebas dan menukarkan warna kertas litmus biru lembap kepada merah, Baki pemanasan berwarna kuning semasa panas dan berwarna putih setelah sejuk. Apakah garam X?
Salt X decomposes when heated strongly. Brown gas is liberated and changes the color of the moist blue litmus paper to red. Heating residue is yellow when hot and white when cool. What Is salt X?

A $ZnCO_3$ B $PbCO_3$ C $Pb(NO_3)_2$ D $Zn(NO_3)_2$

[Selangor2023 Set 1-16] Antara garam berikut, yang manakah menghasilkan logam oksida dan gas berwarna perang apabila dipanaskan dengan kuat?
Which of the following salts produces a metal oxide and brown gas when heated strongly?

A Kuprum(II) nitrat
Copper(II) nitrate

B Magnesium sulfat
Magnesium sulphate

C Kuprum(II) karbonat
Copper(II) carbonate

D Natrium klorida
Sodium chloride

[Pahang JUJ Set 2 2023-27] Apabila serbuk garam Q dipanaskan, pemerhatian berikut diperoleh.
When powder of salt Q is heated, the following observations are obtained.

• Serbuk hijau menjadi hitam/*Green powder turns black*

• Gas yang terbebas mengeruhkan air kapur
Gas released turns lime water chalky

Apakah garam Q?/ *What is salt Q?*

A Zink karbonat
Zinc carbonate

B Ferum(II) karbonat
Iron(II) carbonate

C Kuprum(II) karbonat
Copper(II) carbonate

D Magnesium karbonat
Magnesium carbonate

[Johor PPD Tangkak 2023 31] Apabila bahan R yang bewarna hijau dipanaskan, warnanya bertukar menjadi hitam dan gas yang mengeruhkan air kapur dibebaskan. Apakah R?
When the green substance R is heated, it turns black and a gas which turns lime water milky is released. What is R?

A Ferum(III) karbonat
Iron(III) carbonate

B Zink karbonat
Zinc carbonate

C Kuprum(III) karbonat
Kuprum(III) carbonate

D Magnesium karbonat
Magnesium carbonate

[Johor PPD Tangkak 2023 11] Pepejal Q dipanaskan dengan kuat. Warna bakinya adalah perang semasa panas dan kuning semasa sejuk. Apakah pepejal Q?
Solid Q is heated strongly. The colour of the residue is brown when hot and yellow when cold. What is solid Q?

A Kalsium karbonat
Calcium carbonate

B Natrium karbonat
Sodium carbonate

C Zink karbonat
Zinc carbonate

D Plumbum(II) karbonat
Lead(II) carbonate

[Kedah2023-16] Rajah menunjukkan satu eksperimen ringkas yang dijalankan dengan memanaskan garam K
The diagram shows s simple experiment carried out by heating salt X

Garam X
Salt X

Larutan penunjuk semesta
universal indicator solution

Hasil pemanasan garam X ialah gas berwarna perang yang menukarkan larutan penunjuk semesta kepada merah
The result of heating salt X is a brown gas that turns the universal indicator solution red

A Zink nitrat
Zinc nitrate

C kalium nitrat
Potassium nitrate

B natrium karbonat
Sodium carbonate

D kalium karbonat
Potassium carbonate

[Putrajaya2023-39] Seorang pelajar telah menjalankan ujian terhadap garam Q dengan dipanaskan dengan kuat garam tersebut.
A student carried out a test on salt Q by heat the salt strongly.

Jadual 3 menunjukkan persamaan kimia bagi mewakili penguraian garam Q dan pemerhatian bagi tindak balas tersebut :
Table 3 shows the chemical equation to represent the decomposition of the salt Q and the observation for the reaction:

Persamaan kimia *Chemical equation*	Garam Q → Oksida R + Gas S + Gas T *Salt* Q → *Oxide* R + *Gas* S + *Gas* T		
Pemerhatian *Observation*	Oksida R berwarna kuning semasa panas dan bertukar putih apabila sejuk *Oxide* R *is yellow colour when hot and turn white when cold*	Gas S berwarna perang terbebas *Brown gas* S *is released*	Gas tidak berwarna T terbebas *The colourless* T *gas released*

Antara yang berikut, yang manakah benar tentang ujian itu?
Which of the following is true about the test?

A Gas S adalah gas klorin
Gas S is chlorine gas

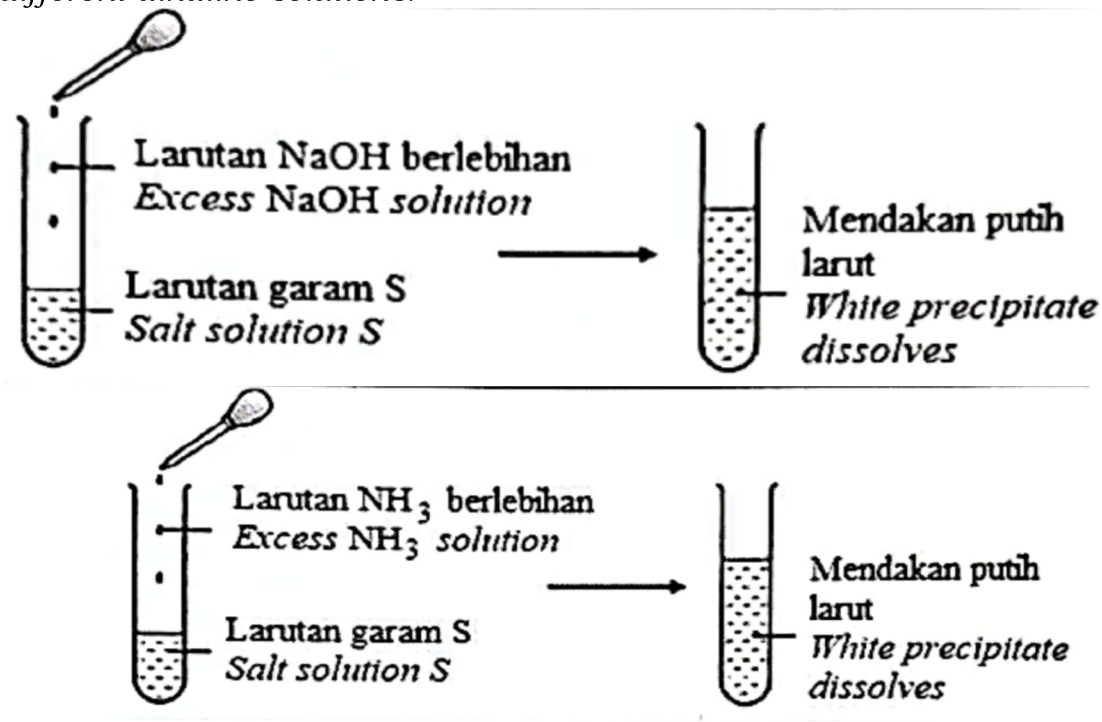
B Garam Q tidak larut dalam air menghasilkan mendakan kuning
Salt Q insoluble in water produced yellow precipitate

C Oksida R bertindak balas dengan asid sulfurik menghasilkan garam terlarutkan
Oxide R reacts with sulphuric acid produced soluble salt

D Bunyi pop terhasil apabila Gas T diuji dengan kayu uji menyala
Pop sound is produced when gas T is tested with burning wooden splinter

6.11 Analisis Kualitatif

[Johor Bahru 2023-39] Rajah 14 menunjukkan pemerhatian apabila larutan garam S diuji dengan larutan alkali yang berlainan.
Diagram 14 shows the observations when salt solution S is tested with different alkaline solutions.



Larutan garam S kemudiannya ditambahkan dengan larutan natrium karbonat dan satu mendakan putih terbentuk. Mendakan putih itu seterusnya dipanaskan dengan kuat. Antara yang berikut, padanan manakah yang betul bagi kation dalam larutan garam S dan pemerhatian bagi baki pemanasan itu?
Salt solution S is then added with sodium carbonate solution and a white precipitate forms. The white precipitate is then heated strongly. Which of the following pairs is correct about the cation in salt solution S and the observation for the residue of the heating?

	Kation *Cation*	Pemerhatian bagi baki pemanasan *Observation for the residue of the heating*
A	Pb^{2+}	Perang semasa panas dan kuning semasa sejuk *Brown when hot and yellow when cold*
B	Zn^{2+}	Kuning semasa panas dan putih semasa sejuk *Yellow when hot and white when cold*
C	Cu^{2+}	Pepejal berwarna hitam *Black solid*
D	Al^{3+}	Pepejal berwarna putih *White solid*

[Johor PPD Tangkak 2023 12] Jadual 3 menunjukkan pemerhatian apabila tiga larutan bagi tiga jenis kation ditambahkan ke dalam larutan kalium karbonat dan larutan natrium klorida masing masing.
Table 3 shows the observations when three solutions of three cations are added into potassium carbonate solution and sodium chloride solution respectively.

Kation *Cation*	Pemerhatian *Observation*	
	Larutan kalium karbonat *Potassium carbonate solution*	Larutan natrium klorida *Sodium chloride solution*
Mg^{2+}	Mendakan putih terbentuk *White precipitate formed*	Larutan tidak berwarna terbentuk *Colourless solution formed*
X	Mendakan putih terbentuk *White precipitate formed*	Mendakan putih terbentuk *White precipitate formed*
Ag+	Mendakan putih terbentuk *White precipitate formed*	Mendakan putih terbentuk *White precipitate formed*

Apakah X?/ What is X?

A Pb^{2+} B Al^{3+} C Cu^{2+} D Fe^{2+}

[Johor Skudai2023-33] Semasa perintah kawalan pergerakan (PKP) baru-baru ini, Anas menghabiskan masanya dengan memakan banyak makanan rapu sambil menonton televisyen. Pada suatu hari, Anas rasa teramat sakit pada bahagian abdomennya dan terus ke klinik untuk mendapatkan rawatan. Anas perlu minum segelas 'Barium meal' sebelum doktor melakukan X-ray pada bahagian abdomennya. 'Barium meal' ini diperbuat daripada garam barium sulfat di mana garam ini membantu imej usus kelihatan jelas pada filem X-ray. Antara yang berikut, larutan yang manakah sesuai digunakan untuk menentusahkan kehadiran anion dalam garam tersebut?
During movement control order (MCO) recently, Ahmad spent most of his time eating a lot of junk foods while watching television. One day, he felt excruciating abdominal pain and rushed to a clinic for treatment. Ahmad needed to drink a glass of Barium meal before the doctor ran an X-ray on his

abdomen. A barium meal is made of barium sulphate salt which helps the image of intestines appear on X-ray films clearly. Which of the following solutions are suitable to verify the presence of anion in that salt?

I Asid hidroklorik
Hydrochloric acid

II Asid sulfurik
Sulphuric acid

III Larutan barium klorida
Barium chloride solution

IV Larutan natrium sulfat
Sodium sulphate solution

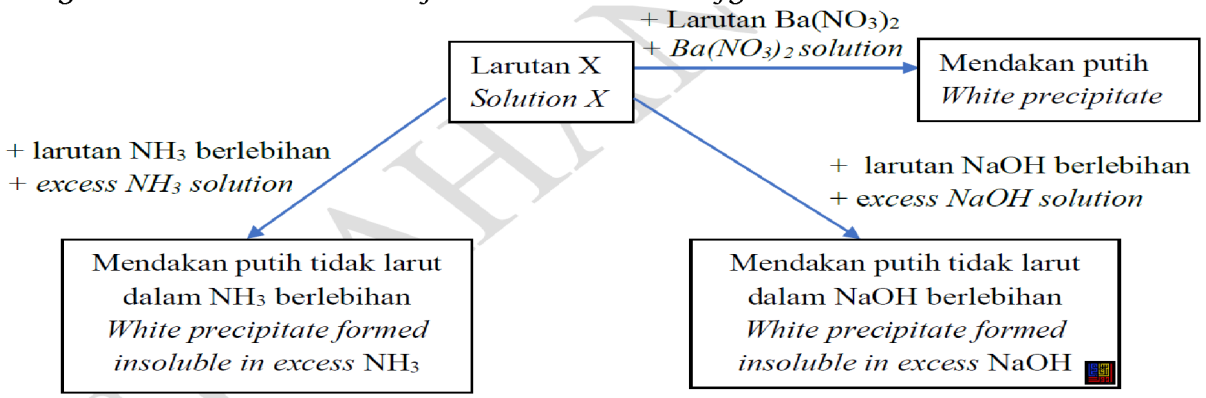
A I dan II
I and II

B I dan III
I and III

C II dan IV
II and IV

D III dan IV
III and IV

[Pahang JUJ Set 1 2023-39] Rajah 20 menunjukkan siri tindak balas bagi mengenal pasti larutan X.
Diagram 20 shows series of reactions to identify solution X.



Apakah larutan X ?/ *What is solution X ?*

A Kalsium sulfat
Calcium sulphate

B Kalsium klorida
Calcium chloride

C Magnesium sulfat
Magnesium sulphate

D Magnesium klorida
Magnesium chloride

[Melaka 2023-09] Pernyataan berikut adalah satu pemerhatian bagi ujian pengesahan kation garam X.
The following statement is an observation for the confirmatory test of cation of salt X.

Mendakan putih larut apabila larutan ammonia ditambah ke dalam larutan garam X secara berlebihan.
White precipitate dissolves when ammonia solution is added into the salt solution of X in excess.

Apakah kation bagi garam X?/ *What is cation of salt X?*

A Pb^{2+} B Al^{3+} C Zn^{2+} D Ca^{2+}

[Melaka 2023-38] Larutan garam X bertindak balas dengan larutan $Pb(NO_3)_2$ menghasilkan pepejal berwarna putih. Antara berikut, manakah yang betul bagi menguji kehadiran anion bagi garam X?
Salt solution X reacts with $Pb(NO_3)_2$ solution to produce a white solid. Which of the following is correct to test the presence of anion for salt X?

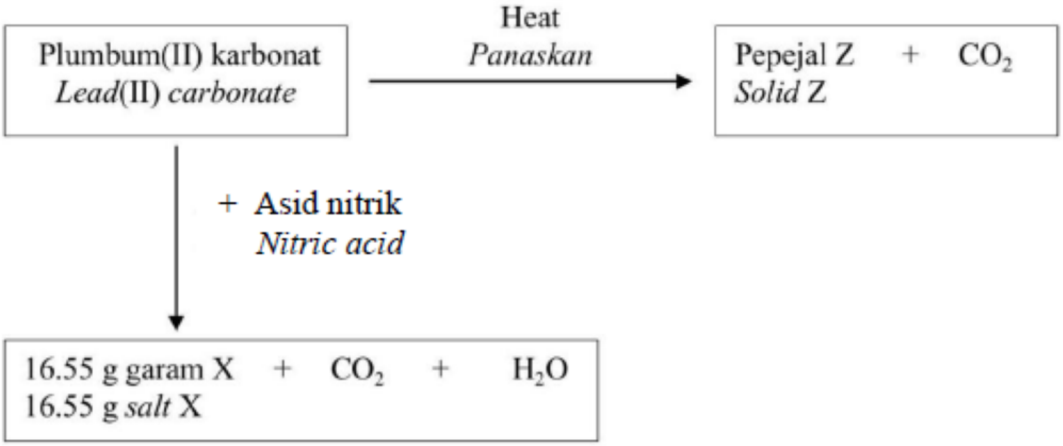
A Tambah 2 cm^3 HC1 diikuti dengan 2 cm^3 $BaCl_2$ ke dalam larutan X
Add 2 cm^3 HC1 followed by 2 cm^3 $BaCl_2$ into X solution

B Tambah 2 cm^3 HC1 ke dalam larutan X dan alirkan gas terbebas dalam air kapur
Add 2 cm^3 HC1 into X solution and flow the liberated gas into lime water

C Tambah 2 cm^3 H_2SO_4 cair, 2 cm^3 larutan $FeSO_4$ dan beberapa titis H_2SO_4 pekat ke dalam larutan X
Add 2 cm^3 dilute H_2SO_4, 2 cm^3 $FeSO_4$ solution and a few drops concentrated H_2SO_4 into X solution

D Tambah 2 cm^3 H_2SO_4dan 2 cm^3 $MgSO_4$ ke dalam larutan X
Add 2 cm^3 H_2SO_4 and 2 cm^3 $MgSO_4$ into X solution

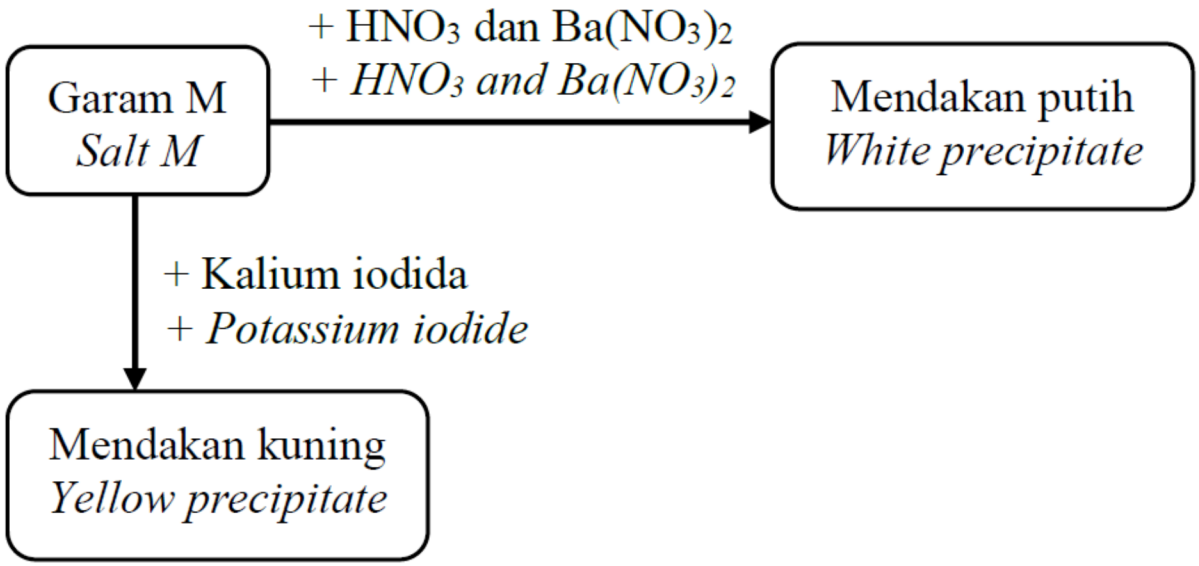
[MRSM2023-40] Rajah 17 menunjukkan dua tindak balas berbeza bagi plumbum(II) karbonat.
Diagram 17 shows two different reactions of lead(II) carbonate.



Berapakah jisim pepejal Z yang terbentuk apabila jisim plumbum(II) karbonat yang sama digunakan?
[Jisim atom relatif: N = 14, O = 16, Pb = 207]
What is the mass of solid Z formed when the same mass of lead(II) carbonate is used? [Relative atomic mass: N = 14, O = 16, Pb = 207]

A 14.34 g B 13.38 g C 11.95 g D 11.15 g

[Pahang 2023-24] Rajah 6 menunjukkan siri tindak balas melibatkan garam M.
Diagram 6 shows a series of reaction involving salt M.



Apakah kation dan anion yang hadir di dalam garam M?
What are the cation and anion present in salt M?

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

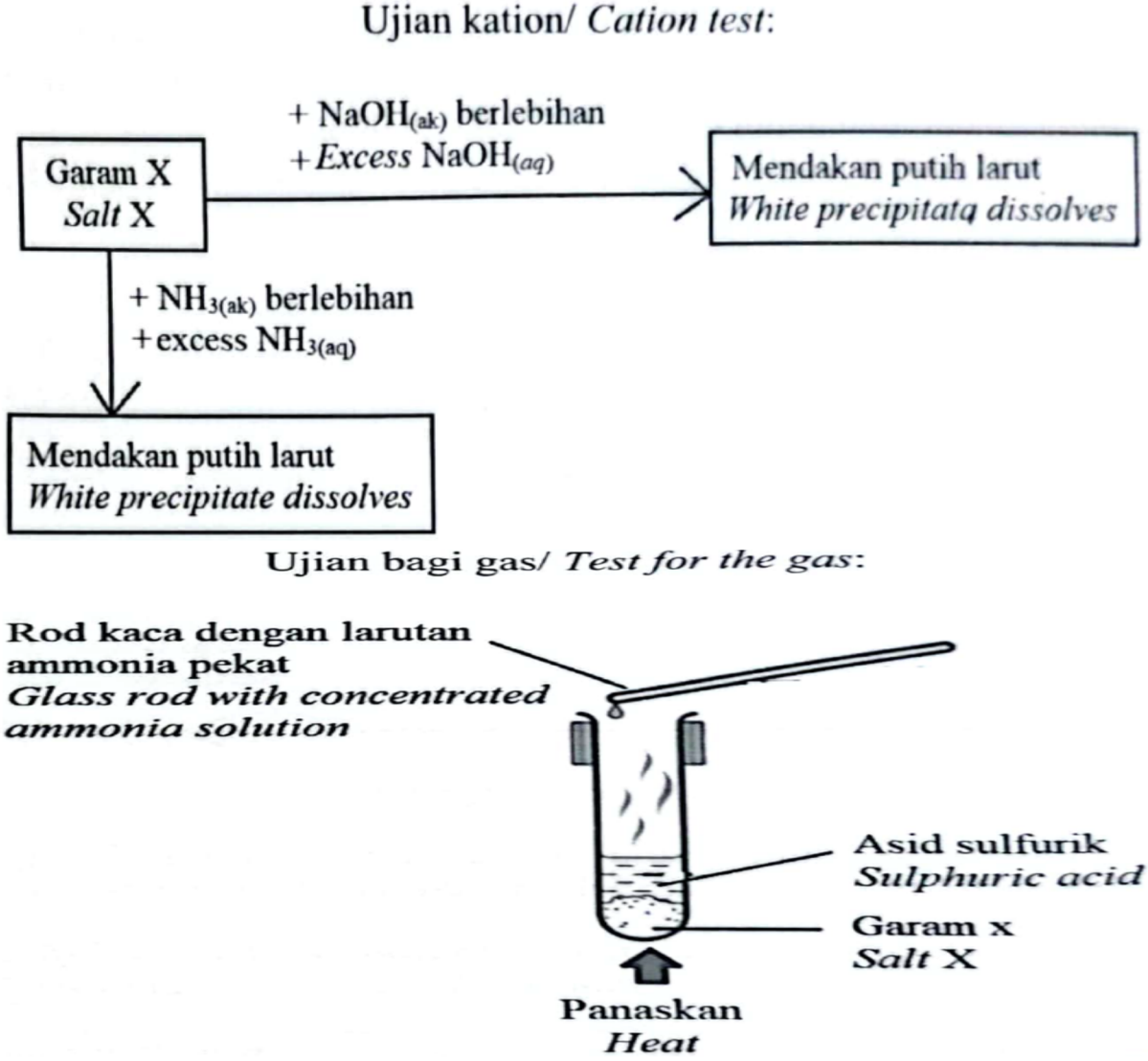
[Putrajaya2023-29] Satu ujian dijalankan untuk mengesahkan kation dan anion yang hadir dalam satu larutan garam. Jadual 2 menunjukkan pemerhatian bagi setiap ujian.
A series of tests are conducted to verify the cation and anion that is present in a salt solution. Table 2 shows the observation for each test.

Ujian/ *Test*	**Pemerhatian/ *Observation***
Tambah larutan natrium hidroksida secara berlebihan ke dalam larutan garam *Add excess of sodium hydroxide solution into the salt solution*	Mendakan putih terbentuk dan larut dalam larutan natrium hidroksida yang berlebihan. *White precipitate formed and soluble in excess sodium hydroxide*
Tambah larutan ammonia secara berlebihan ke dalam larutan garam *Add excess of ammonia solution into a salt solution*	Mendakan putih terbentuk dan larut dalam larutan ammonia yang berlebihan. *White precipitate formed and soluble in excess ammonia solution.*

Antara yang berikut yang manakah kation yang hadir dalam larutan garam tersebut?
Which of the following is the cation present in the salt solution?

A Ca^{2+} B Mg^{2+} C Zn^{2+} D Pb^{2+}

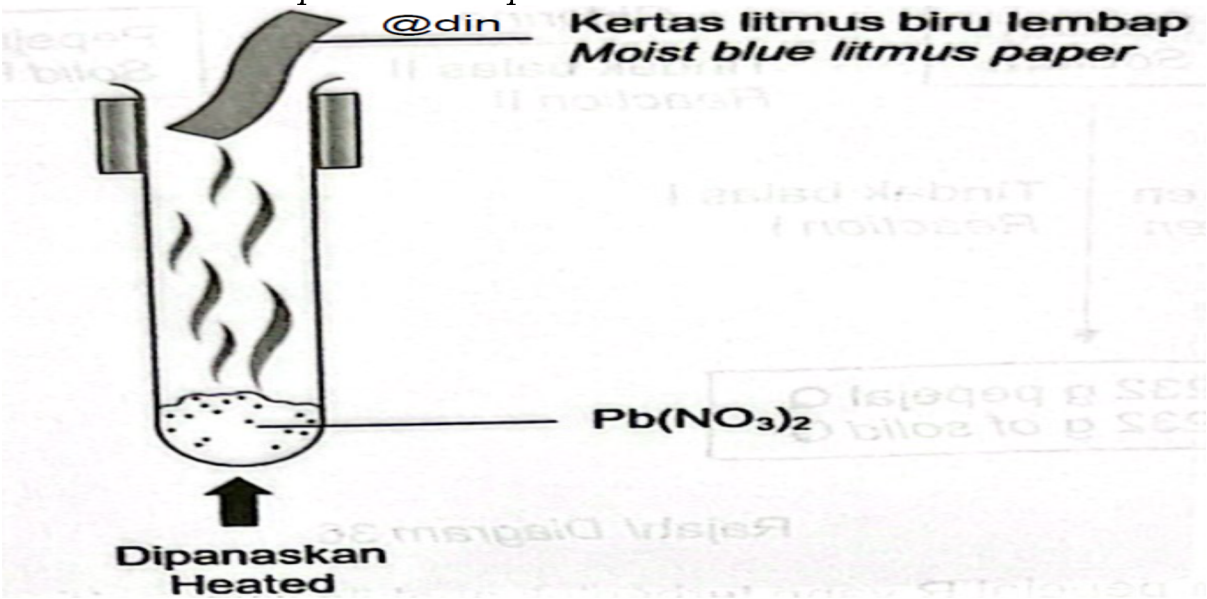
[SBP2023-40] Rajah 11 menunjukkan carta alir bagi ujian kation dan susunan radas bagi ujian gas yang terdapat dalam garam X.
Diagram 11 shows a flowchart for the cation test and the apparatus setup for a gas test found in salt X.



Kaedah W digunakan untuk tindak balas antara garam X dengan larutan plumbum(II) nitrat untuk menghasilkan pepejal berwarna Y. Apakah W dan pemerhatian apabila Y dimasukkan ke dalam air dan dipanaskan?
Method W is used for the reaction between salt X with lead(II) nitrate solution to produce coloured solid Y. What is W and observation when Y is put in the water and heated?

	Kaedah W *Method W*	Pemerhatian Observation
A	Pemendakan *Precipitation*	Pepejal kuning larut dalam air panas dan muncul semula apabila sejuk *Yellow solid dissolves in hot water and reappear when cold*
B	Pemendakan *Precipitation*	Pepejal putih larut dalam air panas dan muncul semula apabila sejuk *White solid dissolves in hot water and reappear when cold*
C	Pentitratan *Titration*	Pepejal putih larut dalam air panas dan muncul semula apabila sejuk *White solid dissolves in hot water and reappear when cold*
D	Pentitratan *Titration*	Pepejal kuning larut dalam air panas dan muncul semula apabila sejuk *Yellow solid dissolves in hot water and reappear when cold*

[Terengganu2023-37] Rajah 37 menunjukkan tindak balas penguraian plumbum(II) nitrat, $Pb(NO_3)_2$ apabila dipanaskan pada suhu dan tekanan bilik.
Diagram 37 show the decomposition reaction of lead(II) nitrate, $Pb(NO_3)_2$ when heated at room temperature and pressure.



Antara berikut, yang manakah benar apabila 0.1 mol plumbum(II) nitrate, $Pb(NO_3)_2$ terurai?
Which of the following is true when 0.1 mol of lead(II) nitrate, $Pb(NO_3)_2$ is decomposed?
[Jisim formula relatif: PbO = 223 dan 1 mol gas menempati isi padu sebanyak 24 dm^3 pada suhu dan tekanan bilik]
[Relative formula mass: PbO = 223 and 1 mol gas occupies the volume 24 dm^3 at room temperature and pressure]

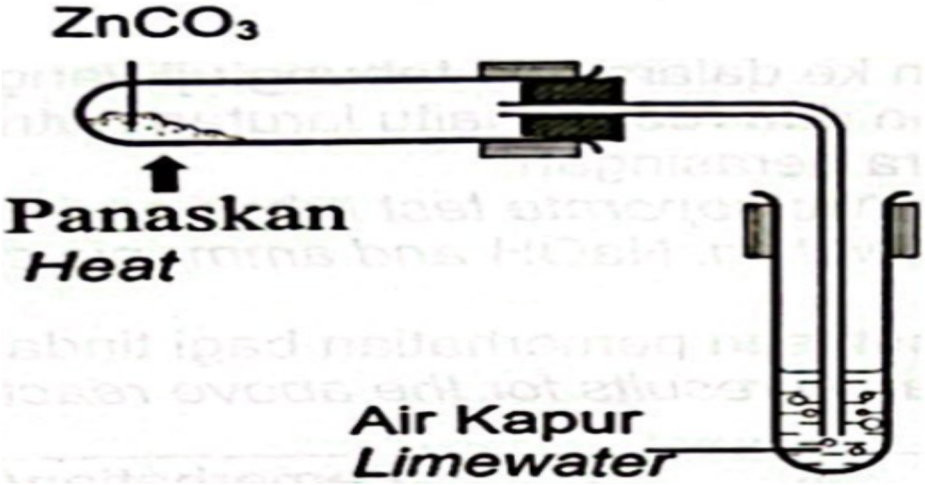
A 2.23 g plumbum(II) oksida terbentuk
2.23 g lead(II) oxide is formed

B 2.4 dm^3 gas oksigen terbebas
2.4 dm^3 oxygen gas released

C 4.46 g plumbum(II) oksida terbentuk
4.46 g lead(II) oxide is formed

D 4800 cm^3 gas nitrogen dioksida terbebas
4800 cm^3 nitrogen oxide gas released

[Terengganu2023-38] Rajah 38 menunjukkan satu ujikaji untuk mengesan kehadiran gas karbon dioksida di dalam makmal.
Diagram 38 shows an experiment to detect the presence of carbon dioxide in a laboratory.



Berapakah jisim bahan yang diperlukan sekiranya isi padu gas karbon dioksida yang terhasil adalah 350 cm^3?
What is the mass of reactant required if the volume of carbon dioxide gas produced is 350 cm^3?
[Jisim atom relatif: Zn = 65;C = 12;0 = 16; Isi padu molar = 24 dm^3 mol^{-1} pada keadaan bilik]
[Relative atomic mass-. Zn = 65;C = 12;0 = 16; Molar volume = 24 dm^3 mol^{-1} at room condition]

A 2.055 g B 1.825 g C 0.125 g D 0.0146

[Selangor2023 Set 1-37] Jadual 5 menunjukkan pemerhatian untuk ujian-ujian yang dilakukan ke atas larutan yang mengandungi kation W.
Table 5 shows the observations obtained for tests which carried out on solutions that contained cations W.

Ujian *Test*	Pemerhatian *Observation*
Ditambahkan dengan ammonia akueus *Added with aqueous ammonia*	Mendakan putih terbentuk *White precipitate is formed*
Ditambahkan dengan larutan natrium klorida *Added with sodium chloride solution*	Mendakan putih terbentuk *White precipitate is formed*
Ditambahkan dengan asid sulfurik cair *Added with dilute sulphuric acid*	Mendakan putih terbentuk *White precipitate is formed*

Apakah kation W?
What is cation W?

A Zn^{2+}
B Pb^{2+}
C Al^{3+}
D Mg^{2+}

BAB 7 Kadar Tindak Balas

7.1 Penentuan Kadar Tindak Balas

[Kedah2023-04] Apakah unit yang dtgunakan baqi kadar tindak balas?
Which unit is used for the rate of reaction?

A g mol^{-1} D g min^{-1} C mol dm^{-3} D kJ mol^{-1}

[Selangaor2023 Set 01-04] Antara berikut, yang manakah unit yang betul bagi kadar tindak balas?
Which of the following is the correct unit for the rate of reaction?

A N kg^{-1} B g cm^{-3} C cm^3 min^{-1} D kJ mol^{-1}

[Terengganu2023-10] Antara berikut yang manakah merupakan faktor yang mempengaruhi kadar tindak balas?
Which of the following is a factor that affects the rate of reaction?

A Suhu
Temperature

B Isipadu
Volume

C Bilangan mol
Number of mol

D Bilangan zarah
Number of particles

[Selangor2023 Set 1-04] Antara berikut, yang manakah contoh tindak balas yang berkadar tinggi?
Which of the following is an example of a reaction with a high rate?

A Letupan mercun
Explosion of firecrackers

B Fotosintesis tumbuhan hijau
Photosynthesis of green plants

C Pencernaan makanan
Digestion of food

D Penguraian bangkai haiwan
The decomposition of animal carcasses

[Terengganu2023-09] Antara berikut yang manakah merupakan tindak balas perlahan?
Which of the following is a slow reaction?

I Tindak balas pemendakan
Precipitate reaction

II Tindak balas penapaian
Fermentation reaction

III Tindak balas pembakaran
Combustion reaction

IV Tindak balas pereputan
Decay reaction

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

[Selangor2023 Set 1-22] Jadual 2 menunjukkan dua tindak balas kimia, P dan Q.
Table 2 shows two chemical reactions, P and Q.

Tindak balas *Reaction*	Bahan tindak balas *Reactants*
P	25 cm^3 asid hidroklorik 0.5 mol dm^{-3} + pita magnesium pada suhu bilik *25 cm^3 of 0.5 mol dm^{-3} hydrochloric acid* *+ magnesium ribbon at room temperature*
Q	25 cm^3 asid hidroklorik 0.2 mol dm^{-3} + pita magnesium pada suhu bilik *25 cm^3 of 0.2 mol dm^{-3} hydrochloric acid* *+ magnesium ribbon at room temperature*

Pernyataan yang manakah menjelaskan mengapa kadar tindak balas P lebih tinggi daripada kadar tindak balas Q?
Which statement explains why the rate of reaction P is higher than the rate of reaction Q?

A Jumlah luas permukaan bahan tindak balas yang lebih tinggi
The total surface area of reactants is higher

B Terdapat lebih banyak molekul bahan tindak balas per unit isi padu
There are more reactant molecules per unit volume

C Molekul bahan tindak balas mengandungi tenaga kinetik yang lebih tinggi
The reactant molecules contain higher kinetic energy

D Tenaga pengaktifan tindak balas yang lebih rendah
The activation energy of the reaction is lower

[Pahang 2023-21] Apakah maksud kadar tindak balas merujuk kepada tindak balas antara pita magnesium dan 50 cm^3 asid nitrik 0.5 mol dm^{-3}?
What is meant by rate of reaction based on the reaction between magnesium ribbon and 50 cm^3 of 0.5 mol dm^{-3} nitric acid?

A Pengurangan isi padu asid nitrik per unit masa
Decreasing in volume of nitric acid per unit time

B Peningkatan isi padu gas hidrogen per unit masa
Increasing in volume of hydrogen gas per unit time

C Peningkatan kepekatan asid nitrik per unit masa
Increasing in concentration of nitric acid per unit time

D Peningkatan jisim pita magnesium per unit masa
Increasing in mass of magnesium ribbon per unit time

[Pahang 2023-25] Jadual 1 menunjukkan maklumat tentang dua eksperimen yang berbeza.
Table 1 shows the information about two different expriments.

Eksperimen *Experiment*	Bahan tindak balas *Reactants*	Kadar tindak balas *Rate of reaction*
I	Zink berlebihan + 25 cm^3 asid Q 1.0 mol dm^{-3} *Excess zinc + 25 cm3 of 1.0 mol dm-3 acid Q*	15 cm^3 s^{-1}
II	Zink berlebihan + 25 cm_3 asid P 1.0 mol dm^{-3} *Excess zinc + 25 cm_3 of 1.0 mol dm^{-3} acid* P	12 cm^3 s^{-1}

Berdasarkan Jadual 1, pernyataan manakah menerangkan perbezaan dalam kadar tindak balas bagi kedua-dua eksperimen?
Based on Table 1, which of the following explains the difference in the rate of reaction for the two experiments?

A Asid Q adalah asid yang lebih lemah daripada asid P
Acid Q is a weaker acid than acid P

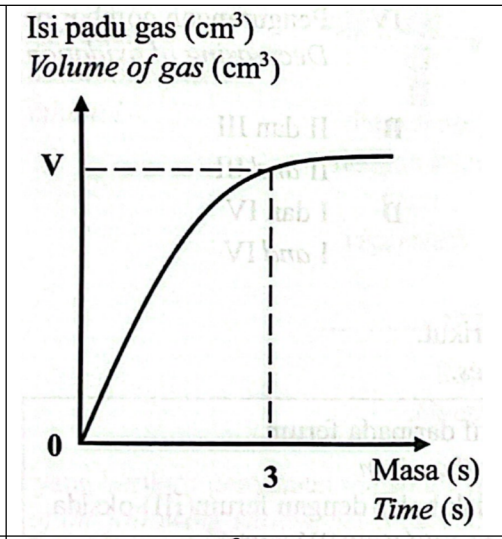
B Eksperimen I mempunyai tenaga pengaktifan yang lebih tinggi berbanding Eksperimen II
Experiment I has higher activation energy than Experiment II

C Bilangan zarah-zarah bahan tindak balas dalam Eksperimen II lebih tinggi berbanding bilangan zarah-zarah bahan tindak balas dalam Eksperimen I
The number of particles of reactants in Experiment II is higher than the number of particles of reactants in Experiment I

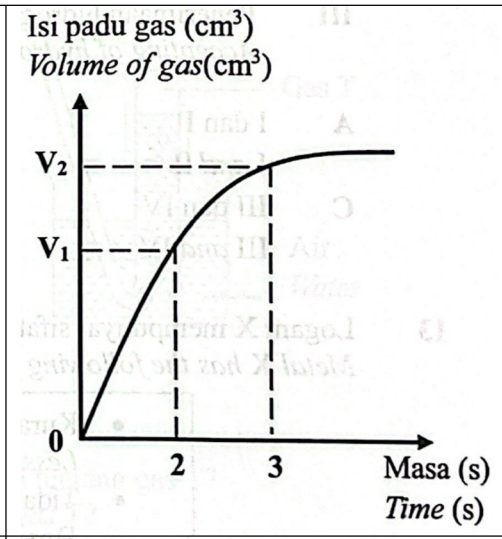
D Perlanggaran berkesan antara zarah-zarah bahan tindak balas dalam Eksperimen I lebih tinggi daripada perlanggaran berkesan zarah-zarah bahan tindak balas dalam Eksperimen II
The effective collision among particles of reactants in Experiment I is higher than the effective collision among particles of reactants in Experiment II

[Negeri Sembilan 2023-10] Antara yang berikut, kaedah manakah yang betul untuk menghitung kadar tindak balas pada saat ketiga?
Which of the following is the correct method to calculate the rate of reaction at third seconds?

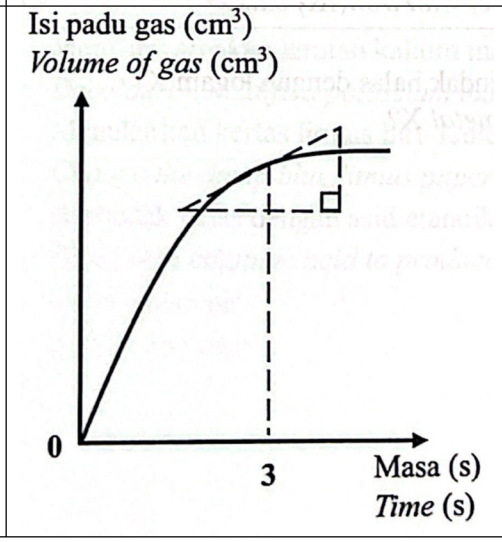
A



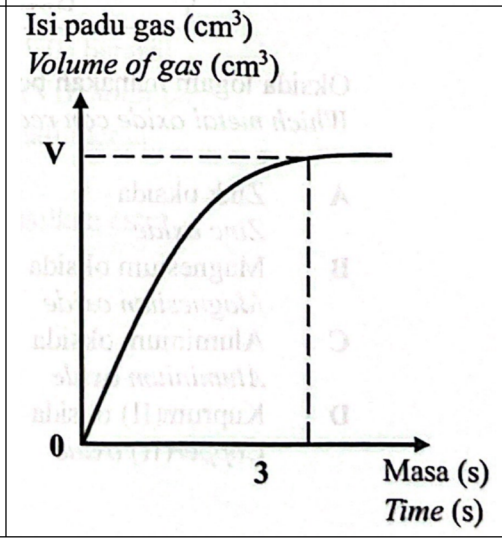
B



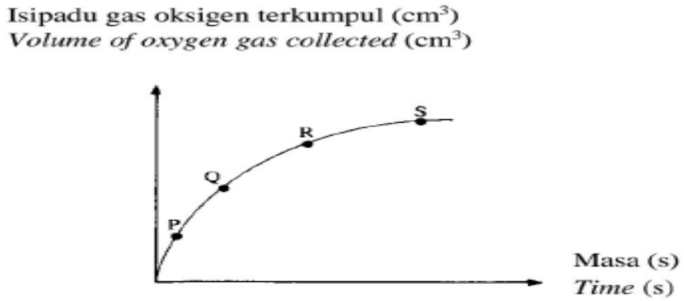
C



D



[Melaka 2023-10] Rajah 3 menunjukkan satu graf isi padu gas oksigen yang terkumpul melawan masa dalam tindak balas penguraian hidrogen peroksida apabila menggunakan mangkin mangan(IV) oksida.
Diagram 3 shows a graph of volume of oxygen gas collected against time in the decomposition reaction of hydrogen peroxide when using catalyst manganese(IV) oxide.

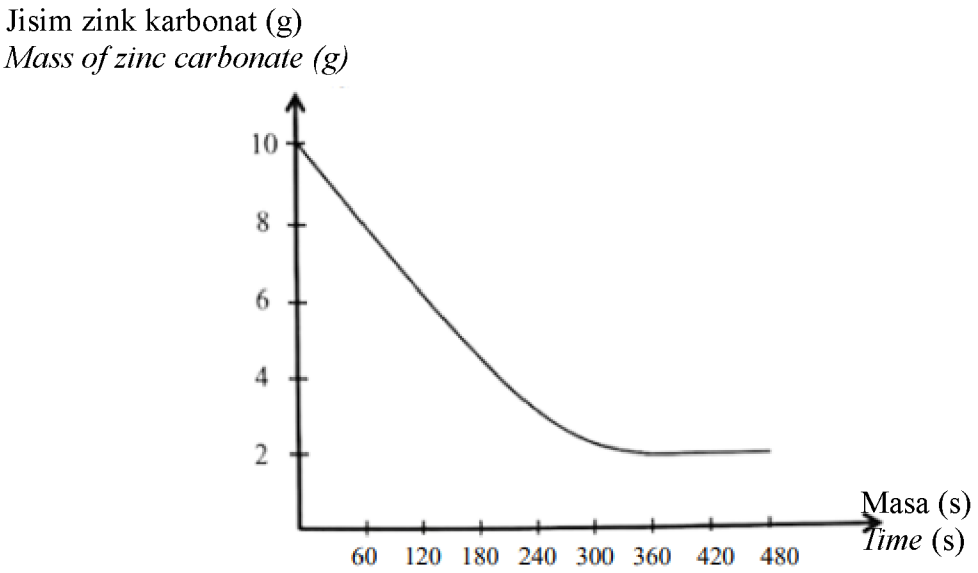


Titik manakah yang menunjukkan kadar tindak balas paling tinggi?
Which point shows the highest rate of reaction!

A P B Q C R D S

Pengiraan

[Putrajaya2023-36] Rajah 15 menunjukkan lengkung perubahan jisim kalsium karbonat berbanding masa bagi tindak balas antara kalsium karbonat dengan asid hidroklorik.
Diagram 15 shows the curve of changes in mass of calcium carbonate against time for the reaction between calcium carbonate and hydrochloric acid.



Berapakah kadar tindak balas purata keseluruhan bagi tindak balas itu?
What is overall average rate of reaction for the reaction?

A 0.033 g s^{-1}
B 0.028 g s^{-1}
C 0.022 g s^{-1}
D 0. 006 g s^{-1}

[Selangor2023 Set 1-30] Jadual 3 menunjukkan keputusan eksperimen untuk menentukan kadar tindak balas.
Table 3 shows the results obtained to determine the rate of reaction.

Masa (s) Time (s)	0	30	60	90	120	150	180	210
Isi padu gas (cm^3) Volume of gas (cm^3)	12.00	22.00	30.00	36.00	40.00	42.00	42.00	42.00

Jadual 3/ Table 3

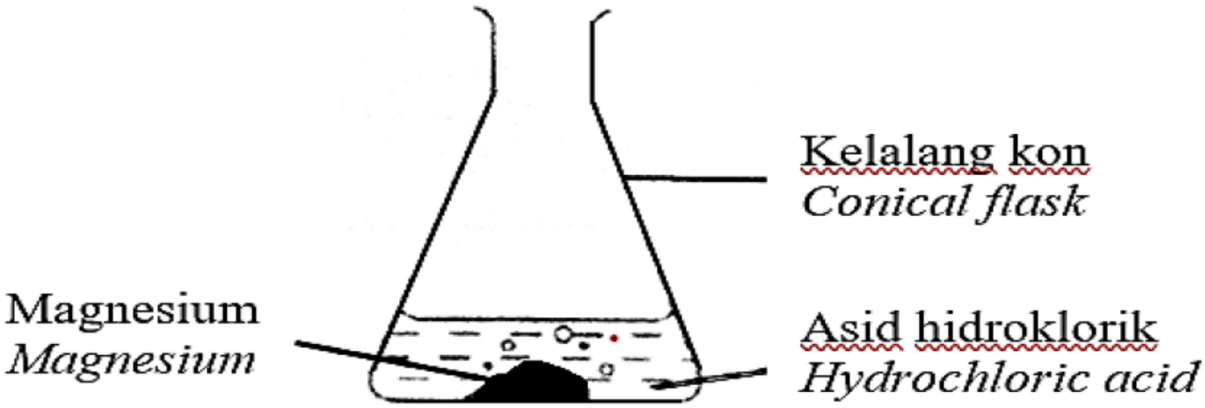
Apakah kadar tindak balas purata dari 60 s ke 150 s?
What is the average rate of reaction from 60 s to 150 s?

A 0.110 $cm^3\ s^{-1}$
B 0.133 $cm^3\ s^{-1}$
C 0.220 $cm^3\ s^{-1}$
D 0.343 $cm^3\ s^{-1}$

[Selangor2023 Set 1-31] 0.20 mol serbuk zink bertindak balas dengan asid nitrik cair berlebihan. Selepas 5 minit, 0.05 mol zink tertinggal sebagai baki. Apakah kadar tindak balas purata keseluruhan?
0.20 moles of zinc powder react with excess dilute nitric acid. After 5 minutes, 0.05 moles of zinc remains as residue. What is the overall average rate of reaction?
[Jisim atom relatif: Zn = 65] [Relative atomic mass: Zn = 65]

A 0.65 g min^{-1}
B 1.95 g min^{-1}
C 2.60 g min^{-1}
D 3.25 g min^{-1}

[Pahang JUJ Set 2 2023-30] Rajah 9 menunjukkan tindak balas antara magnesium dengan asid hidroklorik.
Diagram 9 shows the reaction between magnesium and hydrochloric acid.



Antara berikut, perubahan manakah yang boleh diperhatikan dan diukur untuk menentukan kadar tindak balas?
Which of the following changes can be observed and measured to determine the rate of reaction?

A Warna larutan per unit masa
Colour of the solution per unit time

B Penambahan jisim magnesium per unit masa
Increase in mass of magnesium per unit time

C Penambahan isipadu gas hidrogen per unit masa
Increase in volume of hydrogen gas per unit time

D Pengurangan kepekatan asid hidroklorik per unit masa
Decrease in the concentration of hydrochloric acid per unit time

[Pahang JUJ Set 2 2023-11] Tindak balas manakah yang mempunyai kadar tindak balas paling tinggi?
Which reaction has the highest rate of reaction?

A Penapaian nasi
Fermentation of rice

B Penguraian makanan
Decomposition of food

C Pengaratan paku besi
Rusting of iron nail

D Pembakaran bahan api
Burning of fuel

[Pahang JUJ Set 1 2023-07] Apakah maksud kadar tindak balas?
What is the meaning of the rate of reaction?

A Pengurangan kuantiti hasil tindak balas.
Decrease in quantity of product.

B Peningkatan kuantiti hasil tindak balas per unit masa
Increase in quantity of product per unit time

C Pengurangan kuantiti hasil tindak balas dengan masa
Decrease in quantity of product against time

D Peningkatan kuantiti bahan tindak balas per unit masa
Increase in quantity of reactant per unit time

[Johor Bahru 2023-07] Antara yang berikut, faktor manakah yang mempengaruhi kadar tindak balas?
Which of the following factors can affect the rate of reaction?

I Isi padu bahan tindak balas
Volume of the reactants

II Kepekatan bahan tindak balas
Concentration of the reactants

III Kehadiran mangkin
Presence of a catalyst

IV Jisim bahan tindak balas
Mass of the reactants

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

[Selangaor2023 Set 01-31] Seorang murid menambahkan 2.0 g jalur zink ke dalam sebuah bikar asid sulfurik berlebihan. Selepas 30 s, jisim zink yang tinggal ialah 1.35 g. Apakah kadar tindak balas purata keseluruhan?
A student added 2.0 g of zinc strip into a beaker of excess sulphuric acid. After 30 s, the mass of zinc left is 1.35 g.

What is the overall average rate of reaction?
[Jisim atom relatif: Zn = 65] [Relative atomic mass: Zn = 65]

A 0.020 mol min^{-1}
B 0.042 mol min^{-1}
C 0.062 mol min^{-1}
D 0.103 mol min^{-1}

[Selangaor2023 Set 01-30] Jadual 3 menunjukkan isi padu gas karbon dioksida terkumpul dalam satu eksperimen.
Table 3 shows the volume of carbon dioxide gas collected in an experiment.

Masa (s) *Time (s)*	0	30	60	90	120	150	180	210	240
Isi padu gas (cm^3) *Volume of gas (cm^3)*	0.0	5.4	9.5	12.8	15.0	15.9	16.3	16.5	16.5

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

A 0.069 cm^3 s^{-1}
B 0.079 cm^3 s^{-1}
C 0.091 cm^3 s^{-1}
D 0.092 cm^3 s^{-1}

[Johor Skudai2023-40] Jadual 40 menunjukkan jumlah isipadu gas oksigen yang dikumpul pada setiap selang masa 30 saat semasa penguraian hidrogen periksida.
Table 40 shows the total volume of oxygen gas collected at 30 second intervals during the decomposition of hydrogen peroxide.

Masa (s) *Time (s)*	0	30	60	90	120
Isipadu gas (cm^3) *Volume ofgas(cm^3)*	0.00	11.00	20.00	24.00	24.00

Hitungkan kadar tindak balas purata bagi tindak balas tersebut.
Calculate the average rate of reaction for the reaction.

A 0.20 cm^3 s^{-1}
B 0.27 cm^3 s^{-1}
C 0.37 cm^3 s^{-1}
D 0.50 cm^3 s^{-1}

[Negeri Sembilan 2023-37] Serbuk zink berlebihan bertindak balas dengan asid hidroklorik menghasilkan gas hidrogen.
Masa yang diambil untuk tindak balas lengkap antara 100 cm^3 asid hidroklorik 0.5 mol dm^{-3} dengan serbuk zink ialah 2 minit 30 saat.
Apakah kadar tindak balas ini?
[1 mol gas menempati 24 dm^3 dalam keadaan bilik]

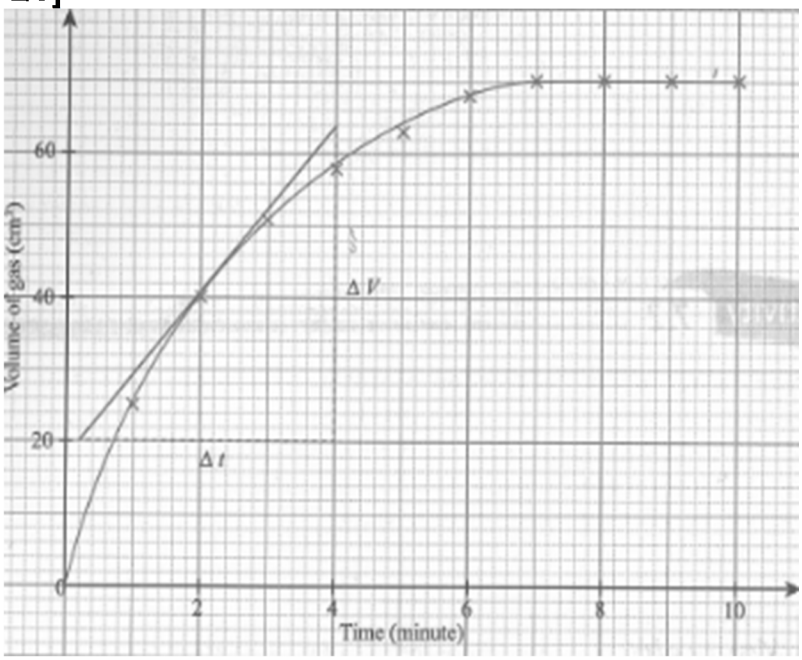
Excess zinc powder reacts with hydrochloric acid to produce hydrogen gas. Time taken for the complete reaction between 100 cm^3 of 0.5 mol dm^{-3} hydrochloric acid and zinc powder is 2 minutes 30 seconds.
What is the rate of reaction?
[1 mol of gas occupies 24 dm^3 in room conditions]

A 0.33 $cm^3\ s^{-1}$
B 0.67 $cm^3\ s^{-1}$
C 4.00 $cm^3\ s^{-1}$
D 8.00 $cm^3\ s^{-1}$

[Perlis 2023-36] 0.2 mol ketulan magnesium karbonat bertindakbalas dengan asid sulfurik cair berlebihan. Selepas 1.0 minit, didapati 0.05 mol magnesium karbonat tertinggal sebagai baki. Berapakah kadar purata bagi tindak balas itu?
0.2 mol of magnesium carbonate crystals react with excess sulphuric acid. After 1.0 minute, 0.05 mol of magnesium carbonate remains as residue. What is the average rate of the rate of reaction?
[Jisim atom relatif : Mg = 24, C = 12, O = 16]
[Relative atomic mass : Mg = 24, C = 12, O = 16]

A 0.21 g s^{-1}
B 0.0025 g s^{-1}
C 0.28 g s^{-1}
D 0.07 g s^{-1}

[Perlis 2023-23]



Berdasarkan graf 1, kira kadar tindak balas purata bagi tindak balas ini.
Based on the graph 1, calculate the average rate of reaction for this reaction.

A 7.00 $cm^3\ min^{-1}$
B 10.00 $cm^3\ min^{-1}$
C 6.50 $cm^3\ min^{-1}$
D 6.00 $cm^3\ min^{-1}$

[Kelantan 2023-33] 4.0 g serbuk cengkerang ditambahkan kepada larutan 200 cm^3 asid sulfurik 1.0 mol dm^{-3}. Selepas 4 minit didapati 0.8 g cengkerang tertinggal sebagai baki. Berapakah kadar tindak balas purata bagi tindak balas itu?
4.0 g of shell powder where added to 200 cm^3 of 1.0 mol dm^{-3} sulphuric acid. After 4 minutes 0.8 g of shell powder remains as residue.
What is the average rate of reaction?

A. 1.2 g min^{-1}
B. 1.0 g min^{-1}
C. 0.8 g min^{-1}
D. 0.05 g min^{-1}

[MRSM2023-33] Jadual 3 menunjukkan jumlah isipadu gas yang terkumpul pada sela masa yang tetap dalam suatu tindak balas.
Table 3 shows the total volume of gas collected at regular intervals in a reaction.

Time/s *Masa/s*	0	30	60	90	120	150	180	210
Volume of gas /cm^3 *Isi padu gas / cm^3*	0	2.0	3.7	5.2	6.4	7.3	8.6	8.6

Berapakah purata kadar tindak balas dalam minit kedua?
What is the average rate of reaction in the second minute?

A 0.040 cm^3 s^{-1}
B 0.045 cm^3 s^{-1}
C 0.053 cm^3 s^{-1}
D 0.062 cm^3 s^{-1}

[Kelantan 2023-32] Jadual 3 menunjukkan jumlah isi padu gas oksigen, O2 dikumpul dalam tindak balas penguraian hidrogen peroksida, H2O2.
Table 3 shows the total volume of oxygen gas, O2 collected in the decomposition reaction of hydrogen peroxide, H2O2.

Masa, s *Time, s*	0	30	60	90	120	150	180	210
Isipadu O_2, cm^3 *Volume of O_2, cm^3*	0.00	18.00	27.50	35.00	42.50	46.50	50.00	50.00

Berapakah kadar tindak balas purata dalam minit kedua?
What is the average rate of reaction in the second minute?

A. 0.458 cm^3 s^{-1}
B. 0.354 cm^3 s^{-1}
C. 0.278 cm^3 s^{-1}
D. 0.250 cm^3 s^{-1}

[Melaka 2023-21] Jadual 1 menunjukkan isi padu gas karbon dioksida yang terhasil dalam tindak balas antara ketulan kalsium karbonat dengan asid hidroklorik.
Table 1 shows the volume of carbon dioxide gas produced in the reaction between granule of calcium carbonate and hydrochloric acid.

Masa (s) *Time (s)*	0	60	120	180	240	300	360
Isipadu gas (cm^3) *Volume of gas (cm^3)*	0.00	25.90	33.00	37.00	X	42.00	42.00

Jika kadar tindak balas purata dalam minit keempat ialah 0.0625 $cm^3\ s^{-1}$. Hitung nilai x.
If the average rate of reaction in the fourth minute is 0.0625 $cm^3\ s^{-1}$. Calculate the value of x.

A 39.50 B 39.85 C 40.10 D 40.75

[Pahang JUJ Set 2 2023-33] Jadual 3 menunjukkan isipadu gas hidrogen yang diperoleh pada sela masa bagi tindak balas antara zink dan asid sulfurik.
Table 4 shows the volume of hydrogen gas obtained at interval time for the reaction between zinc and sulphuric acid.

Masa (min)/ *Time (min)*	0.0	1.0	2.0	3.0	4.0	5.0
Isi padu gas hydrogen (cm^3) *Volume of hydrogen gas (cm^3)*	0.00	5.50	10.00	14.00	17.50	20.00

Hitung kadar tindak balas purata daripada minit kedua ke minit keempat.
Calculate the average rate of reaction from the second minute to the fourth minute.

A 3.50 $cm^3\ min^{-1}$
B 3.75 $cm^3\ min^{-1}$
C 4.17 $cm^3\ min^{-1}$
D 4.50 $cm^3\ min^{-1}$

[Terengganu2023-31] Jadual 31 menunjukkan isi padu gas yang terkumpul apabila magnesium karbonat bertindak balas dengan asid sulfurik.
Table 31 shows the volume of gas that accumulates when magnesium carbonate reacts with sulfuric acid.

Masa(minit) *Time (minute)*	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
Isi padu gas (cm^3) *Volume of gas (cm^3)*	0.0	25.0	40.0	51.0	58.0	63.0	68.0	70.0	70.0

Berapakah kadar tindak balas purata dalam dua minit pertama?
What is the average rate of reaction in the first two minutes?

A 29 cm^3 $minit^{-1}$
29 cm^3 $minute^{-1}$

C 18 cm^3 $minit^{-1}$
18 cm^3 $minute^{-1}$

B 20 cm^3 $minit^{-1}$
20 cm^3 $minute^{-1}$

D 17.5 cm^3 $minit^{-1}$
17.5 cm^3 $minute^{-1}$

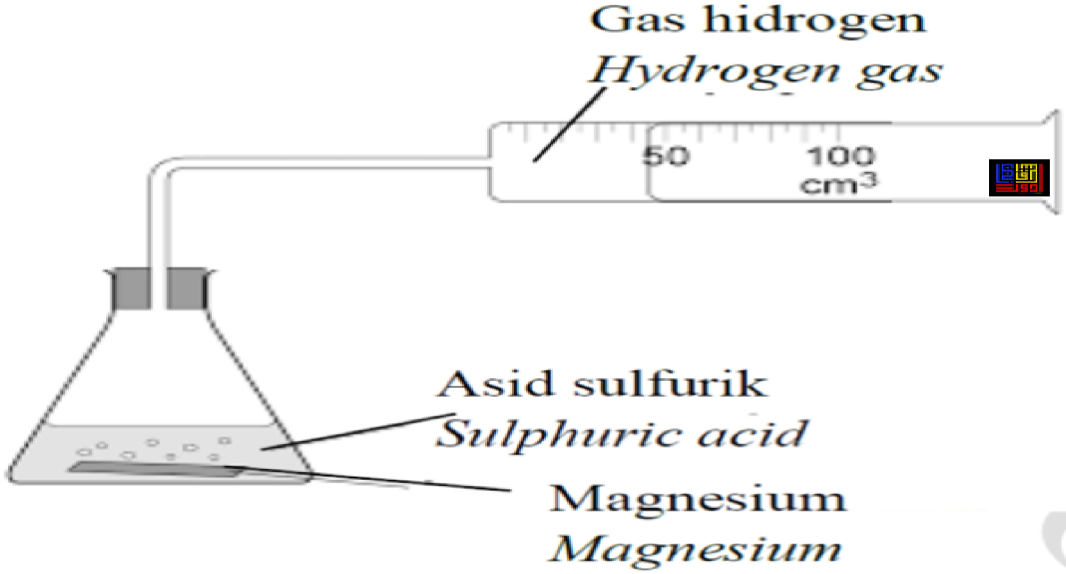
[Pahang JUJ Set 1 2023-32] Jadual 3 menunjukkan jumlah isipadu gas oksigen, O_2 yang dikumpul dalam tindak balas penguraian hidrogen peroksida, H_2O_2.
Table 3 shows the total volume of oxygen gas, O_2 collected in the decomposition reaction of hydrogen peroxide, H_2O_2.

Masa / *Time (s)*	0	30	60	90	120	150	180	240
Isipadu O_2 / *Volume of O_2 (cm_3)*	0.00	18.00	27.50	35.00	41.50	46.50	50.00	50.00

Berapakah kadar tindak balas purata dalam minit kedua?
What is the average rate of reaction in second minute?

A 0.208 cm^3 s^{-1}
B 0.233 cm^3 s^{-1}
C 0.333 cm^3 s^{-1}
D 0.346 cm^3 s^{-1}

[Pahang JUJ Set 1 2023-25] Rajah 10 menunjukkan susunan radas bagi satu tindak balas kimia
Diagram 10 shows the apparatus set-up for a chemical reaction.



Kaedah manakah yang paling sesuai untuk meningkatkan kadar tindak balas?
Which method is the most suitable to increase the rate of reaction?

A Meningkatkan jisim magnesium
Increase the mass of magnesium

B Merendahkan suhu asid sulfurik
Lower the temperature of sulphuric acid

C Menggunakan saiz magnesium lebih kecil
Use smaller size of magnesium

D Mengurangkan kepekatan larutan asid sulfurik
Reduce the concentration of sulphuric acid solution

[Johor PPD Tangkak 2023 16] Antara tindak balas kimia berikut, yang manakah mempunyai kadar tindak balas yang boleh ditentukan dengan perubahan isi padu gas?
In which of the chemical reactions can the rate be determined by measuring the change in the gas volume?

A Larutan asid hidroklorik dengan larutan natrium hidroksida
Hydrochloric acid solution with sodium hydroxide solution

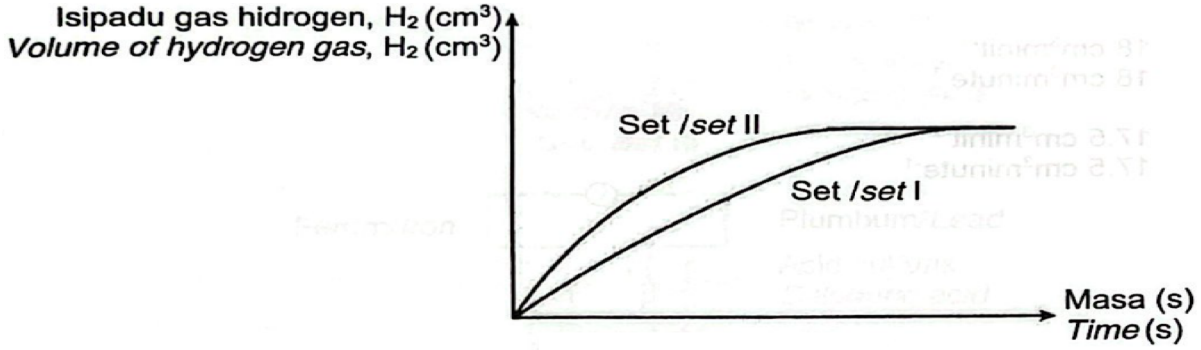
B Larutan asid sulfurik dengan kalsium karbonat
Sulphuric acid and calcium carbonate

C Larutan kuprum(II)sulfat dengan magnesium
Copper(II)sulphate solution with magnesium

D Larutan plumbum(II)nitrat dengan larutan natrium karbonat
Lead(II)nitrate solution with sodium carbonate solution

7.2 Faktor yang Mempengaruhi Kadar Tindak Balas

[Terengganu2023-30] Rajah 30 menunjukkan graf isi padu gas melawan masa bagi dua eksperimen, I dan II.
Diagram 30 shows the graph of gas volume against time for two experiments, I and II.



alam eksperimen set 1, 5.0 g ketulan zink bertindak balas dengan 25.00 cm^3 asid etanoik pada suhu dan tekanan bilik. Apakah perubahan yang perlu dilakukan ke atas bahan tindak balas di dalam eksperimen set II?
In experiment set 1,5.0 g of zinc lumps react with 25.00 cm^3 of ethanoic acid at room temperature and pressure. What changes should be made to the reactants in experiment set II?

A Meningkatkan saiz zink
Increase the size of zinc

B Tambah Nikel sebagai mangkin
Add nickel as a catalyst

C Menambah isi padu asid etanoik
Increase the volume of ethanoic acid

D Menggantikan asid etanoik dengan asid hidroklorik.
Replace ethanoic acid with hydrochloric acid

[Perlis 2023-18] Kepingan marmar bertindak balas dengan asid hidroklorik untuk menghasilkan karbon dioksida. Persamaan untuk tindak balas adalah seperti berikut :
Marble chips react with hydrochloric acid to produce carbon dioxide. The equation for the reaction is as follows :

$$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$$

Antara berikut, yang manakah akan merendahkan kadar tindak balas ini?
Which of the following will lower the rate of the reaction?

A Menggunakan kepekatan asid hidroklorik yang lebih cair
Using a more dilute concentration of hydrochloric acid

B Menggunakan kepingan marmar bersaiz lebih kecil
Use smaller sized marble chips

C Menggunakan isipadu asid hidroklorik yang lebih besar
Use a larger volume of hydrochloric acid

D Menggunakan kepingan marmar yang mempunyai luas permukaan yang lebih besar
Use marble chips that have a larger surface area

[MRSM2023-22] Asid nitrik cair bertindak balas lebih cepat dengan serbuk zink berbanding kepingan zink. Antara berikut yang manakah menerangkan penyataan tersebut?
Dilute nitric acid reacts faster with zinc powder compared to zinc strip. Which of the following explains this statement?

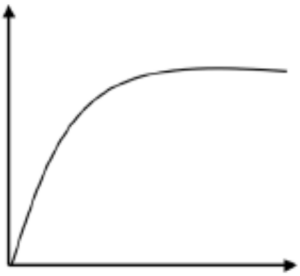
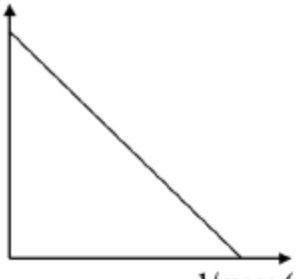
A Terdapat lapisan zink oksida yang terbentuk pada kepingan zink
There is a layer of zinc oxide on the zinc strip

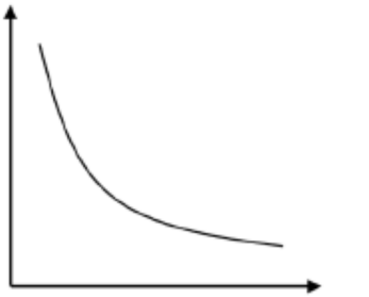
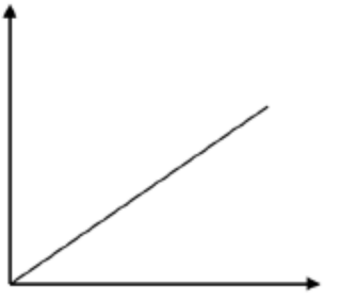
B Zarah-zarah dalam kepingan zink tersusun sangat rapat
The particles in the zinc strip are packed closely
C Serbuk zink mempunyai jumlah luas permukaan yang lebih besar
The zinc powder has a larger total surface area

D Zarah-zarah dalam serbuk zink mempunyai tenaga kinetik yang lebih tinggi
The particles of zinc powder have higher kinetic energy

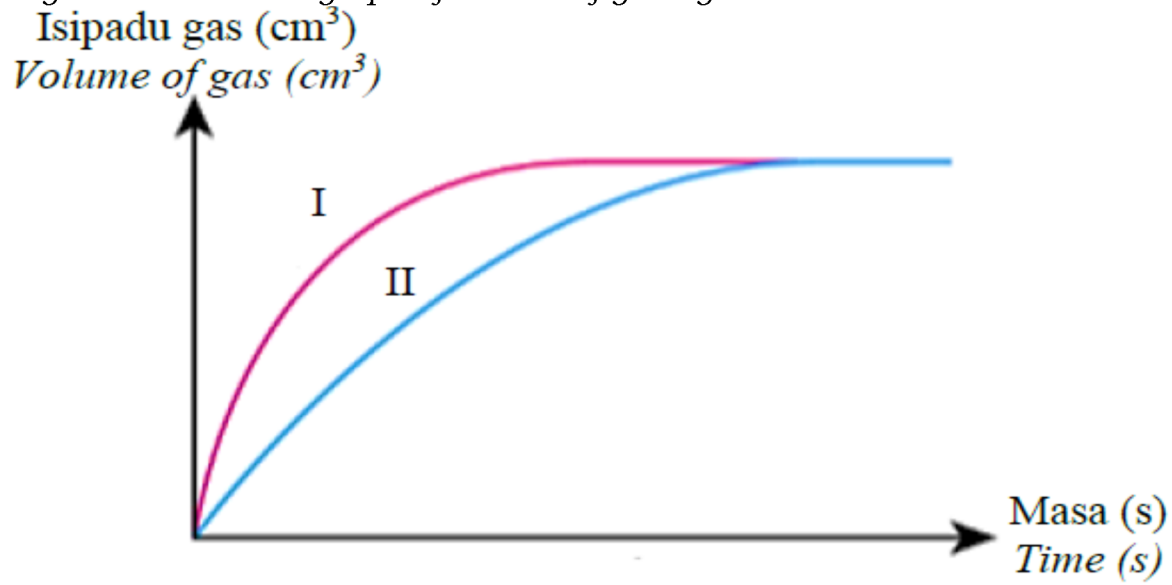
[MRSM2023-24] Seorang murid menjalankan eksperimen untuk mengkaji kesan suhu terhadap kadar tindak balas antara natrium tiosulfat, $Na_2S_2O_3$ dan asid sulfurik, H_2SO_4. Eksperimen dijalankan pada suhu yang berbeza tanpa mengubah kepekatan atau isipadu kedua-dua bahan tindak balas.
A student carries out an experiment to investigate how the temperature affects the rate of the reaction between sodium thiosuphate, $Na_2S_2O_3$ and sulphuric acid, H_2SO_4. The experimet is carried at different temperatures without changing the concentration or volume of both reactants.

Antara yang berikut, manakah graf yang menunjukkan keputusan eksperimen tersebut?
Which of the following shows the graph for the experiment?

A	Suhu $Na_2S_2O_3$ (°C) *Temperature* $Na_2S_2O_3$ (°C)  1/masa (s^{-1}) 1/*time* (s^{-1})	B	Suhu $Na_2S_2O_3$ (°C) *Temperature* $Na_2S_2O_3$ (°C)  1/masa (s^{-1}) 1/*time* (s^{-1})

C	Suhu $Na_2S_2O_3$ (°C) *Temperature* $Na_2S_2O_3$ (°C)  	D	Suhu $Na_2S_2O_3$ (°C) *Temperature* $Na_2S_2O_3$ (°C) 

[Pahang 2023-32] Rajah 11 menunjukkan graf isipadu gas melawan masa.
Diagram 11 shows a graph of volume of gas against time.



Lengkung I terhasil apabila 50 cm^3 asid hidroklorik 1.0 mol dm^{-3} bertindak balas dengan serbuk $CaCO_3$. Antara bahan tindak balas berikut, yang manakah menghasilkan Lengkung II?
Curve I produced when 50 cm^3 of 1.0 mol dm^{-3} of hydrochloric acid reacts with $CaCO_3$. Which of the following reactants will produces Curve II?

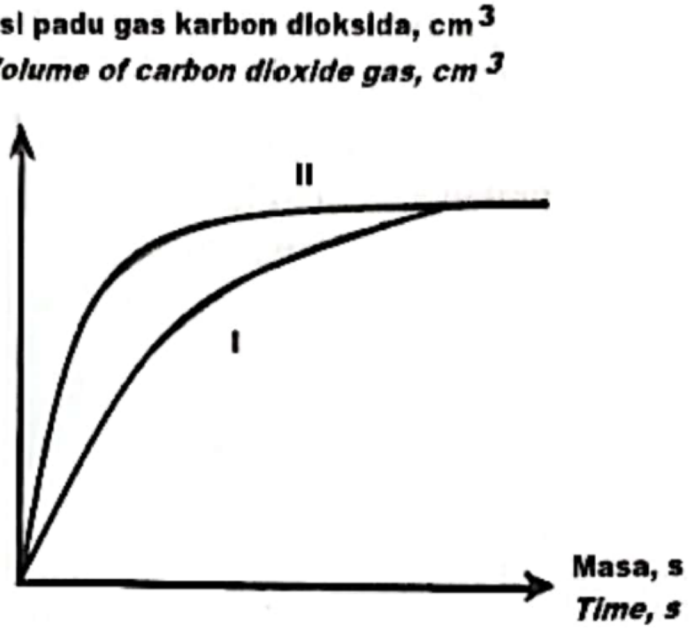
A 25 cm^3 asid hidroklorik 0.5 mol dm^{-3} dan serbuk kalsium karbonat
25 cm^3 of 0.5 mol dm^{-3} hydrochloric acid and calcium carbonate powder

B 25 cm^3 asid hidroklorik 1.0 mol dm^{-3} dan ketulan kalsium karbonat
25 cm^3 of 1.0 mol dm^{-3} hydrochloric acid and calcium carbonate chips

C 50 cm^3 asid hidroklorik 1.0 mol dm^{-3} dan ketulan kalsium karbonat
50 cm^3 of 1.0 mol dm^{-3} hydrochloric acid and calcium carbonate chips

D 50 cm^3 asid hidroklorik 0.5 mol dm^{-3} dan ketulan kalsium karbonat
50 cm^3 of 0.5 mol dm^{-3} hydrochloric acid and calcium carbonate chips

[Johor Bahru 2023-30] Rajah 9 menunjukkan lengkung 1 yang diperoleh apabila 1.0 g ketulan kalsium karbonat bertindak balas dengan asid sulfurik berlebihan pada suhu 50 °C.
Diagram 9 shows curve I obtained when 1.0 g calcium carbonate chips reacts with excess sulphuric acid at 50 °C.



Antara yang berikut, yang manakah akan menghasilkan lengkung II?
Which of the following will produce curve II?

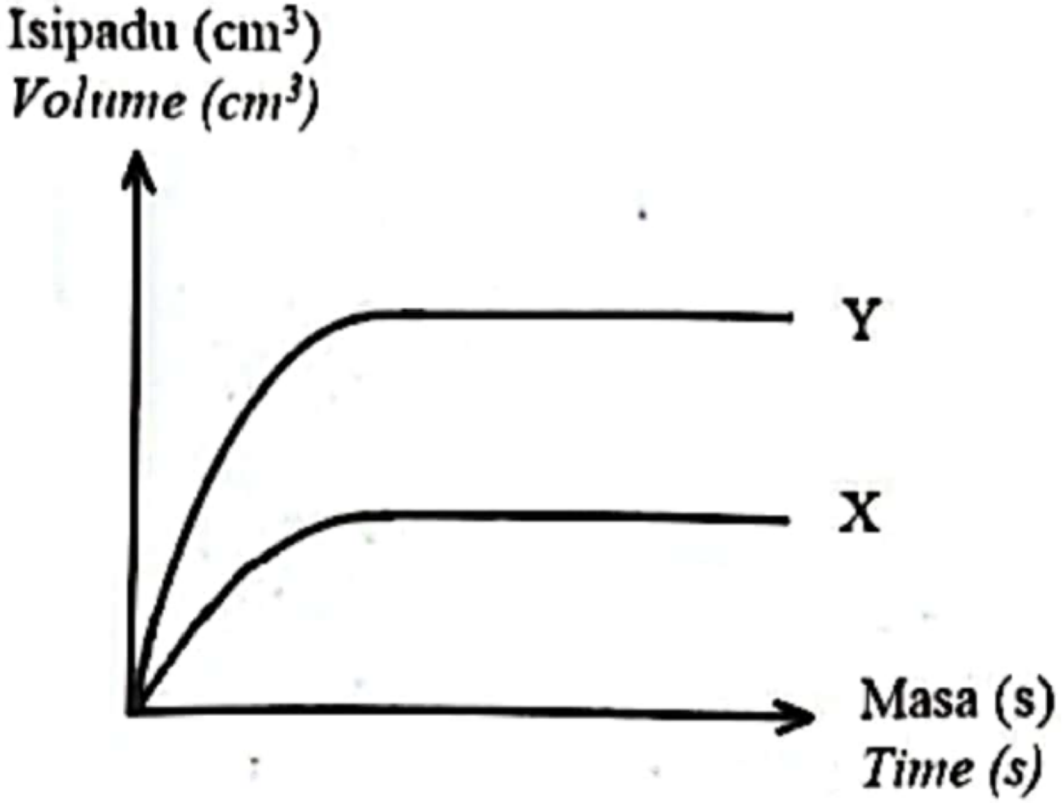
A Menggunakan 2.0 g ketulan kalsium karbonat
Using 2.0 g of calcium carbonate chips

B Menggunakan 1.0 g serbuk kalsium karbonat
Using 1.0 g of calcium carbonate powder

C Menambahkan air suling kepada asid sulfurik
Adding distilled water to the sulphuric acid

D Menurunkan suhu asid sulfurik kepada 30 °C
Decreasing the temperature of sulphuric acid to 30 °C

[Johor Bahru 2023-34] Rajah 11 menunjukkan graf isi padu gas hidrogen melawan masa bagi tindak balas antara zink dan asid sulfurik.
Diagram 11 shows a graph of volume of hydrogen gas against time for the reaction between zinc and sulphuric acid.



Lengkung X diperoleh apabila 25 cm^3 asid sulfurik 1 mol dm^{-3} ditambahkan ke dalam butiran zink berlebihan dalam sebuah kelalang kon.
Antara yang berikut, yang manakah perlu dilakukan untuk menghasilkan lengkung Y?
Curve X is obtained when 25 cm^3 of 1 mol dm^{-3} sulphuric acid is added to excess zinc granules in a conical flask.
Which of the following should be done to obtain curve Y?

A Menggantikan butiran zink dengan serbuk zink
Replace the zinc granules with zinc powder

B Menambahkan beberapa titik larutan kuprum(II) sulfat
Add a few drops of copper(II) sulphate solution

C Menggantikan 25 cm^3 asid sulfurik 1 mol dm^{-3} dengan 25 cm^3 asid sulfurik 2 mol dm^{-3}
Replace 25 cm^3 of 1 mol dm^{-3} sulphuric acid with 25 cm^3 of 2 mol dm^{-3} sulphuric acid

D Menggantikan 25 cm^{-3} asid sulfurik 1 mol dm^{-3} dengan 50 cm^3 asid sulfurik 1 mol dm^{-3}
Replace 25 cm^3 of 1 mol dm^3 sulphuric acid with 50 cm^3 of 1 mol dm^{-3} sulphuric acid

[Kelantan 2023-20] Jadual 2 menunjukkan masa yang diambil untuk mengumpul 30 cm^3 gas hidrogen apabila zink bertindak balas dengan beberapa jenis asid yang berbeza.
Table 2 shows the time taken to collect 30 cm^3 of hydrogen gas when zinc reacts with several different types of acid.

Bahan tindak balas *Reactants*	Masa yang diambil untuk kumpul 30 cm^3 gas hidrogen, s *Time taken to collect 30 cm^3 of hydrogen gas, s*
Zink + Asid Y *Zinc + Acid Y*	40
Zink + Asid X *Zinc + Acid X*	30
Zink + Asid W *Zinc + Acid W*	60

Berdasarkan Jadual 2, susun kekuatan asid-asid yang digunakan dalam tertib menaik.
Based on Table 2, arrange the strength of the acids used in ascending order.

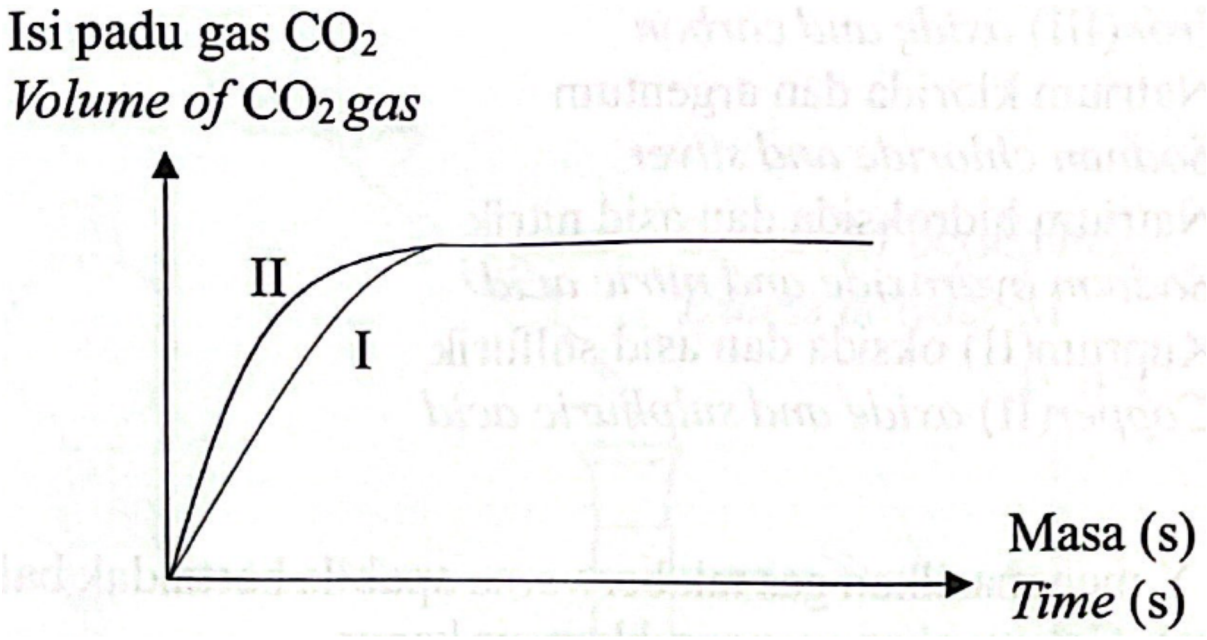
A. Asid W, Asid Y, Asid X
Acid W, Acid Y, Acid X

B. Asid X, Asid Y, Asid W
Acid X, Acid Y, Acid W

C. Asid Y, Asid X, Asid W
Acid Y, Acid X, Acid W

D. Asid X, Asid W, Asid Y
Acid X, Acid W, Acid Y

[Negeri Sembilan 2023-28] Rajah 9 menunjukkan lengkung yang diperoleh apabila kalsium karbonat bertindak balas dengan asid hidroklorik.
Diagram 9 shows the curves obtained when calcium carbonate reacts with hydrochloric acid.



Antara yang berikut, keadaan bahan tindak balas manakah menghasilkan lengkung I dan lengkung II?
Which of the following conditions of the reactants produce curve I and curve II?

	Lengkung I/ *Curve I*	Lengkung II/ *Curve II*
A	Ketulan kalsium karbonat berlebihan + 25 cm^3 asid hidroklorik 2.0 mol dm^{-3} *Excess calcium carbonate granules + 25 cm^3 of 2.0 mol dm^{-3} hydrochloric acid*	Serbuk kalsium karbonat berlebihan + 25 cm^3 asid hidroklorik 2.0 mol dm^{-3} *Excess calcium carbonate powder + 25 cm^3 of 2.0 mol dm^{-3} hydrochloric acid*
B	Ketulan kalsium karbonat berlebihan + 25 cm^3 asid hidroklorik 1.0 mol dm^{-3} *Excess calcium carbonate granules + 25 cm^3 of 1.0 mol dm^{-3} hydrochloric acid*	Ketulan kalsium karbonat berlebihan + 25 cm^3 asid hidroklorik 2.0 mol dm^{-3} *Excess calcium carbonate granules + 25 cm^3 of 2.0 mol dm^{-3} hydrochloric acid*
C	Ketulan kalsium karbonat berlebihan + 25 cm^3 asid hidroklorik 1.0 mol dm^{-3} *Excess calcium carbonate granules + 25 cm^3 of 1.0 mol dm^{-3} hydrochloric acid*	Ketulan kalsium karbonat berlebihan + 50 cm^3 asid hidroklorik 1.0 mol dm^{-3} *Excess calcium carbonate granules + 50 cm3 of 1.0 mol dm^{-3} hydrochloric acid*
D	Ketulan kalsium karbonat berlebihan + 25 cm^3 asid hidroklorik 1.0 mol dm^{-3} *Excess calcium carbonate granules + 25 cm^{-3} of 1.0 mol dm^{-3} hydrochloric acid*	Serbuk kalsium karbonat berlebihan + 25 cm^3 asid hidroklorik 2.0 mol dm^{-3} *Excess calcium carbonate powder + 25 cm^3 of 2.0 mol dm^{-3} hydrochloric acid*

[SBP2023-23] Persamaan ion berikut mewakili tindak balas antara larutan natrium tiosulfat dan asid sulfurik.
The following ionic equation represents the reaction between sodium thiosulphate solution and sulphuric acid.

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

Antara penyataan berikut, yang manakah menerangkan kesan peningkatan kepekatan larutan natrium tiosulfat ke alas kadar tindak balas?
Which of the following statements explains the effect of the increasing of the concentration of sodium thiosulphate solution on the rale of reaction?

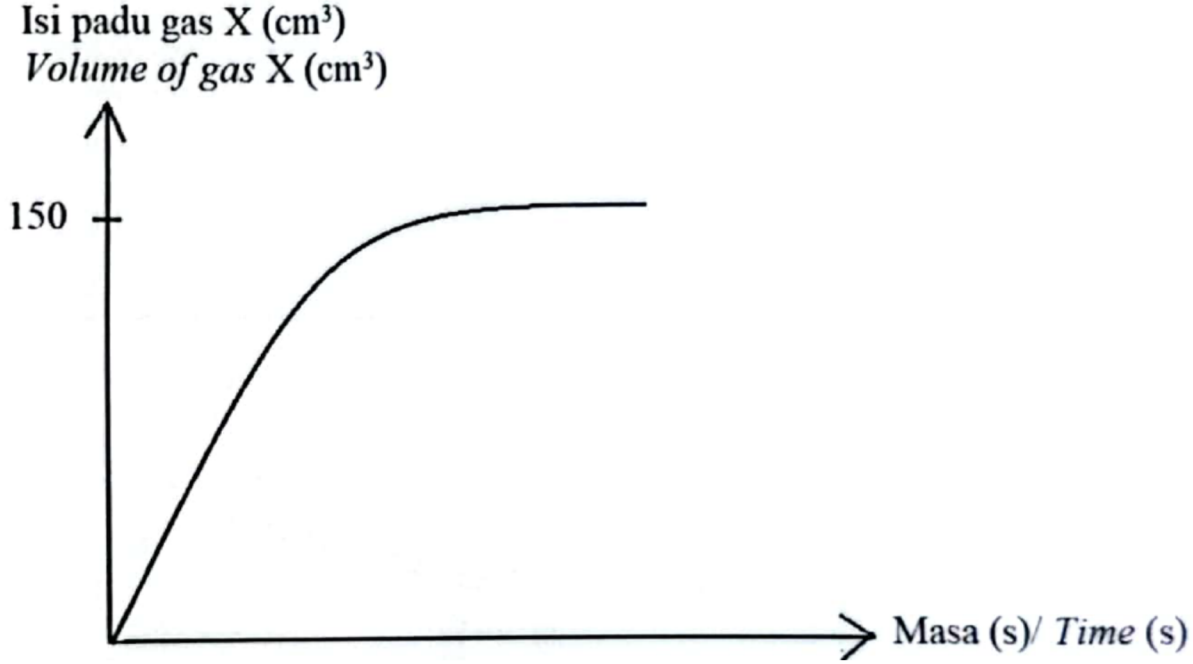
A Tenaga kinetik ion tiosulfat bertambah
Kinetic energy' of thiosulphate ions increases

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

C Masa perlanggaran antara ion hidrogen dan ion tiosulfat bertambah
The time of collision between hydrogen ions and thiosulphate ions increases

D Tenaga pengaktifan bagi perlanggaran ion hidrogen dan ion tiosulfat bertambah
Activation energy of colliding hydrogen ions and thiosulphate ions increases

[SBP2023-39] Sekumpulan murid telah menjalankan satu eksperimen untuk mengkaji faktor-faktor yang mempengaruhi kadar tindak balas. Serpihan kalsium karbonat berlebihan telah dimasukkan ke dalam sebuah kelalang kon yang berisi 25 cm^3 larutan asid nitrik 0.5 mol dm^{-3}.
Rajah 10 menunjukkan graf isi padu gas terbebas melawan masa yang diplot setelah tindak balas itu lengkap.
A group of students carried out an experiment to investigate factors that affect the rate of reaction. Excess calcium carbonate chips were put into a conical flask containing 25 cm^3 of 0.5 mol dm^{-3} nitric acid solution.
Diagram 10 shows a graph of the volume of gas released against time plotted after the reaction is complete.

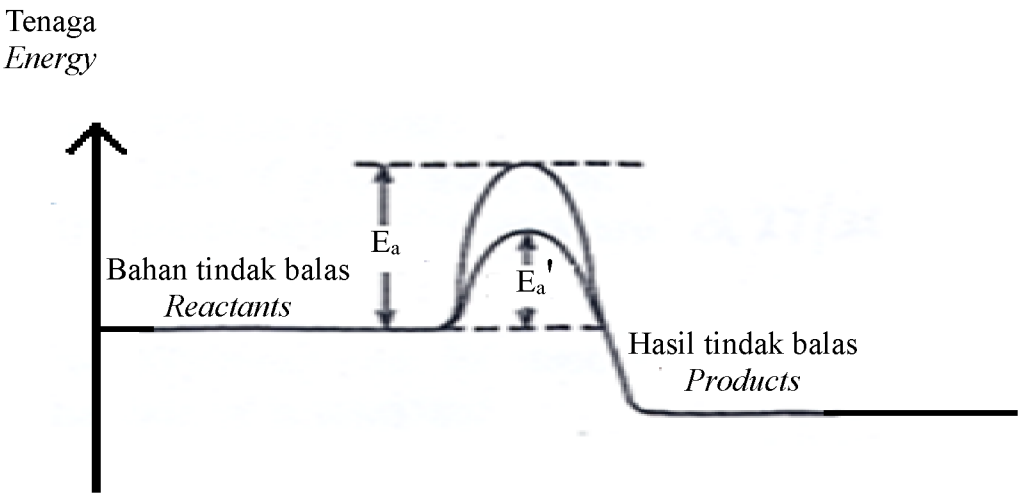


Antara yang berikut, apakah isi padu dan kepekatan asid nitrik yang perlu digunakan sekiranya murid itu ingin mengumpul dua kali ganda isi padu gas dalam masa yang lebih panjang?
Which of the following volume and concentration of nitric acid should be used if the student wants to obtain twice the volume of the gas in a longer time?

	Isi padu asid nitrik *Volume of nitric acid (cm^3)*	Kepekatan asid nitrik *Concentration of nitric acid (mol dm^{-3})*
A	100.0	0.25
B	50.0	0.10
C	50.0	0.50
D	25.0	1.00

Mangkin

[Putrajaya2023-23] Rajah 8 menunjukkan profil tenaga bagi suatu tindak balas. Ea adalah tenaga pengaktifan bagi tindak balas ini.
Diagram 8 shows the energy profile of a reaction. Ea is the activation energy for this reaction.



Apakah yang akan mengubah tenaga pengaktifan daripada Ea ke Ea'?
What will change the activation energy from Ea to Ea'?

A Saiz
Size

C Kepekatan
Concentration

B Suhu
Temperature

D Mangkin
Catalyst

[Putrajaya2023-08] Antara yang berikut, pernyataan yang manakah benar tentang mangkin?
Which of the following statement is correct about catalyst?

A Mangkin boleh meningkatkan kuantiti hasil tindak balas
Catalyst can increase the quantity of product formed

B Mangkin tidak berubah keadaan fizikal selepas tindak balas
Catalyst does not change its physical state after reaction

C Mangkin meningkatkan tenaga pengaktifan untuk tindak balas
Catalyst increases the activation energy for a reaction

D Mangkin diperlukan dalam kuantiti kecil sahaja untuk mempercepatkan tindak balas.
Only a small amount of catalyst is required to speed up reaction.

[MRSM2023-06] Persamaan kimia berikut menunjukkan tindak balas antara magnesium dan asid sulfurik.
The following chemical equation shows a reaction between magnesium and sulphuric acid.

$$Mg + H_2SO_4 \xrightarrow{CuSO_4} MgSO_4 + H_2$$

Antara pernyataan berikut, yang manakah benar tentang $CuSO_4$ dalam tindak balas ini?
Which of the following statement is true about $CuSO_4$ in the reaction?

A Mengubah kadar tindak balas
Alter the rate of reaction

B Meningkatkan kuantiti hasil tindak balas
Increase the quantity of product

C Sifat kimianya berubah
Its chemical properties change

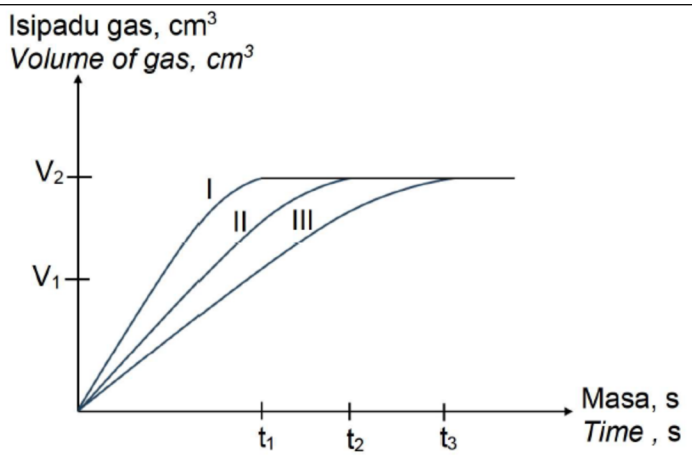
D Jisim $CuSO_4$ berkurang pada akhir tindak balas
Mass of $CuSO_4$ decreases at the end of the reaction

[Kelantan 2023-39] Jadual 5 menunjukkan maklumat tentang tiga set eksperimen menggunakan X g serbuk zink dengan asid sulfurik berlebihan yang mempunyai kepekatan Y mol dm'3. Setiap set eksperimen menggunakan isipadu asid sulfurik yang berbeza dan ditambahkan air pada isipadu yang berlainan.
Table 5 shows information about three sets of experiments using X g of zinc powder with excess of sulphuric acid with a concentration of Y mol dm-3. Each set of experiments used different volumes of sulfuric acid and added different volumes of water.

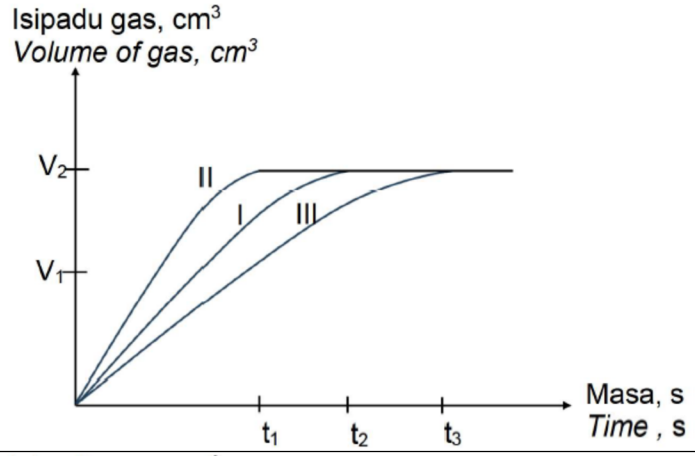
Set Set	Isipadu asid sulfurik, *Volume of sulphuric acid,*	Isipadu air, cm^3 *Volume of water cm^3*	Kehadiran mangkin *Presence of catalyst*
I	100	300	Ya/ *Yes*
II	400	0	Ya/ *Yes*
III	100	300	Tiada/ No

Berdasarkan Jadual 5, graf manakah yang menunjukkan lengkung yang betul bagi setiap set eksperimen.
Based on Table 5, which graph shows the correct curve for each set of experiments.

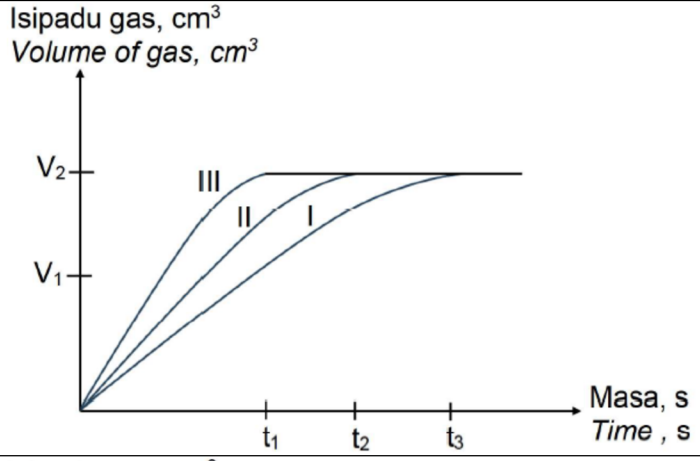
A


Isipadu gas, cm3
Volume of gas, cm3
V2
V1
I
II
III
t1
t2
t3
Masa, s
Time , s

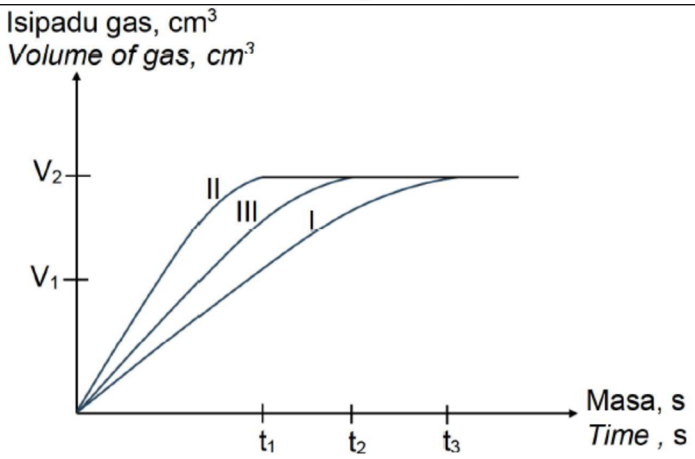
B


Isipadu gas, cm3
Volume of gas, cm3
V2
V1
II
I
III
t1
t2
t3
Masa, s
Time , s

C


Isipadu gas, cm3
Volume of gas, cm3
V2
V1
III
II
I
t1
t2
t3
Masa, s
Time , s

D


Isipadu gas, cm3
Volume of gas, cm3
V2
V1
II
III
I
t1
t2
t3
Masa, s
Time , s

[Kedah2023-27] Apabila beberapa titik larutan kuprum (II) sulfat ditambah kepada campuran serbuk zink dan asid sulfurik cair, kadar tindak balas meningkat. Pernyataan manakah yang menjelaskan mengapa kadar tindak balas meningkat.
When a few drops of copper (II) sulphate solution added to a mixture of zinc powder and dilute sulphuric acid, the rate of reaction increases.
Which statement explains why the rate of reactions Increases.

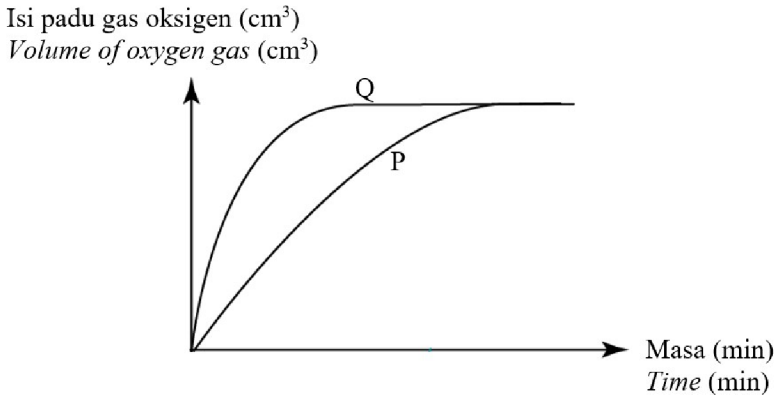
A Merendahkan tenaga pengaktifan
Lower the activation energy

B Meningkatkan frekuensi perlanggaran
Increases the collision frequency

C Meningkatkan kepekatan ion sulfat dalam campuran
Increases the concentration of sulphate ion in the mixture

D Menjadikan orientasi pelanggaran antara zarah bahan tindak balas lebih sesuai
Make the orientation of collision between the reacting particles more suitable

[Johor Skudai2023-34] Rajah 34 menunjukkan lengkung P dan lengkung Q yang diperoleh bagi penguraian larutan hidrogen peroksida dengan kehadiran suatu mangkin.
Diagram 34 shows the curve P and Q obtained for decomposition of hydrogen peroxide solution in the presence of a catalyst.



Lengkung P terhasil dengan menggunakan 50 cm^3 larutan hidrogen peroksida 1.0 mol dm^{-3} pada suhu 21°C.
Curve P is obtained by using 50 cm^3 of 1.0 mol dm^{-3} of hydrogen peroxide solution at temperature 21°C.

Antara berikut, yang manakah dapat menghasilkan lengkung Q?
Which of the following would obtain curve Q?

	Hidrogen peroksida ***Hydrogen peroxide***		**Suhu (°C)** ***Temperature (°C)***
	Isipadu (cm^3) ***Volume*** **(cm^3)**	**Kepekatan ($mol\ dm^{-3}$)** ***Concentration (mol dm^{-3})***	
A.	25	0.5	30
B.	25	1.0	25
C.	50	0.5	25
D.	50	1.0	30

[Johor Skudai2023-35] Seorang pelajar ingin menyediakan gas hidrogen di dalam makmal melalui tindak balas antara pita magnesium dan asid hidroklorik. Langkah-langkah manakah mesti diambil untuk memendekkan masa pengumpulan gas itu?
A student wants to prepare hydrogen gas in the laboratory through the reaction between magnesium ribbon and hydrochloric acid. Which steps must be taken to shorten the time to collect the gas?

I Menambahkan air kepada asid hidroklorik
Adding water to hydrochloric acid

II Menggunakan kelalang kon yang lebih besar untuk larutan tersebut
Using a larger conical flask for the solution

III Menggantikan pita magnesium dengan serbuk magnesium
Replacing magnesium ribbon with magnesium powder

IV Menambahkan beberapa titis larutan kuprum(II) sulfat kepada campuran bahan tindak balas
Adding a few drops of copper(II) sulphate solution to the mixture of the reactants

A I and II
I dan II

C II and III
II dan III

B I and IV
I dan IV

D III and IV
III dan IV

[Johor PPD Tangkak 2023 33] Seorang pelajar ingin menyediakan gas hidrogen di dalam makmal melalui tindak balas antara pita magnesium dan asid hidroklorik. Langkah-langkah manakah mesti diambil untuk memendekkan masa pengumpulan gas itu?
A student wants to prepare hydrogen gas in the laboratory through the reaction between magnesium ribbon and hydrochloric acid. Which steps must be taken to shorten the time to collect the gas?

I Menambahkan air kepada asid hidroklorik
Adding water to hydrochloric acid

II Menggunakan kelalang kon yang lebih besar untuk larutan tersebut
Using a large conical flask for the solution

III Menggantikan pita magnesium dengan serbuk magnesium
Replacing magnesium ribbon with magnesium powder

IV Menambahkan beberapa titis larutan kuprum(II) sulfat kepada campuran bahan tindakbalas
Adding a few drops of copper(II) sulphate solution to the mixture of the Reactants

A I dan II
I and II

C II dan III
II and III

B I dan IV
I and IV

D III dan IV
III and IV

[Johor Skudai2023-16] Persamaan berikut mewakili tindak balas antara kalsium karbonat dan asid hidroklorik
The following equation represents the reaction between calcium carbonate and hydrochloric acid

$$CaCO_3(s) + 2\ HCl(aq) \rightarrow CaCl_2(s) + H_2O(l) + CO_2(g)$$

Antara faktor berikut, yang manakah boleh meningkatkan kadar tindak balas ini?
Which of the following factors can increase the rate of this reaction.

A Meningkatkan saiz kalsium karbonat
Increase the size of calcium carbonate

B Meningkatkan suhu campuran
Increase the temperature of the mixture

C Mengurangkan isipadu asid hidroklorik
Decrease the volume of hydrochloric acid

D Mengurangkan kepekatan asid hidroklorik
Decrease the concentration of hydrochloric acid

[SBP2023-08] Antara yang berikut. kaedah manakah tidak akan meningkatkan kadar tindak balas antara ketulan zink dan asid hidroklorik?
Which of the following methods will not increase the rate of reaction between zinc granules and hydrochloric acid?

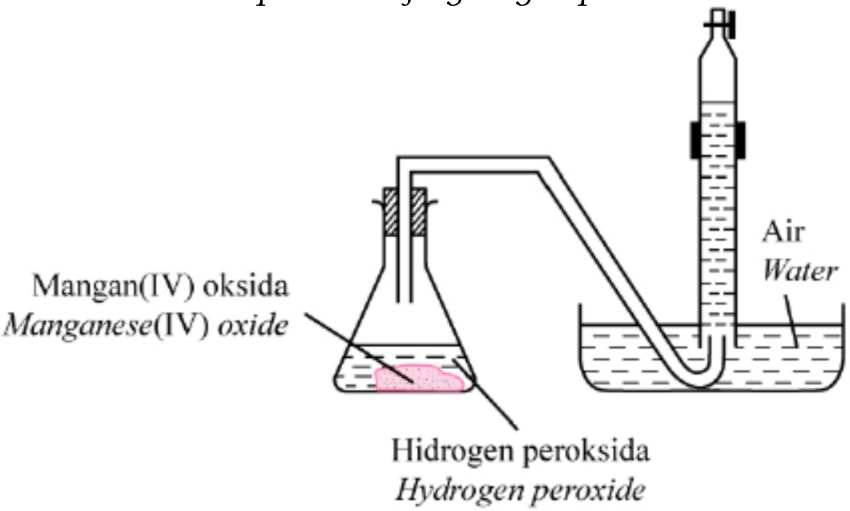
A Gunakan serbuk zink
Use zinc powder

B Panaskan asid hidroklorik
Heat the hydrochloric acid

C Masukkan mangkin ke dalam campuran
Put catalyst into the mixture

D Tambahkan air ke dalam asid hidroklorik
Add water into hydrochloric acid

[Selangaor2023 Set 01-22] Rajah 7 menunjukkan penguraian hydrogen peroksida.
Diagram 7 shows the decomposition of hydrogen peroxide.



Apakah yang perlu dilakukan untuk meningkatkan kadar penguraian hidrogen peroksida?
What should be done to increase the rate of decomposition of hydrogen peroxide?

A Tambah air/ *Add water*

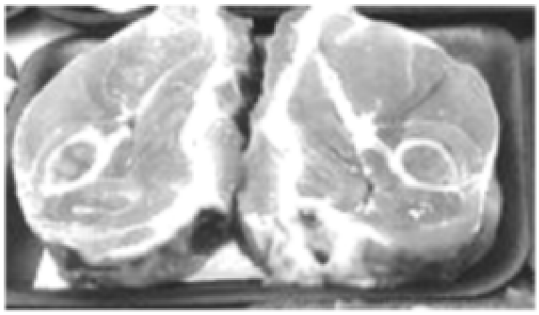
B Gunakan kelalang kon yang lebih kecil
Use smaller conical flask

C Keluarkan mangan(IV) oksida/ *Remove manganese (IV) oxide*

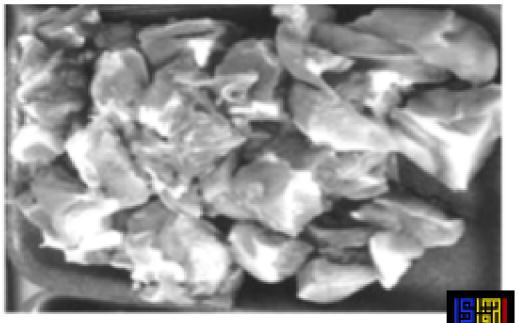
D Meningkatkan kepekatan hidrogen peroksida
Increase the concentration of hydrogen peroxide

7.3 Aplikasi Faktor yang Mempengaruhi Kadar Tindak Balas dalam Kehidupan

[Pahang JUJ Set 1 2023-21] Rajah 6 menunjukkan daging A dan daging B dalam dua saiz yang berbeza.
Diagram 6 shows meat A and meat B in two different sizes.



Daging A/ *Meat A*



Daging B / *Meat B*

Daging B lebih cepat dimasak kerana ia mempunyai
Meat B is cooked faster because it has

A jisim lebih rendah
lower mass

B ketumpatan lebih rendah
lower density

C kapisiti haba lebih rendah
lower heat capacity

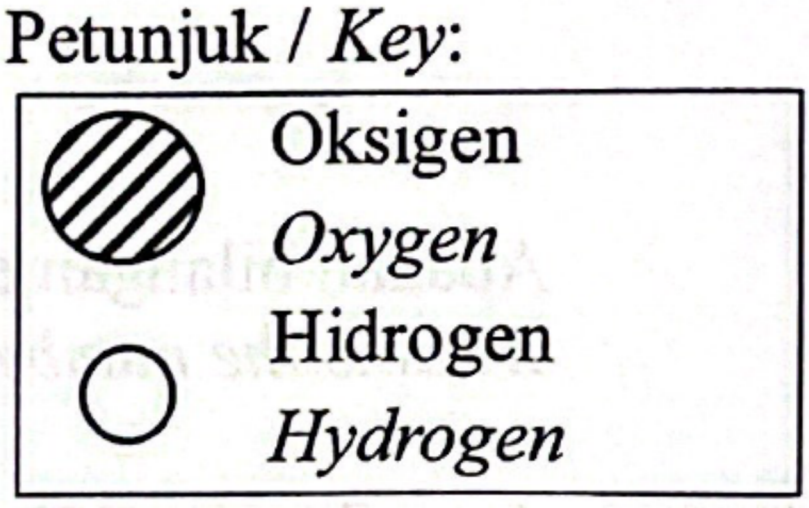
D jumlah luas permukaan lebih besar
bigger total surface area

7.4 Teori Perlanggaran

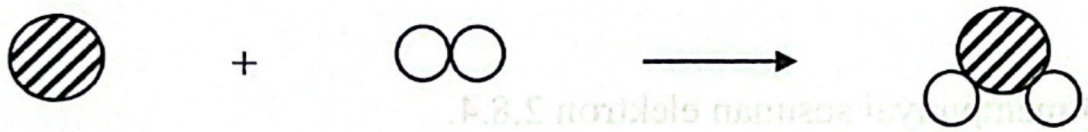
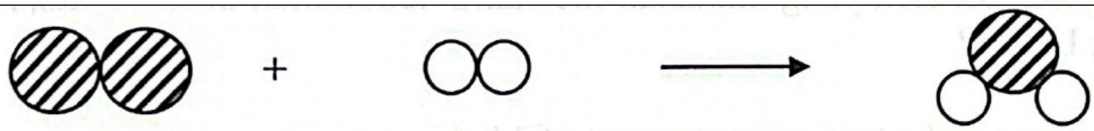
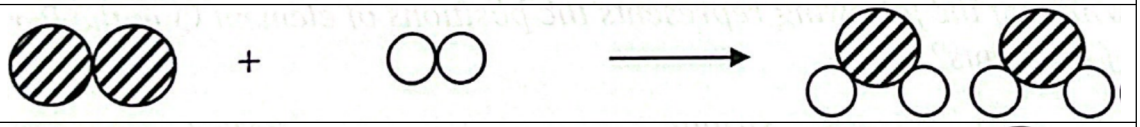
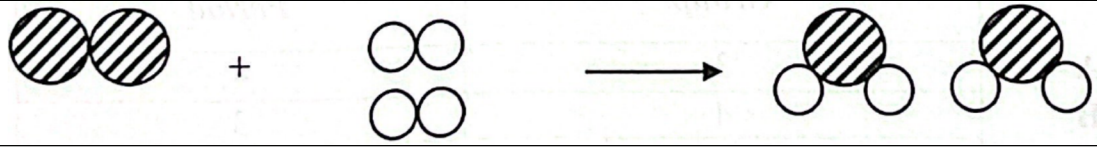
[Negeri Sembilan 2023-23] Persamaan berikut menunjukkan satu tindak balas kimia.
The following equation shows a chemical reaction.

Oksigen + Hidrogen → Air
Oxygen + *Hydrogen* → *Water*

Petunjuk / Key:



Antara yang berikut, susunan zarah manakah betul mewakili tindak balas tersebut?
Which of the following arrangement of particles is correct to represent the reaction?

A	
B	
C	
D	

[Pahang 2023-07] Pernyataan manakah paling baik menjelaskan maksud istilah perlanggaran berkesan?
Which statement best explains the meaning of effective collision?

A Perlanggaran yang berlaku pada suhu yang tinggi
Collisions that occur at high temperatures

B Perlanggaran yang menyebabkan tindak balas kimia berlaku
Collisions that causes a chemical reaction to occur

C Perlanggaran yang menyebabkan pembentukan ikatan baru
Collision that causes the formation of new bonds

D Perlanggaran yang berlaku apabila zarah-zarah bahan tindak balas melanggar antara satu sama lain pada orientasi yang betul
Collisions occur when reactant particles collide with each other in the correct orientation

[Johor Skudai2023-15] Yang manakah menerangkan maksud perlanggaran berkesan?
Which of the following explains the meaning of effective collision?

A Perlanggaran yang menyebabkan tindak balas
The collision that cause reaction

B Perlanggaran yang berlaku semasa tindak balas
The collision occur during reaction

C Tenaga perlanggaran yang kurang dari tenaga pengaktifan
Collision energy that less than the activation energy

D Perlanggaran yang mempunyai tenaga pengaktifan paling tinggi
The collision that has the highest activation energy

[Johor PPD Tangkak 2023 15] Tindak balas antara zink dengan asid hidroklorik berlaku apabila zarah bahan tindak balas berlanggar antara satu sama lain. Hanya perlanggaran berkesan akan menghasilkan hasil tindak balas. Antara berikut, keadaan yang manakah diperlukan untuk perlanggaran berkesan berlaku?
Reaction between zinc and hydrochloric acid occurred when the particles of reactant collide with each other. Only effective collision will produce products. Which of the following condition needed for an effective collision to occur?

A Zarah bahan tindak balas mempunyai tenaga pengaktifan yang sama.
The reactant particles have the same activation energy.

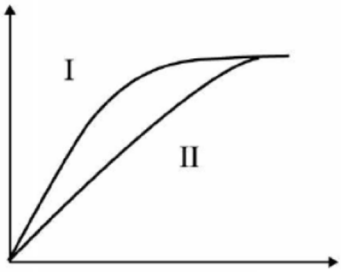
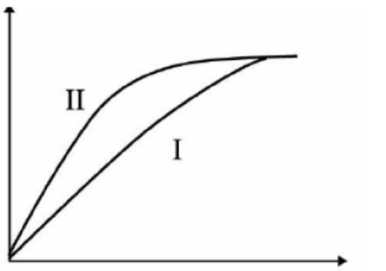
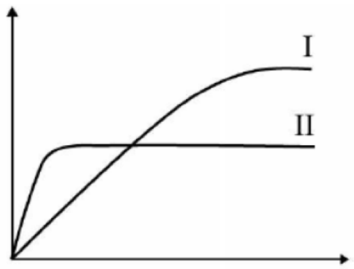
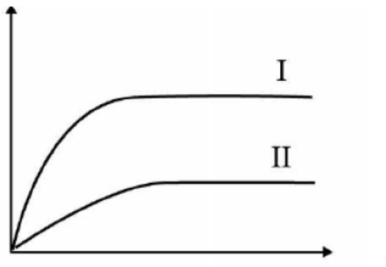
B Zink dan ion H+ perlu mencapai tenaga minimum.
Zinc and H+ ions need to reach minimum energy.

C Zarah hasil tindak balas berlanggar pada orientasi yang betul.
The particles of the product collide at the correct orientation.

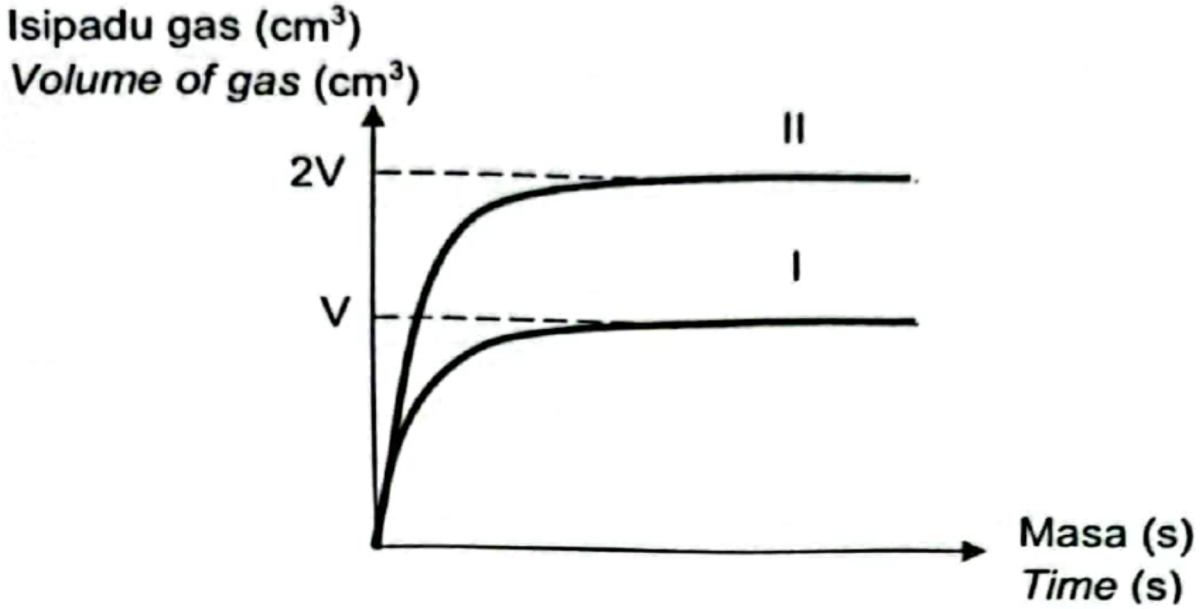
[Pahang JUJ Set 2 2023-40] Jadual 4 menunjukkan maklumat mengenai bahan tindak balas yang digunakan dalam eksperimen I dan II.
Table 4 shows the information about the reactants used in Experiment I and II.

Ekperimen *Experiment*	Bahan tindak balas *Reactants*
I	20 cm^3 asid sulfurik 0.1 mol dm^{-3} dan serbuk zink berlebihan *20 cm^3 of 0.1 mol dm^{-3} sulphuric acid and excess zinc powder*
II	20 cm^3 asid hidroklorik 0.1 mol dm^{-3} dan serbuk zink berlebihan *20 cm^3 of 0.1 mol dm^{-3} hydrochloric acid and excess zinc powder*

Graf manakah yang mewakili tindak balas dalam Eksperimen I dan II?
Which graph represents the reaction in Experiment I and II?

A	Isi padu gas hydrogen (cm^3) *Volume of hydrogen gas (cm^3)*  	B	Isi padu gas hydrogen (cm^3) *Volume of hydrogen gas (cm^3)* 
C	Isi padu gas hydrogen (cm^3) *Volume of hydrogen gas (cm^3)*  	D	Isi padu gas hydrogen (cm^3) *Volume of hydrogen gas (cm^3)* 

[Kedah2023-39] Rajah menunjukkan graf dalam eksperimen I yang menggunakan 5 g serbuk kalsium karbonat, $CaCO_3$ dan 50 cm^3 asid nitrik, HNO_3 1.0 mol dm^{-3} menghasilkan gas karbon dioksida, CO_2.
Diagram shows the graph in experiment I that are using 5 g of calcium carbonate powder, $CaCO_3$ and 50 cm^3 of 1.0 mol dm^{-3} of nitnc acid, HNO_3 to produce carbon dioxide gas, CO_2.



Antara tindak balas berikut, yang manakah akan menghasilkan graf II?
Which of the following reaction will produce graph II?

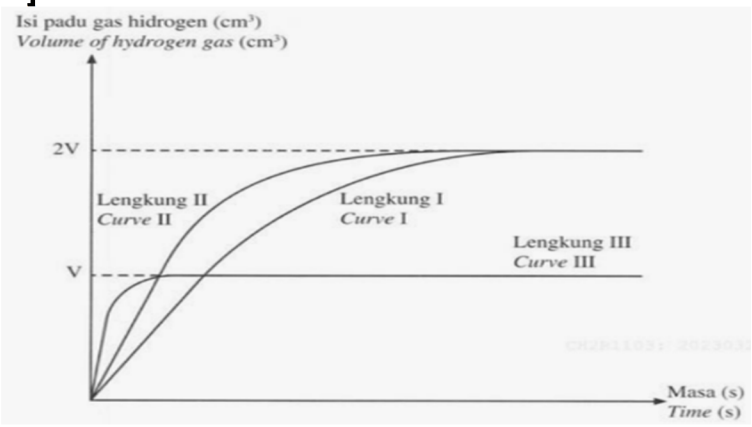
A 5 g serbuk kalsium karbonat, $CaCO_3$ + 50 cm^3 asid nitrik HNO_3 2.0 mol dm^{-3}
5 g of calcium carbonate powder, $CaCO_3$ + 50 cm^3 of 2.0 mol dm^{-3} of nitric acid, HNO_3

B 5 g serbuk kalsium karbonat, $CaCO_3$ + 100 cm^3 asid nitrik HNO_3 1.0 mol dm^{-3}
5 g of calcium carbonate powder, $CaCO_3$ + 100 cm^3 of 1.0 mol dm'3 of nitric acid, HNO_3

C 5 g ketulan kalsium karbonat, $CaCO_3$ + 100 cm^3 asid nitrik HNO_3 1.0 mol dm^{-3}
5 g of calcium carbonate chips, $CaCO_3$ + 100 cm^3 of 1.0 mol dm'3 of nitric acid, HNO_3

D 5 g ketulan kalsium karbonat, $CaCO_3$ + 50 cm^3 asid nitrik HNO_3 1.0 mol dm^{-3}
5 g of calcium carbonate chips, $CaCO_3$ + 50 cm^3 of 1.0 mol dm^{-3} of nitric acid, HNO_3

[Perlis 2023-39]

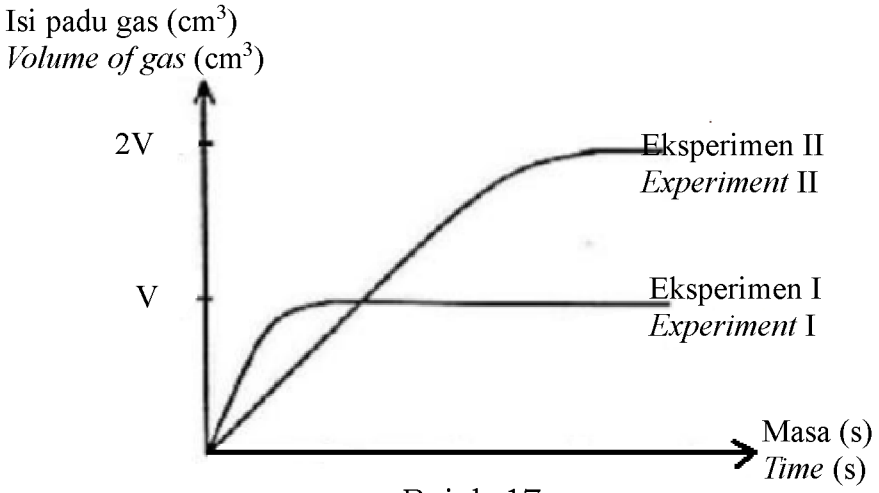


Ekhwan menjalankan satu eksperimen kadar tindak balas dengan menggunakan ketulan zink berlebihan dan 50 cm^3 asid hidroklorik 1.0 mol dm^{-3}. Isipadu gas hidrogen yang terkumpul di plot seperti lengkung I di dalam Rajah 12.
Ekhwan carried out an experiment of rate of reaction using granules of zinc and 50 cm^3 hydrochloric acid 1.0 mol dm^{-3}. Volume of hydrogen gas plots as shown as curve I in Diagram 12.

Cadangkan bahan yang boleh mendapatkan lengkung II dan III.
Suggest substances can be replaced to obtain curve II and III.

	Lengkung II *Curve* II	Lengkung III *Curve* III
A	Serbuk zink berlebihan dan 50 cm^3 asid hidroklorik 1.0 mol dm^{-3} *Excess zinc powder and* 50 cm^3 *hydrochloric acid* 1.0 mol dm^{-3}	Serbuk zink berlebihan dan 25 cm^3 asid hidroklorik 1.0 mol dm^{-3} *Excess zinc powder and* 25 cm^3 *hydrochloric acid* 1.0 mol dm^{-3}
B	Serbuk zink berlebihan dan 50 cm^3 asid sulfurik 1.0 mol dm^{-3} *Excess zinc powder and* 50 cm^3 *sulphuric acid* 1.0 mol dm^{-3}	Serbuk zink berlebihan dan 25 cm^3 asid sulfurik 1.0 mol dm^{-3} *Excess zinc powder and* 25 cm^3 *sulphuric acid* 1.0 mol dm^{-3}
C	Ketulan zink berlebihan dan 50 cm^3 asid sulfurik 1.0 mol dm^{-3} *Excess zinc granule and* 50 cm^3 *sulphuric acid* 1.0 mol dm^{-3}	Ketulan zink berlebihan dan 25 cm^3 asid sulfurik 1.0 mol dm^{-3} *Excess zinc granule and* 25 cm^3 *sulphuric acid* 1.0 mol dm^{-3}
D	Serbuk zink berlebihan dan 50 cm^3 asid hidroklorik 1.0 mol dm^{-3} *Excess zinc powder and* 50 cm^3 *hydrochloric acid* 1.0 mol dm^{-3}	Serbuk zink berlebihan dan 25 cm^3 asid hidroklorik 1.0 mol dm^{-3} beserta larutan kuprum (II) sulfat 1.0 mol dm^{-3} *Excess zinc powder and* 25 cm^3 *hydrochloric acid with copper*(II) *sulphate solution* 1.0 mol dm^{-3}

[Putrajaya2023-40] Rajah 17 menunjukkan graf isi padu gas melawan masa bagi dua set eksperimen untuk mengkaji faktor yang mempengaruhi kadar tindak balas.
Diagram 17 shows a graph of volume if gas against time for two sets of experiments to study the factor that affects the rate of reactions.



Rajah 17
Diagram 17

Lengkung I mewakili tindak balas antara 40 cm^3 asid nitrik 0.05 mol dm^{-3} dan serbuk magnesium berlebihan. Jika eksperimen diulang dengan menggunakan larutan asid nitrik yang berlainan kepekatan dan isi padu, antara keadaan berikut yang manakah menghasilkan lengkung II?
Curve I represent the reaction between 40 cm^3 0.05 mol dm^{-3} nitric acid and excess magnesium powder. If the experiment is repeated with different concentration and volume of nitric acid solution, which of the following condition produced 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	0.20	20
B	0.10	40
C	0.05	80
D	0.02	200

BAB 8 Bahan Buatan dalam Industri

8.1 Aloi dan Kepentingannya

[Selangaor2023 Set 01-17] Apakah unsur utama dalam aloi loyang?
What is the major element in brass alloy?

A Aluminium
Aluminium

C Stanum
Tin

B Zink
Zinc

D Kuprum
Copper

[SBP2023-09] Antara yang berikut, unsur manakah adalah komposisi keluli?
Which of the following elements are the composition of steel?

I Ferum
Iron

III Kuprum
Copper

II Zink
Zinc

IV Karbon
Carbon

A I dan II
I and II

C II dan III
II and III

B I dan IV
I and IV

D III dan IV
III and IV

[Selangaor2023 Set 01-11]

Gangsa adalah lebih keras daripada kuprum tulen.
Bronze is harder than pure copper.

Pernyataan yang manakah menerangkan fenomena di atas dengan tepat?
Which statement exactly explains phenomena above?

A Ruang kosong antara atom kuprum tulen adalah lebih kecil daripada gangsa
The empty spaces between the pure copper atoms are smaller than bronze

B Kehadiran atom bendasing dalam gangsa mengganggu susunan teratur atom kuprum tulen
The presence of foreign atoms in bronze disrupts the orderly arrangement of pure copper atoms

C Ikatan antara atom dalam gangsa adalah lebih kuat
Bond between atom in bronze is stronger

D Kehadiran atom bendasing dalam gangsa mengurangkan atom kuprum tulen menggelongsor antara satu sama lain dengan mudah
The presence of foreign atoms in bronze reduces the pure copper atoms from sliding over one another easily

[Pahang 2023-08] Proses pengaloian boleh mengubah sifat logam tulen supaya menjadi lebih keras dan kukuh kerana dalam proses ini atom-atom asing yang dicampurkan bersama logam tulen menjadikan
The alloying process helps to alter the properties of a pure metal to make it harder and strong because in this process the foreign atoms that are mixed with the pure metals make

A susunan atom-atom logam tulen lebih teratur
the arrangement of pure metal atoms is in more orderly arrangement

B ikatan antara atom-atom logam tulen bertambah kuat
the bond between the pure metal atoms become stronger

C lapisan atom-atom logam tulen lebih sukar menggelongsor
layers of pure metal atoms are more difficult to slide

D ikatan antara atom-atom logam tulen dengan atom-atom logam asing bertambah kuat
the bond between the pure metal atoms with foreign metal atoms become stronger

[Negeri Sembilan 2023-11] Antara yang berikut, padanan manakah yang betul menunjukkan tentang aloi dan unsur utamanya?
Which of the following shows the correct pairing of alloy and its main element?

	Aloi/ *Alloy*	Unsur utama/ *Main element*
A	Loyang/ *Brass*	Zn
B	Keluli nirkarat/ *Stainless steel*	Cr
C	Duralumin	Mg
D	Piuter/ *Pewter*	Sn

[Pahang JUJ Set 1 2023-08] Keluli ialah campuran antara ferum dan Q. Apakah Q?
Steel is a mixture of iron and Q. What is Q?

A Zink
Zinc

B Karbon
Carbon

C Stanum
Tin

D Kuprum
Copper

[Pahang JUJ Set 1 2023-26] Rajah 11 menunjukkan kegunaan dua bahan yang berbeza, X dan Y.
Diagram 11 shows uses of the two different material, X and Y.

	
X	Y

Apakah unsur utama yang terdapat dalam bahan X dan Y?
What is the main element in material X and Y?

A Zink
Zinc

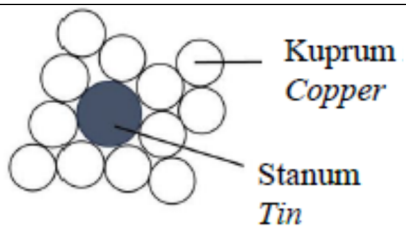
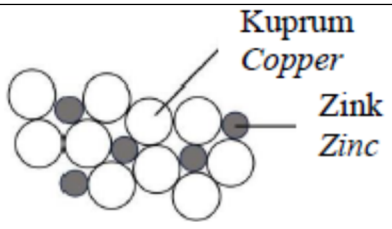
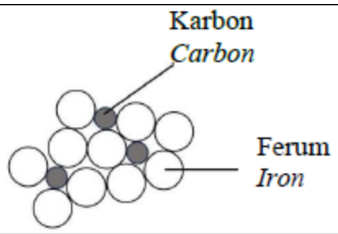
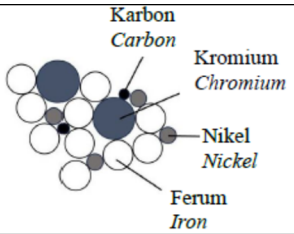
C Stanum
Tin

B Ferum
Iron

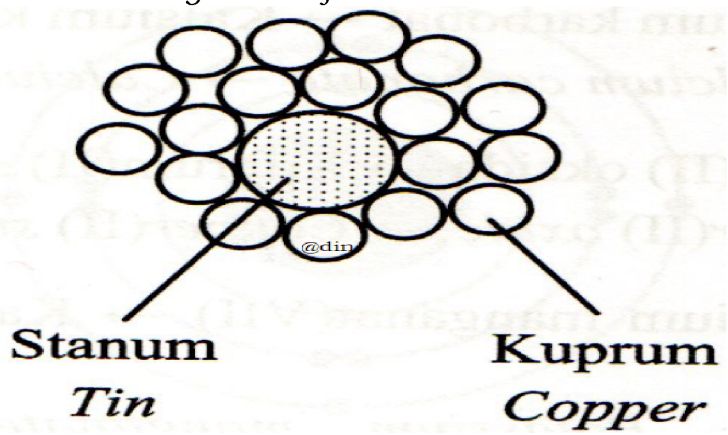
D Kuprum
Copper

[MRSM2023-15] Rajah 7 menunjukkan sebuah jambatan keluli.
Diagram 7 shows a steel bridge.

Yang manakah antara berikut merupakan susunan atom bagi keluli?
Which of the following, is the arrangement of the atoms in steel?

A		C	
B		D	

[Selangor2023 Set 1-11] Rajah 3 menunjukkan susunan atom dalam gangsa
Diagram 3 shows the arrangement of atoms in bronze



Apakah fungsi atom stanum?
What is the function of tin atom?

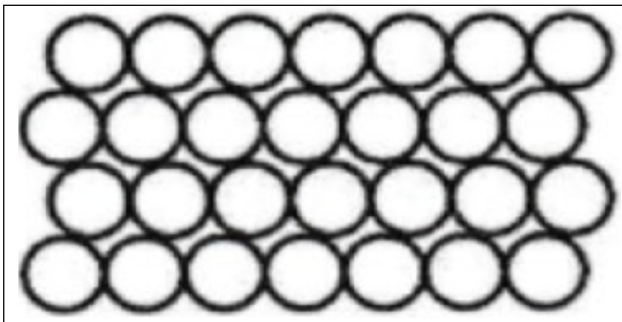
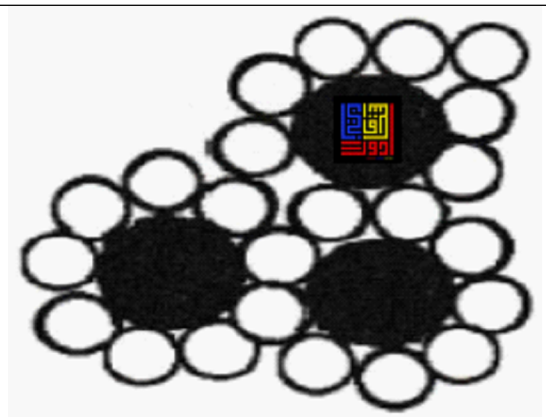
A Untuk menambahkan ruang antara atom-atom kuprum
To increase space between copper atoms

B Untuk mencegah kuprum mengalami pengoksidaan
To prevent copper undergoes oxidation

C Untuk menguatkan ikatan antara atom-atom kuprum
To strengthen the bond between copper atoms

D Untuk mengurangkan lapisan atom-atom kuprum daripada menggelongsor dengan mudah
To reduce the layer of copper atoms from sliding easily

[Pahang JUJ Set 2 2023-08] Antara sifat berikut, yang manakah menunjukkan bahawa bahan Y adalah lebih baik daripada bahan X?
Which of the following properties show that substance Y is better than substance X?

	
Bahan X/ *Substance X*	Bahan Y/ *Substance Y*

I Lebih kuat
Stronger

II Lebih keras
Harder

III Lebih mulur
More ductile

IV Tidak mudah terkakis
Not easily corrode

A I , II dan III
I , II and III

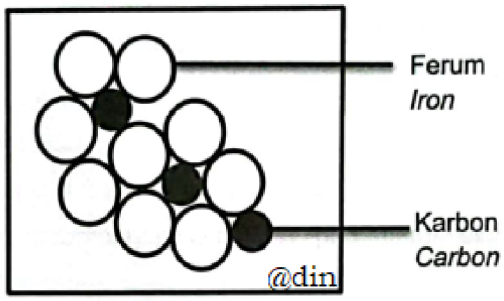
B I , II dan IV
I , II and IV

C I , III dan IV
I , III and IV

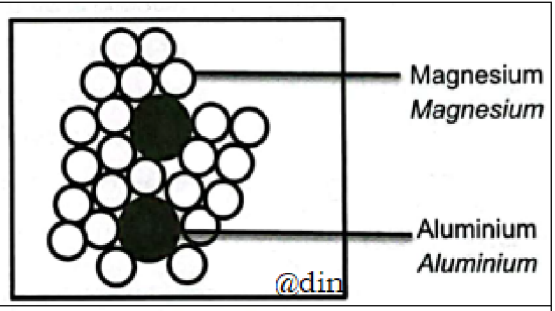
D I , II, III dan IV
I , II, III and IV

[Kedah2023-17] Encik Amir mendapati struktur kerangka pagarnya mudah berkarat kerana rumahnya berdekatan dengan kawasan pantai. Suatu struktur yang kuat yang boleh menahan kakisan diperlukan untuk membina kerangka yang baharu. Kombinasi bahan manakah yang perlu Encik Amir pilih untuk menghasilkan kerangka tersebut?
Mr. Amir found that the structure of the fence frame is easy to rust because his house is near to the beach area. A strong structure which can withstand corrosion is needed to construct a new frame. Which combination of substance is the most suitable for Mr. Amir to produce the frame?

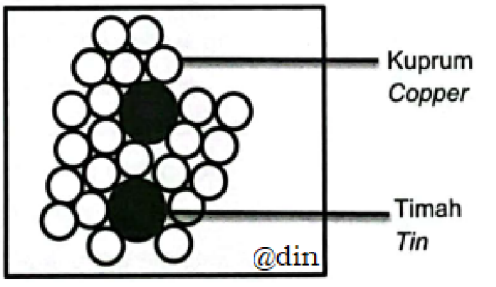
A



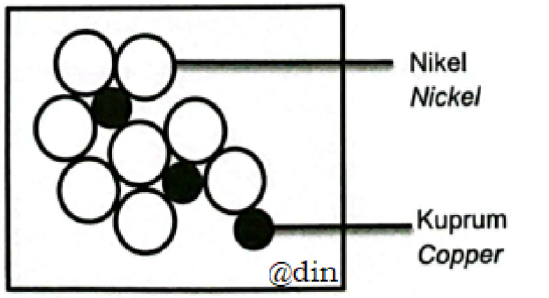
B



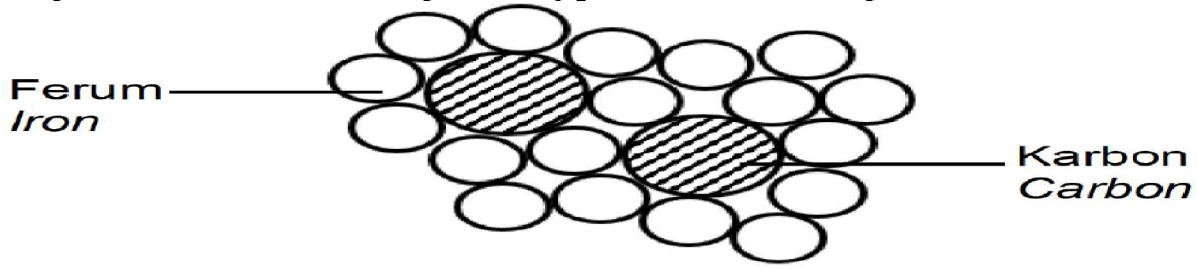
C



D



[Kelantan 2023-05] Rajah 1 menunjukkan susunan zarah dalam suatu aloi.
Diagram 1 shows the arrangement of particles in an alloy.



Apakah aloi yang ditunjukkan dalam Rajah 1
What is the alloy shown in Diagram 1

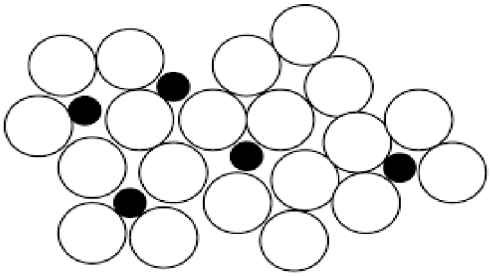
A. Keluli
Steel

C. Duralumin
Duralumin

B. Loyang
Brass

D. Keluli nirkarat
Stainless steel

[Perlis 2023-19]



Rajah 4 menunjukkan suatu komposisi aloi. Manakah antara berikut mewakili struktur tersebut?
Diagram 4 shows the composition of an alloy. Which of the following represents the alloy?

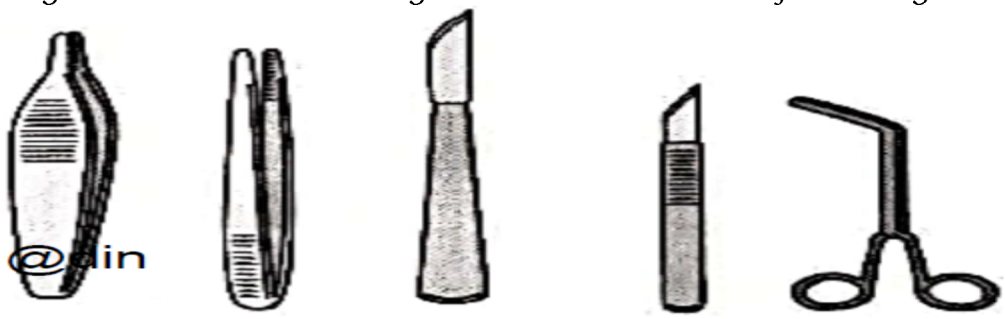
A Keluli nirkarat
Stainless steel

C Piuter
Pewter

B Duralumin
Duralumin

D Keluli
Steel

[Johor Bahru 2023-25] Rajah 6 menunjukkan beberapa peralatan pembedahan yang diperbuat daripada aloi X.
Diagram 6 shows some surgical instruments made from alloy X.



Apakah aloi X? / *What is alloy X?*

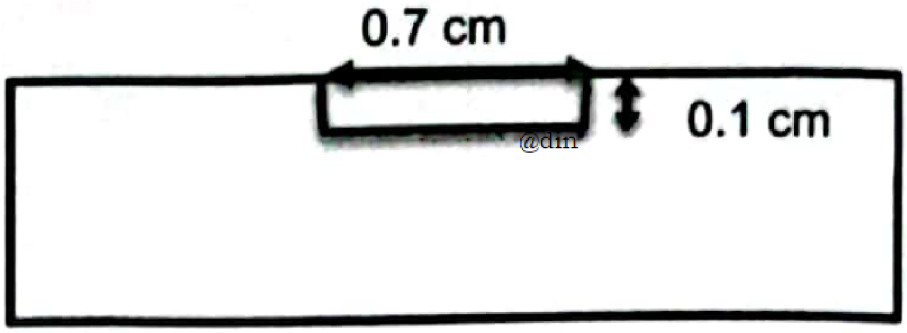
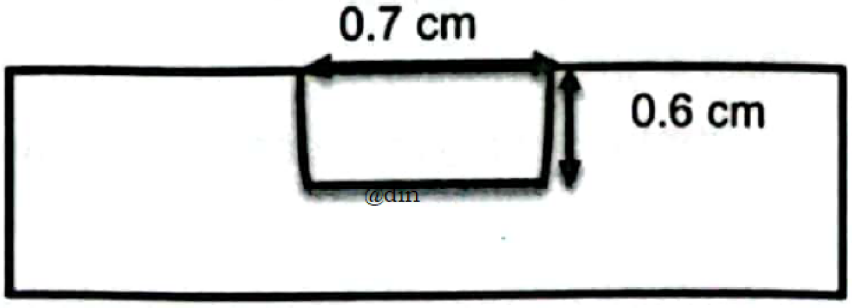
A Keluli nirkarat
Stainless steel

C Keluli
Steel

B Gangsa
Bronze

D Piuter
Pewter

[Kedah2023-22] Jadual di bawah menunjukkan kedalaman lekuk selepas pemberat 1 kg dijatuhkan ke atas permukaan gangsa dan logam tulennya.
Table below shows the depth of dent after a 1 kg weight t is dropped on the surface of bronze and its pure metal.

Bahan *Material*	Kedalaman lekuk (cm) *Depth of dent (cm)*
Gangsa *Bronze*	
X	

Apakah X?/ *What is X?*

A Keluli
Steel

C Loyang
Brass

B Kuprum
Copper

D Piuter
Pewter

8.2 Komposisi Kaca dan Kegunaannya

[Perlis 2023-02] Apakah bahan utama dalam kaca?
What is the main substance in glass?

A Silikon dioksida
Silicon dioxide

C Ferum oksida
Iron oxide

B Sulfur dioksida
Sulphur dioxide

D Boron oksida
Boron oxide

[SBP2023-10] Apakah sebahagian daripada komponen-komponen dalam kaca borosilikat selain daripada silikon dioksida?
What are part of the components in borosilicate glass besides silicon dioxide?

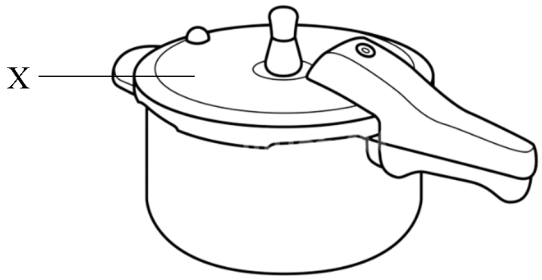
A Aluminium oksida dan natrium karbonat
Aluminium oxide and sodium carbonate

B Boron oksida dan kuprum(I) klorida
Boron oxide and copper(I) chloride

C Kalsium oksida dan argentum klorida
Calcium oxide and silver chloride

D Plumbum(II) oksida dan kalsium karbonat
Lead(II) oxide and calcium carbonate

[Putrajaya2023-10] Rajah 2 menunjukkan sebuah periuk tekanan
Diagram 2 shows a pressure cooker.



Antara yang berikut, kaca manakah yang digunakan pada bahagian X?
Which of the following glass is used in part X?

A Kaca borosilikat
Borosilicate glass

B Kaca plumbum
Lead kristal glass

C Kaca soda kapur
Soda lime glass

D Kaca silika terlakur
Fused silica glass

[Perlis 2023-08] Berikut merupakan sifat-sifat satu bahan buatan dalam industri.
The following are the properties of a manufactured substance.

- Keras tetapi rapuh/ *Hard but brittle*
- Lutsinar/ *Transparent*
- Lengai terhadap bahan kimia/ *Inert towards chemicals*
- Sensitif terhadap keamatan Cahaya/ *Sensitive towards light intensity*

Bahan yang manakah mempunyai sifat-sifat seperti di atas?
Which substance has the above properties?

A Peralatan dapur
Kitchen utensils

C Kaca mata
Spectacles

B Kereta lumba
Racing car

D Prisma
Prism

[Pahang 2023-14] Silika digunakan untuk membuat semua jenis kaca. Jenis kaca manakah yang diperbuat daripada silika sahaja?
Silica is used to make all types of glass. Which type of glass is made up of only silica?

A Kaca plumbum
Lead crystal glass

C Kaca soda kapur
Soda-lime glass

B Kaca borosilikat
Borosilicate glass

D Kaca silika terlakur
Fused silica glass

[Johor PPD Tangkak 2023 17] Rajah 7 menunjukkan perbualan antara Isabelle dengan gurunya.
Diagram 7 shows the conversation between Isabelle and her teacher.

Apakah jenis kaca bagi bikar itu?
What type of glass is the beaker?

A Kaca plumbum
Lead crystal glass

C Kaca soda kapur
Soda lime glass

B Kaca borosilikat
Borosilicate glass

D Kaca silika terlakur
Fused silica glass

[Johor Skudai2023-30] Bagi menghasilkan kaca yang lebih tahan terhadap haba dan bahan kimia, bahan X ditambah ke dalam kaca soda kapur dalam proses pembuatannya. Apakah X?
In order to produce a glass that is more resistant to heat and chemicals, substance X is added to soda lime glass in the manufacturing process. What is X?

A Boron oksida
Boron oxide

C Kalsium karbonat
Calcium carbonate

B Natrium karbonat
Sodium carbonate

D Plumbum(II) oksida
Lead(II) oxide

[Johor PPD Tangkak 2023 30] Jadual 4 menunjukkan maklumat tentang dua jenis kaca R dan S.
Table 4 shows information about two types of glasses R and S.

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

Nyatakan dua persamaan sifat bagi kaca R dan kaca S.
State two similarities of the properties of glass R and glass S.

I Penebat haba
Heat insulator

III Keras tetapi rapuh
Hard but fragile

II Lutsinar
Transparent

IV Pekali pengembangan rendah
Low expansion coefficient

A I dan II
I and II

C II dan III
II and III

B III dan IV
III and IV

D I dan IV
I and IV

[Pahang JUJ Set 1 2023-14] Rajah 2 menunjukkan alat untuk melihat bintang.
Diagram 2 shows instrument for stargazing.

Antara jenis kaca berikut, yang manakah sesuai digunakan di dalam alat tersebut?
Which of the following types of glass is suitable to use in the instrument?

A Kaca plumbum
Lead crystal glass

C Kaca silika terlakur
Fused silica glass

B Kaca borosilikat
Borosilicate glass

D Kaca soda kapur
Soda-lime glass

[Kelantan 2023-22] Kaca soda kapur ditambahkan dengan bahan X dalam pembuatannya supaya menjadi kaca yang lebih tahan haba yang tinggi dan lengai secara kimia. Apakah bahan X?
Soda-lime glass is added with substance X in its manufacture so that it becomes a glass that is more resistant to high heat and is chemically inert. What is substance X?

A. Kalsium karbonat
Calcium carbonate

C. Boron oksida
Boron oxide

B. Natrium karbonat
Sodium carbonate

D. Plumbum (II) oksida
Lead (II) oxide

8.3 Komposisi Seramik dan Kegunaannya

[Putrajaya2023-25] Cakera brek pada kereta diperbuat daripada seramik. Antara yang berikut, pernyataan yang manakah menerangkan mengapa seramik sesuai digunakan?
Brake discs on cars are made of ceramic. Which of the following statements explains why ceramics are suitable to use?

A Pekali pengembangan haba bagi seramik adalah rendah
Thermal expansion coefficient of ceramics is low

B Seramik mempunyai kekuatan regangan yang tinggi
Ceramics has a high stretching strength

C Elektron di dalam seramik tidak boleh bergerak bebas
Electrons in ceramics cannot move freely

D Atom-atom dalam seramik diikat oleh ikatan kovalen dan ikatan ion yang kuat
The atoms in ceramics are bonded by strong covalent bonds and ionic bonds.

[MRSM2023-07] Seramik termaju diperbuat daripada sebatian tak organik seperti oksida, karbida dan nitrida. Antara bahan berikut yang manakah diperbuat daripada seramik termaju?
Advanced ceramics are made from inorganic compounds such as oxides, carbides and nitrides. Which of the following is made from advanced ceramics?

A		B	
C		D	

[Terengganu2023-11] Maklumat berikut merupakan kegunaan bahan S.
The following information is about the uses of substance S.

- Cakera pemotong/ *Cutting disc*
- Cakera brek/ *Brake disc*
- Cincin karbida tungsten/ *Tungsten carbide ring*

Apakah bahan S?/ *What is substance S?*

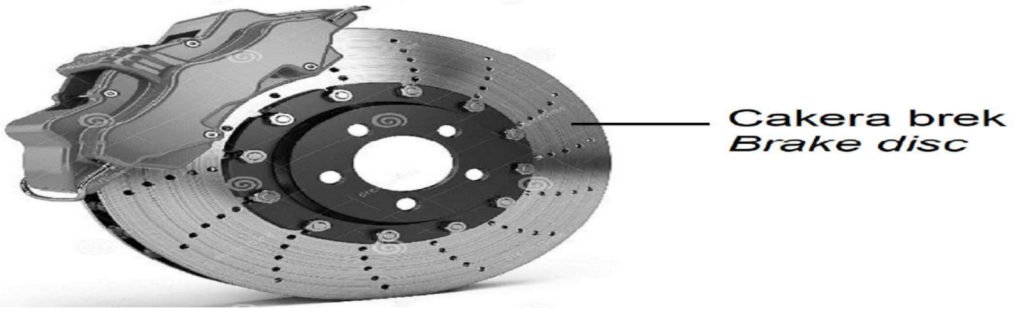
A Superkonduktor
Superconductor

B Seramik termaju
Advanced ceramics

C Seramik tradisional
Traditional ceramics

D Konkrit diperkukuhkan
Reinforced concrete

[Kelantan 2023-27] Rajah 11 menunjukkan cakera brek yang diperbuat daripada seramik termaju.
Diagram 11 shows brake disc made from advanced ceramic.
Cakera brek Brake disc



Antara berikut, sifat yang manakah paling sesuai dengan kegunaan cakera brek tersebut.
Which of the the following property is most suitable for the use of the brake disc.

A. Mudah pecah
Fragile

B. Penebat elektrik
Electrical insulator

C. Lengai secara kimia
Chemically inert

D. Tahan kejutan terma
Withstand thermal shock

[Johor Bahru 2023-12] Antara yang berikut, bahan manakah yang digunakan dalam implan gigi?
Which of the following substances is used in tooth implant?

A Seramik alumina
Alumina ceramic

B Silikon karbida
Silicon carbide

C Seramik zirkonia
Zirconia ceramic

D Silikon nitrida
Silicon nitride

8.4 Bahan Komposit dan Kepentingannya

[SBP2023-24] Bahan komposit terdiri daripada bahan matriks dan bahan pengukuhan. Bahan komposit X digunakan dalam pembinaan jambatan dan empangan. Antara yang berikut, yang manakah sifat bahan matriks bagi X?
Composite materials are made up of matrix and strengthening substances. Composite material X is used in the construction oj bridges and dams. Which of the following are the properties of the matrix substance of X?

A Kekuatan mampatan tinggi dan tahan kakisan
High compression strength and resistant to corrosion

B Kekuatan regangan tinggi dan fleksibel
High stretching strength and flexible

C Kekuatan regangan rendah dan fleksibel
Low stretching strength and flexible

D Kekuatan mampatan rendah dan tahan kakisan
Low compression strength and resistant to corrosion

[Melaka 2023-34] Sekumpulan pekerja pembinaan menggunakan konkrit untuk membina sebuah bangunan. Mereka dapati dinding bangunan itu mudah pecah apabila dikenakan daya regangan yang tinggi. Antara berikut, kaedah manakah yang sesuai digunakan untuk meningkatkan kebolehan konkrit menahan daya itu?
A group of construction workers use concrete to build a building. They found that the wall of the building easily broken when exert high tensile forces. Which of the following is the suitable method to increase the ability of the concrete to withstand the force?

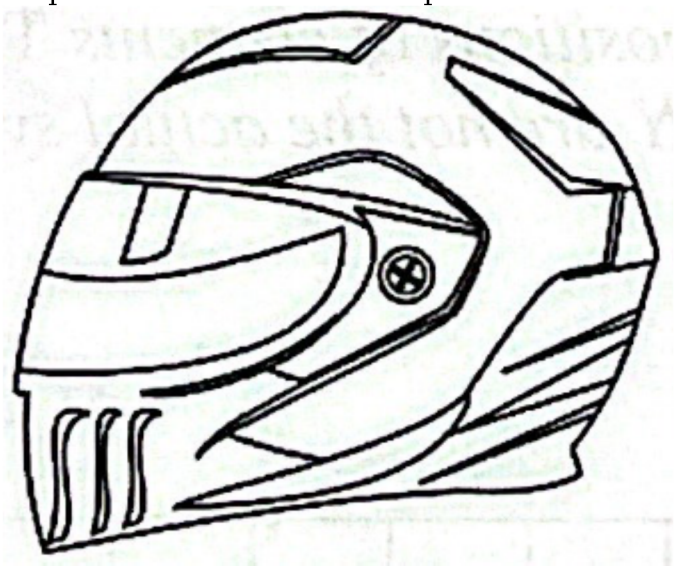
A Tambahkan keluli nirkarat ke dalam konkrit
Add stainless steel to the concrete

B Tambahkan kaolin ke dalam konkrit
Add kaolin to the concrete

C Benamkan tetulang keluli ke dalam konkrit
Immersed steel bars into the concrete

D Benamkan silikon dioksida ke dalam konkrit
Immersed silicone dioxide into the concrete

[Negeri Sembilan 2023-27] Rajah 8 menunjukkan satu produk yang diperbuat daripada bahan komposit.
Diagram 8 shows a product made from composite substances.



Rajah 8/ Diagram 8

Antara yang berikut, sifat manakah yang betul bagi bahan pengukuhan yang digunakan?
Which of the following properties are correct about the strengthening substances used?

I Kekuatan regangan tinggi
High stretching strength

II Kekuatan mampatan rendah
High compression strength

III Keras
Hard

IV Kekonduksian haba rendah
Low heat conductivity

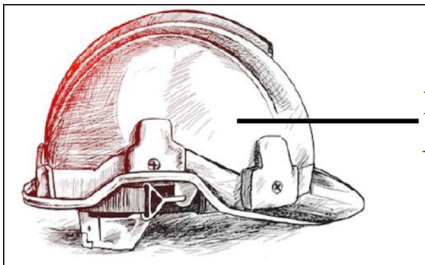
A I dan II
I and II

B II dan III
II and III

C III dan IV
III and IV

D I dan IV
I and IV

[Pahang 2023-26] Rajah 7 menunjukkan topi keledar keselamatan. Ianya diperbuat daripada bahan Y.
Diagram 7 shows a safety helmet. It is made of material Y.

 Bahan Y *Material Y*	Bahan Y mempunyai ciri-ciri berikut: *Material Y has the following properties:* Kekuatan regangan yang tinggi *High stretching strength*

	Penebat haba dan elektrik *Heat and electrical insulator* Tahan kakisan *Resistant to corrosion* Tahan lasak/ *Durable*

Antara yang berikut, yang manakah bahan Y?
Which of the following is material Y?

A Gentian optik
Optical fibre

B Kaca gentian
Fibre glass

C Superkonduktur
Superconductor

D Kaca fotokromik
Photochromic glass

[Selangor2023 Set 1-17] Apakah bahan yang ditambahkan kepada kaca untuk menghasilkan kaca fotokromik?
What substance is added to glass to produce photochromic glass'?

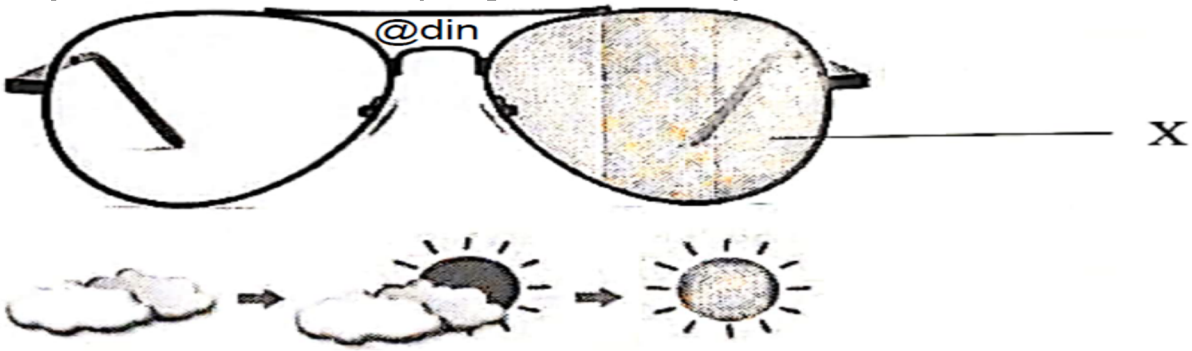
A Argentum klorida
Silver chloride

B Aluminium klorida
Aluminium chloride

C Natrium bromida
Sodium bromide

D Kalsium bromida
Calcium bromide

[Johor Bahru 2023-17] Rajah 1 menunjukkan kanta cermin mata yang diperbuat daripada bahan X.
Diagram 1 shows the lens of a spectacle made of substance X.



Apakah X?/ *What is X?*

A Kaca plumbum
Lead crystal glass

B Kaca borosilikat
Borosilicate glass

C Kaca fotokromik
Photochromic glass

D Kaca silikat terlakur
Fused silica glass

[Putrajaya2023-09] 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(I) chloride

II Ferum(II) klorida
Iron(II) chloride

III Argentum klorida
Silver chloride

III 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

[Kedah2023-35] Lily berasa silau dengan cahaya matahari ketika dia sedang mengulang kaji pelajaran seperti yang ditunjukkan dalam rajah di bawah.
Lily was dazzled by the sunlight while doing her revision as shown in diagram below.

Dia hendak menukar kaca tingkapnya untuk menyelesaikan masalah tersebut. Kaca tingkap yang baharu perlu mengandungi bahan T. Apakah bahan T?
She wanted to change the window glass to solve the problem The new window glass should contained substance T. What is substance T?

A Boron oksida
Boron oxide

C Kalsium karbonat
Calcium carbonate

B Argentum klorida
Silver chloride

D Plumbum(II) oksida
Lead(II) oxide

[Pahang JUJ Set 2 2023-14] Tingkap rumah Andrew diperbuat daripada kaca fotokromik. Tingkap tersebut boleh melindungi penghuni daripada sinar ultraungu (UV) yang berbahaya. Antara berikut, yang manakah bahan kimia yang digunakan dalam kaca itu?
The windows of Andrew's house are made of photochromic glass. The windows can protect resident from harmful ultraviolet (UV) rays. Which of the following is the chemical used in the glass?

A Boron oksida
Boron oxide

C Plumbum(II) oksida
Lead(II) oxide

B Argentum klorida
Silver chloride

D Plumbum(II) klorida
Lead(II) chloride

[Kedah2023-05] Antara yang berikut, yang manakah bahan komposit?
Which of the following is a composite material?

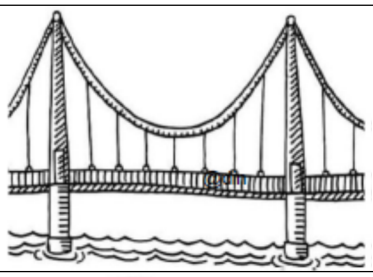
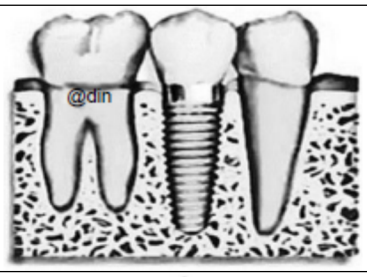
A Kaca fotokromik
Photochromic glass

C Kaca borosilikat
Borosilicate glass

B Kaca plumbum
Lead crystal glass

D Kaca soda kapur
Soda lime glass

[Melaka 2023-11] Antara berikut yang manakah aplikasi seramik termaju?
Which of the following is the application of advanced ceramics?

A		B	
C		D	

[Terengganu2023-12] Bahan T mempunyai sifat seperti berikut:
Substance T has the following properties:

• Kekuatan regangan tinggi/ *High stretching strength*
• Penebat haba dan elektrik/ *Heat and electrical insulator*
• Tahan kakisan/ *Resistant to corrosion*
• Tahan lasak/ *Durable*

Nyatakan kegunaan T?/ *What is the use of T?*

A Topi keledar
Helmet

B Kamera video
Video camera

C Kanta kamera
Camera lens

D Perkabelan rangkaian komputer
Cables in computer network

[Pahang JUJ Set 2 2023-26] Rajah 7 menunjukkan penggunaan mesin pengimejan resonans magnet (MRI) dalam bidang perubatan.
Diagram 7 shows the uses of magnetic resonance imaging (MRI) in medical field.

Bahan X digunakan dalam pembuatan mesin pengimejan resonans magnet (MRI). Apakah sifat istimewa bahan X?
Substance X is used in the manufacturing of magnetic resonance imaging (MRI). What is the special property of substance X?

A Kekuatan mampatan tinggi/ *High compression strength*

B Penebat haba dan elektrik/ *Heat and electrical insulator*

C Penyerapan sinaran UV bergantung pada keamatan cahaya
The absorption of UV rays depends on light intensity

D Mengkonduksikan elektrik tanpa rintangan pada suhu yang sangat rendah.
Conducts electricity with no resistance at low temperature