



Soalan Objektif

1. Faktor yang manakah **tidak** mempengaruhi kadar tindak balas?

SPM 2018

Which factor **do not** affect rate of reaction?

- A Saiz bahan tindak balas bentuk pepejal
Size of solid reactant
- B Suhu bahan tindak balas
Temperature of reactants
- C Kepekatan bahan tindak balas
Concentration of reactants
- D Isi padu bahan tindak balas
Volume of reactants

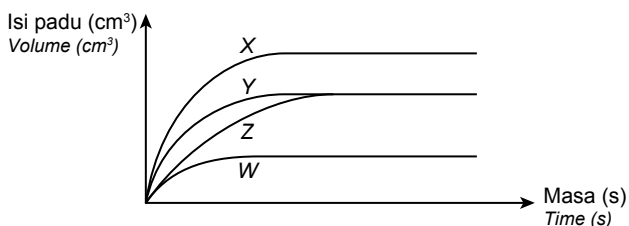
2. Tindak balas manakah yang mempunyai kadar tindak balas paling tinggi?

Which reaction has the highest rate of reaction?

- A Pengaratan paip besi
Rusting of iron pipe
- B Pembakaran arang bersaiz kecil
Burning of small size charcoal
- C Fotosintesis dalam tumbuhan
Photosynthesis in plants

3. Zink yang berlebihan dicampurkan kepada 25 cm³ asid hidroklorik 0.2 mol dm⁻³ pada suhu bilik. Eksperimen ini diulangi dengan menggunakan asid hidroklorik pada isi padu dan kepekatan yang sama tetapi dipanaskan kepada suhu yang lebih tinggi.

Excess zinc is added to 25 cm³ of 0.2 mol dm⁻³ hydrochloric acid at room temperature. The experiment is repeated using hydrochloric acid of the same volume and concentration but heated to a higher temperature.



Antara berikut, yang manakah menunjukkan isi padu gas yang terkumpul pada sela masa tertentu untuk kedua-dua eksperimen ini?

Which of the following graphs show the volume of gas collected at regular interval time for the two experiments?

- A Z, Y
- B Z, X
- C W, Y
- D W, X

4. Jadual menunjukkan isi padu gas yang dikumpulkan apabila kalsium karbonat bertindak balas dengan asid hidroklorik.

KBAT Menganalisis

Table shows the volume of gas collected when calcium carbonate reacts with hydrochloric acid.

Masa (min) Time	0	0.5	1.0	1.5	2.0	2.5	3.0
Isi padu CO ₂ Volume of CO ₂ (cm ³)	0	90	150	180	200	210	210

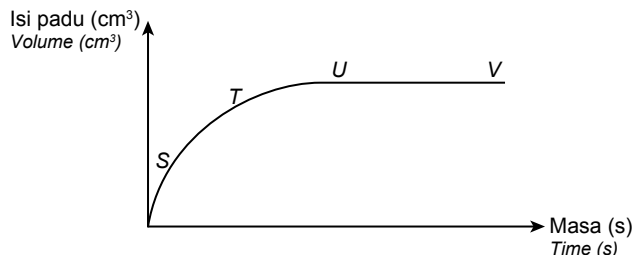
Kirakan kadar tindak balas purata.

Calculate the average rate of reaction.

- A 70 cm³ min⁻¹
- B 84 cm³ min⁻¹
- C 100 cm³ min⁻¹
- D 150 cm³ min⁻¹

5. Rajah menunjukkan satu graf isi padu gas oksigen melawan masa dalam penguraian hidrogen peroksida.

Diagram shows a graph of volume of oxygen gas against time in the decomposition of hydrogen peroxide.



Titik manakah yang menunjukkan kadar tindak balas paling tinggi?

Which point shows the highest rate of reaction?

- A S
- B T
- C U
- D V

6. Dalam tindak balas asid hidroklorik dengan zink, faktor yang manakah tidak mempengaruhi kadar tindak balas?

In the reaction hydrochloric acid and zinc, which of the factors does not affect rate of reaction?

- A Kepekatan asid hidroklorik
Concentration of hydrochloric acid
- B Suhu asid hidroklorik
Temperature hydrochloric acid
- C Tekanan tindak balas
Pressure of reaction
- D Kehadiran mangkin kuprum(II) sulfat
Presence of the catalyst copper(II) sulphate

7. Berdasarkan teori perlanggaran, pernyataan manakah **benar** tentang kesan saiz bahan tindak balas yang kecil?

*Based on the collision theory, which statement is **correct** about the effect of small size reactant?*

- A Kepekatan zarah bahan tindak balas lebih tinggi
Concentration of particles of reactant is higher
- B Jumlah luas permukaan bahan tindak balas lebih besar
Total surface area of reactant is bigger
- C Tenaga pengaktifan bahan tindak balas lebih rendah
Activation energy of reactant is lower
- D Tenaga kinetik bahan tindak balas lebih tinggi
Kinetic energy of the reactant is higher

8. Kadar tindak balas meningkat apabila sedikit larutan kuprum(II) sulfat ditambah kepada campuran serbuk magnesium dan asid nitrik cair. Pernyataan manakah menerangkan mengapa kadar tindak balas meningkat?

The rate of reaction increases when a little copper(II) sulphate solution is added to a mixture of magnesium powder and dilute nitric acid. Which statement explains why the rate of reaction increase?

- A Jumlah luas permukaan zarah-zarah bahan tindak balas bertambah
The total surface area of the reactant particles increases
- B Tenaga kinetik zarah-zarah bahan tindak balas bertambah
The kinetic energy of the reactant particles increases

- C Tenaga pengaktifan dikurangkan
The activation energy is lowered
- D Jumlah bilangan zarah-zarah bahan tindak balas per unit isi padu bertambah
The total number of reactant particles per unit volume increases

9. Penguraian hidrogen peroksida menghasilkan gas oksigen. Apakah kesan kepada penguraian hidrogen peroksida jika dipanaskan pada suhu yang lebih tinggi? **KBAT** Menganalisis

Decomposition of hydrogen peroxide produce oxygen gas to hydrogen peroxide. What is the effect to the decomposition of hydrogen peroxide if it is heated to a higher temperature?

- A Jumlah isi padu oksigen mengurang.
Total volume of oxygen decreases.
- B Lebih banyak haba terbebas.
More heat is released.
- C Kadar awal penguraian hidrogen peroksida meningkat.
Initial rate of decomposition of hydrogen peroxide increases.
- D Kepekatan hidrogen peroksida meningkat.
Concentration of hydrogen peroxide increases.

10. Antara tindak balas berikut, yang manakah kadar tindak balasnya boleh ditentukan dengan mengukur perubahan isi padu gas?

Which of the following reactions, its rate of reaction can be determined by measuring change in gas volume?

- A $\text{Cu} + \text{HCl}$
- B $\text{CuO} + \text{HCl}$
- C $\text{NaOH} + \text{HCl}$
- D $\text{CaCO}_3 + \text{HCl}$

Soalan Struktur

Bahagian A

1. Jadual menunjukkan maklumat bagi dua set eksperimen.

Table shows information for two sets of experiments.

Set	Bahan Material	Isi padu gas terkumpul dalam 2 minit (cm ³) Volume of gas collected after 2 minutes (cm ³)
I	50 cm ³ 1.0 mol dm ⁻³ asid sulfurik + zink <i>50 cm³ 1.0 mol dm⁻³ sulphuric acid + zinc</i>	40.00
II	50 cm ³ 1.0 mol dm ⁻³ asid sulfurik + zink + mangkin Y <i>50 cm³ 1.0 mol dm⁻³ sulphuric acid + zinc + catalyst Y</i>	60.00

Berdasarkan jadual,

Based on table,

(a) Apakah yang dimaksudkan dengan mangkin?

What is the meaning of catalyst?

[1 markah / mark]

- (b) Nyatakan nama bagi mangkin Y yang boleh digunakan dalam Set II.
State the name of catalyst Y that can be used in Set II.

[1 markah / mark]

- (c) (i) Hitung kadar tindak balas purata dalam
Calculate the average rate of reaction in

Set I :

Set II:

[2 markah / marks]

- (ii) Bandingkan kadar tindak balas antara Set I dan Set II.
Compare the rate of reaction between Set I and Set II.

[1 markah / mark]

- (iii) Terangkan jawapan anda di 1(c)(ii) berdasarkan teori perlanggaran.
Explain your answer in 1(c)(ii) based on collision theory.

[2 markah / marks]

- (d) (i) Tuliskan persamaan kimia bagi Set I.
Write the chemical equation for Set I.

[1 markah / mark]

- (ii) Lakarkan rajah profil tenaga bagi Set I.
Draw the energy profile diagram for Set I.

[3 markah / marks]

Bahagian B

2. (a) Susu yang disimpan di dalam peti sejuk tahan lebih lama daripada susu yang dibiarkan di luar. Terangkan mengapa.
Milk kept in the refrigerator last longer compared to milk left outside. Explain why.

[4 markah/ marks]

- (b) Jadual menunjukkan maklumat tentang tiga eksperimen, I, II, dan III yang dijalankan untuk menyiasat faktor-faktor yang mempengaruhi kadar tindak balas.

Table shows the information of three experiments, I, II and III which are carried out to investigate the factors affecting the rate of reaction.

Set	Bahan tindak balas Reactants		Masa untuk selesai tindak balas (s) Time to complete the reaction
I	5 g serbuk CaCO ₃ 5 g CaCO ₃ powder	50 cm ³ 1.0 mol dm ⁻³ HCl	33
II	5 g ketulan CaCO ₃ 5 g CaCO ₃ chip	50 cm ³ 1.0 mol dm ⁻³ HCl	45
III	5 g serbuk CaCO ₃ 5 g CaCO ₃ powder	25 cm ³ 2.0 mol dm ⁻³ HCl	25

- (i) Tuliskan persamaan kimia bagi tindak balas antara kalsium karbonat dan asid hidroklorik.

Hitung isi padu maksimum gas karbon dioksida yang terbebas dalam Eksperimen I.

Write the chemical equation for the reaction between calcium carbonate and hydrochloric acid.

Calculate the maximum volume of carbon dioxide gas produced in Experiment I.

[Isi padu molar gas pada keadaan bilik ialah 24 dm³ mol⁻¹]

[Molar volume of gas at room conditions is 24 dm³ mol⁻¹]

[5 markah/ marks]

- (ii) Lakarkan graf bagi isi padu gas melawan masa bagi eksperimen I, II dan III atas paksi yang sama.

Sketch the graphs for the volume of gas against time for experiment I, II and III on the same axis.

[4 markah/ marks]

- (iii) Berdasarkan jadual di atas:

Based on table above:

- Susun kadar tindak balas bagi Eksperimen I, II, dan III dalam tertib menurun.

Arrange the rate of reaction for Experiment I, II and III in descending order.

- Nyatakan dan terangkan faktor bagi perbezaan kadar tindak balas antara Eksperimen I dan III dengan merujuk kepada teori perlanggaran.

State and explain the factor for the difference of rate of reaction between Experiments I and III by referring to the collision theory.

- Kirakan kadar tindak balas purata bagi Eksperimen II.

Calculate the average rate of reaction for Experiment II.

[7 markah/ marks]

Bahagian C

3. (a) Rajah menunjukkan roket soda yang disediakan oleh Adam menggunakan bahan isi rumah untuk projek sainsnya.

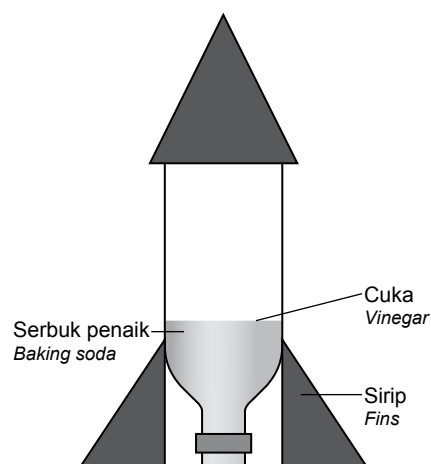
Demonstrasi ini mengaplikasikan tindak balas antara cuka dan serbuk penaik bagi pelancaran roket.

Diagram shows a soda rocket prepared by Adam using household materials for his science project. This demonstration apply reaction between vinegar and baking soda to launch the rocket.

Cadangkan satu bahan yang boleh digunakan oleh Adi untuk menggantikan cuka supaya dia dapat memastikan roket terbang lebih tinggi. Terangkan jawapan anda.

Suggest one substance which Adi can use to replace vinegar so that he can ensure the rocket fly higher.

[4 markah /marks]



- (b) Jadual menunjukkan dua set eksperimen untuk mengkaji faktor yang mempengaruhi kadar tindak balas antara serbuk zink dan asid hidroklorik.

Table shows two sets of experiments to study the factor that affects the rate of reaction between zinc powder and hydrochloric acid.

Set	Bahan tindak balas <i>Reactants</i>	Masa untuk tindak balas lengkap (min) <i>Time taken for reaction to complete</i>
I	Zink + X mol dm ⁻³ asid hidroklorik <i>Zinc + X mol dm⁻³ hydrochloric acid</i>	5.0
II	Zink + Y mol dm ⁻³ asid hidroklorik <i>Zinc + Y mol dm⁻³ hydrochloric acid</i>	3.5

Berdasarkan jadual,

Based on table,

- Cadangkan kepekatan asid hidroklorik yang digunakan dalam Set I dan Set II.
Suggest the concentration of hydrochloric acid used in Set I and Set II.
- Terangkan mengapa terdapat perbezaan dalam kadar tindak balas dengan menggunakan teori perlanggaran.
Explain why there is a difference in the rate of reaction by using collision theory.

[6 markah/ marks]

- (c) Huraikan satu eksperimen untuk mengkaji bagaimana suhu mempengaruhi kadar tindak balas antara larutan natrium tiosulfat dan asid hidroklorik.

Describe an experiment to investigate how temperature affect the rate of reaction between sodium thiosulphate solution and hydrochloric acid.

Dalam huraian anda, sertakan:

In your description include:

Bahan dan Radas
Substance and Apparatus

Prosedur
Procedures

Satu pemerhatian
One observation

[10 markah/ marks]

