**9** (*a*) Jadual 4 menunjukkan bahan tindak balas bagi beberapa eksperimen untuk mengkaji faktor terhadap kadar tindak balas.
*Table 4 shows reactants for a few experiments to study factors on the rate of reaction.*

| **Set** | **Bahan tindak balas** ***Reactants*** | **Suhu / °C** ***Temperature / °C*** |
|---|---|---|
| I | 25 $cm^3$ asid hidroklorik 2.0 mol $dm^{-3}$ + ketulan marmar<br>25 $cm^3$ *of hydrochloric acid* 2.0 mol $dm^{-3}$ + *marble chips* | 30.0 |
| II | 25 $cm^3$ asid hidroklorik 5.0 mol $dm^{-3}$ + ketulan marmar<br>25 $cm^3$ *of hydrochloric acid* 2.0 mol $dm^{-3}$ + *marble chips* | 60.0 |
| III | 25 $cm^3$ asid hidroklorik 2.0 mol $dm^{-3}$ + serbuk marmar<br>25 $cm^3$ *of hydrochloric acid* 2.0 mol $dm^{-3}$ + *marble powder* | 30.0 |
| IV | 25 $cm^3$ asid hidroklorik 5.0 mol $dm^{-3}$ + ketulan marmar<br>25 $cm^3$ *of hydrochloric acid* 5.0 mol $dm^{-3}$ + *marble chips* | 30.0 |

Jadual 4
*Table 4*

Berdasarkan Jadual 4,
*Based on Table 4,*

(*i*) apakah perubahan yang dapat diperhatikan dan diukur untuk menentukan kadar tindak balas? Nyatakan faktor kadar tindak balas yang dikaji antara:
- Set I dan Set III
- Set II dan Set IV

[3 *markah*]

*what changes can be observed and measured to determine the rate of reaction? State the factor of rate of reaction studied between*:
- Set I *and* Set III
- Set II *and* Set IV.

[3 *marks*]

**RUANGAN JAWAPAN**

**9** (*a*)(*i*) Perubahan yang dapat diperhatikan dan diukur untuk menentukan kadar tindak balas
*Changes can be observed and measured to determine the rate of reaction*

.....

.....

Faktor kadar tindak balas yang dikaji antara:
*The factor of rate of reaction studied between*:

Set I dan Set III
Set I *and* Set III

.....

Set II dan Set IV
Set II *and* Set IV.

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

(*ii*) Jika serbuk marmar berlebihan digunakan bertindak balas dengan asid bagi Set II, gas yang tidak berwarna dihasilkan. Tuliskan persamaan kimia yang terlibat dan hitungkan isi padu gas yang terbebas. Namakan bahan yang digunakan di makmal untuk menguji kehadiran gas tersebut.
[1 mol gas menempati 24 $dm^3$ pada keadaan bilik]

[5 *markah*]

*If excess marble powder is used to react with the acid of* Set II, *a colourless gas is produced. Write the chemical equation involved and calculate the volume of the gas evolved. Name the materials used in the laboratory to test for the presence of the gas.*
[1 mole *of gas occupies* 24 $dm^3$ *at room conditions*]

[5 *marks*]

**RUANGAN JAWAPAN**

**9** (*ii*) Persamaan kimia yang terlibat antara serbuk marmar + asid hidroklorik
*Chemical equation that involved between marble powder + hydrochloric acid*
Pilih jawapan yang betul
*Choose the correct answer*.

$2CaCO_3 + 2HCl \longrightarrow 2CaCl + CO_2 + H_2O$ ☐

$CaCO_3 + HCl \longrightarrow CaCl_2 + CO_2 + H_2O$ ☐

$CaCO_3 + 2HCl \longrightarrow CaCl_2 + CO_2 + H_2O$ ☐

Isi padu gas yang terbebas
*Volume of gas evolved*

$\frac{2\ HCl}{\frac{25 \times 5.0}{1000}}$ : $CO_2$

0.125 mol

0.0625 mol
0.0625 x 24
1.5 $dm^3$ ☐

$\frac{HCl}{\frac{25 \times 5.0}{1000}}$ : $CO_2$

0.125 mol

0.125 mol
0.125 x 24
3.0 $dm^3$ ☐

Bahan untuk menguji gas yang terbebas :
*Substance that used to test the gas*: ☐

[5 *markah* / 5 *marks*]

**9**(*iii*) Lakarkan graf isi padu gas melawan masa bagi menunjukkan kadar tindak balas antara Set II dan Set IV.

[2 *markah*]

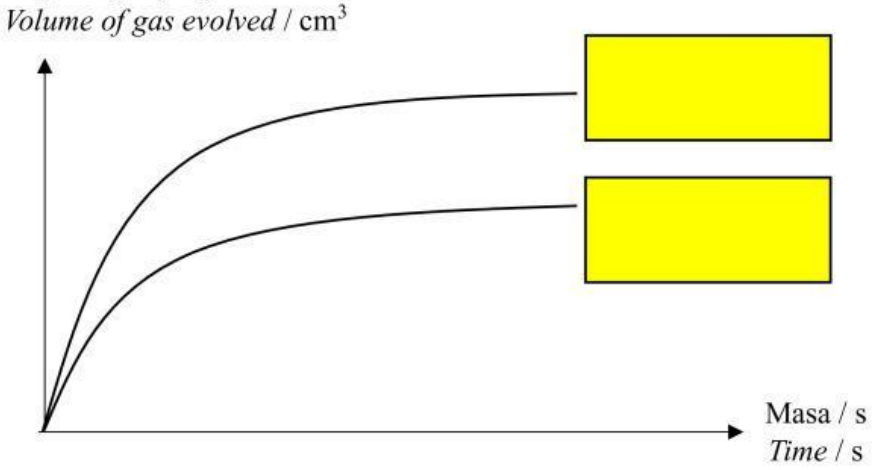
*Sketch a graph of volume of gas against time to show the rate of reaction between* Set II *and* Set IV.

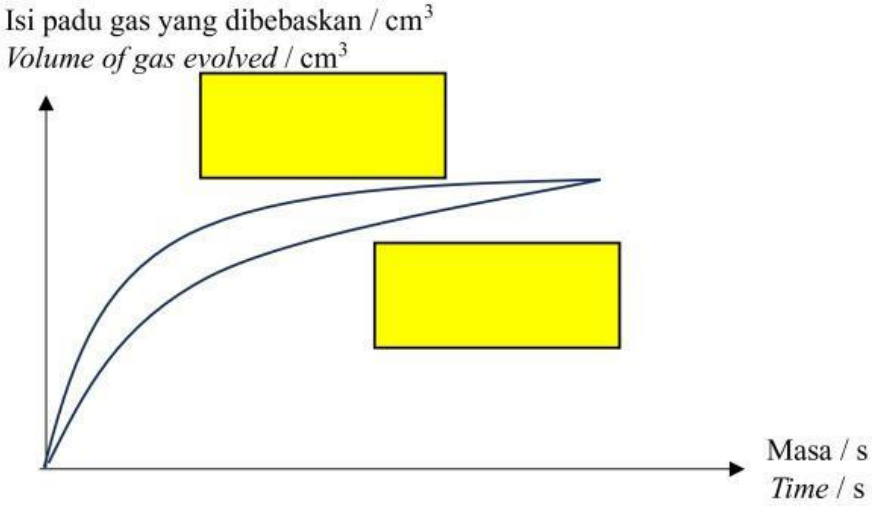
[2 *marks*]

Seret dan letak pada ruangan disediakan.
*Drag and place in the space provided.*

Set II

Set IV



(*iv*) Bandingkan kadar tindak balas antara Set I dan Set III dan terangkan jawapan anda berdasarkan Teori Perlanggaran.

[5 *markah*]

*Compare the rate of reaction between* Set I *and* Set III *and explain your answer based on Collision Theory.*

[5 *marks*]

**RUANGAN JAWAPAN**

**9**(*iv*) Perbandingan kadar tindak balas Set I dan Set III
*Comparison the rate of reaction between* Set I *and* Set III.

**P1**.....

Penerangan berdasarkan Teori Perlanggaran
*Explanation based on Collision Theory*

**P2**.....

**P3**.....

**P4**.....

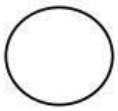
**P5**.....

(*b*) Persamaan berikut menunjukkan suatu tindak balas kimia.
*The following equation shows a chemical reaction*.

Karbon monoksida (g) + Nitrogen dioksida (g) → Karbon dioksida (g) + Nitrogen oksida (g)
*Carbon monoxide* (g) + *Nitrogen dioxide* (g) → *Carbon dioxide* (g) + *Nitrogen oxide* (g)

Bahan tindak balas perlu berlanggar pada orientasi yang betul untuk menghasilkan perlanggaran berkesan dan tindak balas berlaku.
*The reactants need to collide at the correct orientation for effective collisions to occur and for the reaction to occur*.

Rajah 4 menunjukkan penunjuk bagi atom tersebut.
*Diagram* 4 *shows the key for an atom.*

| Atom karbon<br>*Carbon atom* | Atom nitrogen<br>*Nitrogen atom* | Atom oksigen<br>*Oxygen atom* |
|---|---|---|
|  |  |  |

Rajah 4
*Diagram* 4

Apakah syarat lain untuk menghasilkan perlanggaran berkesan? Tuliskan persamaan kimia seimbang bagi tindak balas tersebut. Berdasarkan Rajah 4, lukiskan orientasi zarah bahan tindak balas untuk menghasilkan perlanggaran berkesan.

*What are the other conditions to produce an effective collision? Write the balanced chemical equation for the reaction. Based on Diagram* 4, *draw the orientation of the reactant particles to produce an effective collision.*

[5 *markah* / 5 *marks*]

**RUANGAN JAWAPAN**

**9**(*b*) Syarat lain untuk menghasilkan perlanggaran berkesan
*Other conditions to produce an effective collision*

**P1**.....

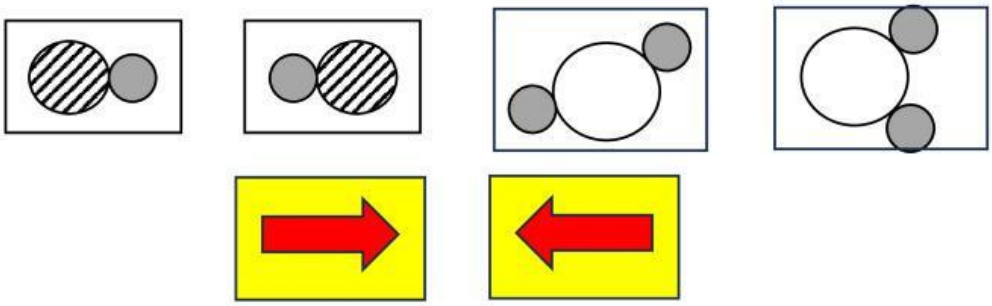
Persamaan kimia seimbang tindak balas tersebut
*Chemical equation for the reaction*

**P2 & P3**

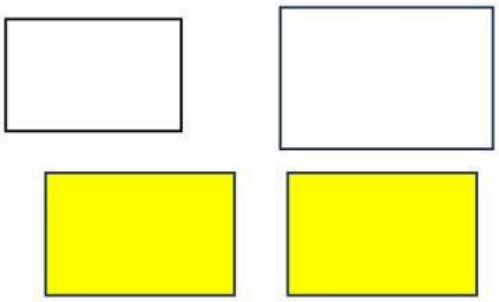
.....

Lukiskan orientasi zarah bahan tindak balas untuk menghasilkan perlanggaran berkesan.
*Draw the orientation of the reactant particles to produce an effective collision.*

Seret dan letakkan pada ruang disediakan.
*Drag and place in the space provided.*



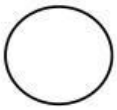
**RUANGAN JAWAPAN**



**Rujukan :**

Karbon monoksida (g) + Nitrogen dioksida (g) → Karbon dioksida (g) + Nitrogen oksida (g)
*Carbon monoxide* (g) + *Nitrogen dioxide* (g) → *Carbon dioxide* (g) + *Nitrogen oxide* (g)

Rajah 4 menunjukkan penunjuk bagi atom tersebut.
*Diagram* 4 *shows the key for an atom.*

| Atom karbon<br>*Carbon atom* | Atom nitrogen<br>*Nitrogen atom* | Atom oksigen<br>*Oxygen atom* |
|---|---|---|
|  |  |  |

**KERTAS PEPERIKSAAN SOALAN 9 TAMAT**