



Tugasan PEKA

2

Kaji situasi di bawah.
Study the situation below.

Bahan pencuci yang berkepekatan tinggi membantu menghilangkan kotoran lebih cepat daripada bahan pencuci yang berkepekatan rendah.

Detergents with high concentration help remove dirt faster than detergents with low concentration.

- (a) Berdasarkan maklumat di atas, rancang dan jalankan satu eksperimen untuk mengkaji kesan kepekatan bahan tindak balas terhadap kadar tindak balas. Anda diminta menulis satu laporan eksperimen yang lengkap.
Based on the above information, plan and run an experiment to study the effect of the concentration of the reactant on the rate of reaction. You are required to write a complete experiment report.
- (b) Laporan anda mesti mengandungi perkara-perkara berikut:
Your report must contain the following:
- (i) Pernyataan masalah
Problem statement
 - (ii) Tujuan
Aim
 - (iii) Hipotesis
Hypothesis
 - (iv) Pemboleh ubah
Variables
 - (v) Radas dan bahan
Apparatus and materials
 - (vi) Prosedur
Procedure
 - (vii) Keputusan
Results
 - (viii) Analisis data
Data analysis
 - (ix) Kesimpulan
Conclusion
- (c) Anda juga dikehendaki menjawab soalan-soalan berikut:
You are required to answer the following questions:
- (i) Nyatakan inferens bagi dapatan eksperimen tersebut.
State the inference for the experimental findings.
 - (ii) Berdasarkan dapatan eksperimen, tuliskan satu hubungan antara pemboleh ubah dimanipulasikan dan pemboleh ubah bergerak balas.
Based on the experimental findings, write a relationship between the manipulated variable and the responding variable.
 - (iii) Nyatakan definisi secara operasi bagi kadar tindak balas.
State the operational definition for the rate of reaction.
 - (iv) Bincangkan kesahan data yang anda peroleh jika kajian ini dilakukan tanpa air.
Discuss the validity of the data you obtained if this study was done without water.
 - (v) Apakah kesan lain terhadap kadar tindak balas akibat kepekatan bahan tindak balas tinggi?
What are the other effects on the rate of reaction due to the high concentration of reactants?
 - (vi) Cadangkan satu langkah yang boleh mengelakkan pengaruh suhu dan terangkan langkah yang dipilih.
Suggest one step that can avoid the influence of temperature and explain the chosen step.

Semasa anda menjalankan eksperimen, kemahiran manipulatif dan amalan sikap saintifik dan nilai murni akan dinilai.

As you conduct the experiment, manipulative skills and the practice of scientific attitudes and noble values will be assessed.



Laporan Amali Laboratory Report

Nama : _____
Name

Tarikh : _____
Date

Tingkatan : _____
Form

Pernyataan Masalah Problem Statement

Bagaimanakah kepekatan bahan tindak balas mempengaruhi kadar tindak balas?

How does the concentration of a reactant affect the rate of reaction?

K1P1

Tujuan Aim

Mengkaji kesan kepekatan terhadap kadar tindak balas.
To study the effect of concentration on the rate of reaction.

K1P2

Hipotesis Hypothesis

Semakin bertambah kepekatan bahan tindak balas, semakin tinggi kadar tindak balas.
The higher the concentration of a reactant, the higher the rate of reaction.

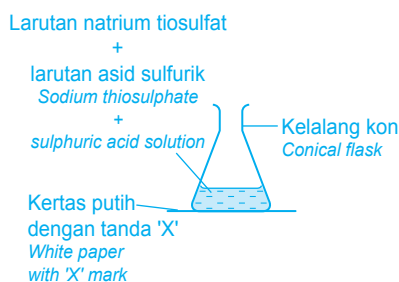
K1P3

Pemboleh Ubah Variables

- (a) Dimanipulasikan : Kepekatan larutan natrium tiosulfat
Manipulated Concentration of sodium thiosulphate solution
- (b) Bergerak balas : Kadar tindak balas
Responding Rate of reaction
- (c) Dimalarkan : Isi padu larutan natrium tiosulfat, isi padu dan kepekatan asid sulfurik cair, suhu campuran
Constant Volume of sodium thiosulphate solution, volume and concentration of dilute sulphuric acid, temperature of mixture

K1P4

Susunan Radas Apparatus set-up



(Lukisan mesti dalam 2D. / *The drawings must be in 2D.*)

K1P7

Prosedur Procedure

Prosedur – boleh rujuk buku teks (muka surat 128)
Procedure – can refer to textbook (page 128)

(Langkah mesti ditulis dalam ayat pasif. / *Steps must be written in passive voice.*)

- 50 cm³ larutan natrium tiosulfat 0.20 mol dm⁻³ diukur dan dituang ke dalam sebuah kelalang kon.
50 cm³ of 0.20 mol dm⁻³ sodium thiosulphate solution was measured and poured into a conical flask.
- Kelalang kon diletakkan di atas sehelai kertas yang bertanda 'X' di bahagian tengah.
The conical flask was placed on a piece of paper with a mark 'X' in the middle.



3. Dengan cepat dan cermat, 5 cm^3 asid sulfurik diukur dan dituang ke dalam kelalang kon yang berisi larutan natrium tiosulfat. Jam randik dimulakan.

Quickly and carefully, 5 cm^3 of sulphuric acid was measured and poured into the conical flask containing sodium thiosulphate solution. Stopwatch was started.

4. Campuran di dalam kelalang kon digoncang beberapa kali dan diletakkan semula ke atas kertas putih.

The mixture in the conical flask was swirled several times and placed back on the white paper.

5. Pembentukan mendakan kuning sulfur diperhatikan dari bahagian atas kelalang kon.

The formation of sulphur yellow precipitate was observed from the top of the conical flask.

6. Jam randik diberhentikan apabila tanda 'X' tidak lagi kelihatan dari atas.

The stopwatch was stopped when the 'X' sign was no longer visible from above.

7. Masa yang diambil untuk tanda 'X' hilang direkodkan.

The time taken for the mark 'X' missing was recorded.

8. Langkah 1 hingga 7 diulangi menggunakan kepekatan yang berbeza, iaitu larutan natrium tiosulfat 0.16 mol dm^{-3} , larutan natrium tiosulfat 0.12 mol dm^{-3} , larutan natrium tiosulfat 0.08 mol dm^{-3} dan larutan natrium tiosulfat 0.04 mol dm^{-3} .

Steps 1 to 7 were repeated using different concentrations, which are 0.16 mol dm^{-3} sodium thiosulphate solution, 0.12 mol dm^{-3} sodium thiosulphate solution, 0.08 mol dm^{-3} sodium thiosulphate solution and 0.04 mol dm^{-3} sodium thiosulphate solution.

9. Kadar tindak balas dikira menggunakan rumus.

The rate of reaction was calculated using formula.

K1P6

Keputusan Results

Kepekatan larutan natrium tiosulfat (mol dm^{-3}) Concentration of sodium thiosulphate solution (mol dm^{-3})	Masa yang diambil bagi tanda 'X' tidak kelihatan, t (s) Time taken for the 'X' to disappear, t (s)	Kadar tindak balas, $1/t$ (s^{-1}) Rate of reaction $1/t$ (s^{-1})
0.20	20	0.050
0.16	23	0.043
0.12	32	0.031
0.08	46	0.022
0.04	95	0.011

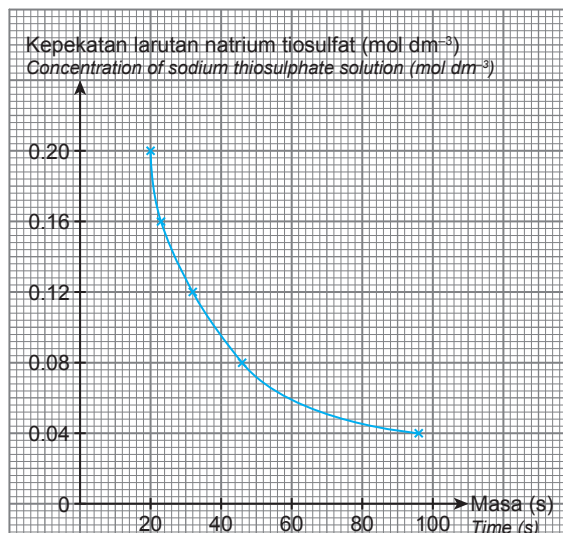
K3P1

K3P2

Analisis data
Data analysis

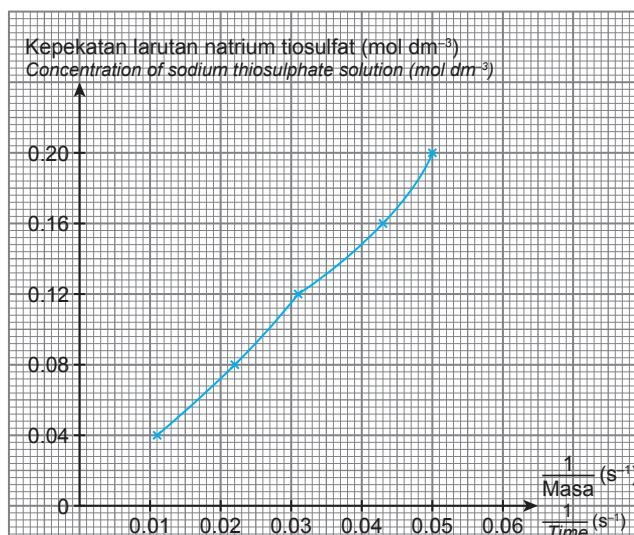
Plotkan graf kepekatan larutan natrium tiosulfat melawan masa.
Plot a graph of concentration of sodium thiosulphate solution against time.

Graf kepekatan larutan natrium tiosulfat melawan masa
Graph of concentration of sodium thiosulphate solution against time



Plotkan graf kepekatan larutan natrium tiosulfat melawan kadar tindak balas, $\frac{1}{t}$.
Plot a graph of concentration of sodium thiosulphate solution against the rate of reaction, $\frac{1}{t}$.

Graf kepekatan larutan natrium tiosulfat melawan kadar tindak balas, $\frac{1}{t}$
Graph of concentration of sodium thiosulphate solution against the rate of reaction, $\frac{1}{t}$



K4P1a K4P1b K4P1c K4P1d

Perbincangan
Discussion

1. Nyatakan inferens bagi dapatan eksperimen ini.
State the inference for the findings of this experiment.

K4P2a

Larutan natrium tiosulfat 0.20 mol dm⁻³ mempunyai kadar tindak balas yang paling tinggi kerana mempunyai kepekatan yang paling tinggi.

0.20 mol dm⁻³ sodium thiosulphate solution has the highest rate of reaction because it has the highest concentration.



2. Berdasarkan dapatan eksperimen, nyatakan hubungan antara pemboleh ubah dimanipulasikan dengan pemboleh ubah bergerak balas.

Based on the experimental findings, state the relationship between the manipulated variable and the responding variable.

K4P2b

Semakin tinggi kepekatan bahan tindak balas, semakin tinggi kadar tindak balas.

The higher the concentration of the reactants, the higher the rate of reaction.

3. Nyatakan definisi secara operasi bagi kadar tindak balas dalam eksperimen ini.

State the operational definition for the rate of reaction in this experiment.

K4P2c

Kadar tindak balas ialah $\frac{1}{\text{masa}}$ tanda 'X' pada kertas putih tidak kelihatan yang dipengaruhi

oleh kepekatan larutan.

The rate of reaction is $\frac{1}{\text{time}}$ the 'X' mark on the white paper is not visible which is influenced by the concentration of the solution.

4. Bincangkan kesahan data yang anda peroleh jika kajian ini dilakukan tanpa air.

Discuss the validity of the data you obtained if this study was done without water

K5P3

K5P4

Data yang diperoleh adalah tidak sah jika kajian dilakukan tanpa air kerana kepekatan larutan melibatkan pelarut (air) yang melarutkan zat terlarut (natrium tiosulfat).

The data obtained are invalid if the study is conducted without water because the concentration of the solution involves a solvent (water) that dissolves the solute (sodium thiosulphate).

5. Apakah kesan lain terhadap kadar tindak balas akibat kepekatan bahan tindak balas yang tinggi?

What are the other effects on the rate of reaction due to the high concentration of reactants?

K5P1

Kepekatan bahan tindak balas yang tinggi boleh menyebabkan masa yang diambil untuk tanda 'X' tidak kelihatan menjadi singkat dan tidak dapat diukur dengan jam randik.

High concentration of reactants can cause the time taken for the 'X' to disappear to be shorter and cannot be measured with a stopwatch.

6. Cadangkan **satu** langkah yang boleh mengelakkan pengaruh suhu dan terangkan langkah yang dipilih.

*Suggest **one** step that can avoid the influence of temperature and explain the chosen step.*

K5P2

Perbezaan suhu dalam larutan natrium tiosulfat akan mempengaruhi keputusan eksperimen.

Pengaruh suhu boleh dielakkan dengan menggunakan termometer untuk mengukur suhu larutan dan memastikan suhu larutan adalah sentiasa tetap pada suhu bilik.

Temperature differences in sodium thiosulphate solution will affect the experimental results. The influence of temperature can be avoided by using a thermometer to measure the temperature of the solution and ensure that the temperature of the solution is always constant at room temperature.

Kesimpulan Conclusion

1. Hipotesis diterima. / Hypothesis is accepted.

2. Semakin bertambah kepekatan bahan tindak balas, semakin tinggi kadar tindak balas.

The higher the concentration of a reactant, the higher the rate of reaction.

K4P3