



## Paper 1

- 1 Which of the following is an example of slow reaction?

Antara berikut, yang manakah merupakan contoh tindak balas perlahan?

- A Burning of fireworks.  
*Pembakaran bunga api.*  
B Reaction of sodium with water.  
*Tindak balas natrium dengan air.*  
C The process of photosynthesis performed by plants.  
*Proses fotosintesis yang dijalankan oleh tumbuhan.*  
D Burning of a piece of paper.  
*Pembakaran kertas.*

- 2 Which of the following statement is **correct** about fast reaction?

Antara pernyataan berikut, yang manakah **betul** tentang tindak balas cepat?

- A The rate of reaction is zero.  
*Kadar tindak balas adalah sifar.*  
B The rate of reaction is slow.  
*Kadar tindak balas adalah perlahan.*  
C Takes a shorter time to complete the reaction.  
*Memerlukan masa yang singkat untuk melengkapkan tindak balas.*  
D Takes a longer time to complete the reaction.  
*Mengambil masa yang lebih lama untuk melengkapkan tindak balas.*

- 3 Choose the following reaction with the lowest rate of reaction.

Antara berikut, pilih tindak balas yang mempunyai kadar tindak balas paling rendah.

- A Fermentation process of glucose to ethanol.  
*Proses penapaian glukosa kepada etanol.*  
B Neutralisation reaction between hydrochloric acid and sodium carbonate solution.  
*Tindak balas peneutralan antara asid hidroklorik dan larutan natrium karbonat.*  
C Displacement reaction of copper(II) sulphate solution by zinc metal.  
*Tindak balas penyesaran antara larutan kuprum(II) sulfat dengan logam zink.*  
D Precipitation of silver chloride by adding silver nitrate solution into sodium chloride solution.  
*Tindak balas pemendakan argentum klorida dengan menambahkan larutan argentum nitrat ke dalam larutan natrium klorida.*

- 4 Excess zinc reacts with dilute sulphuric acid. After a while, the reaction gradually become slower and finally stops.

Which of the following statement best explains why this happens?

Zink berlebihan bertindak balas dengan asid sulfurik cair. Selepas seketika, tindak balas menjadi semakin perlahan dan akhirnya berhenti.

Antara pernyataan berikut, yang manakah paling tepat menjelaskan kejadian ini?

- A The zinc is used up.  
*Zink habis digunakan.*  
B The sulphuric acid is used up.  
*Asid sulfurik habis digunakan.*  
C The insoluble zinc sulphate is formed.  
*Zink sulfat yang tidak larut dihasilkan.*  
D The hydrogen gas covers the zinc metal.  
*Gas hidrogen menutupi logam zink.*

- 5 Diagram 1 shows the graph of volume of hydrogen gas against time.

Rajah 1 menunjukkan graf isi padu gas hidrogen melawan masa.

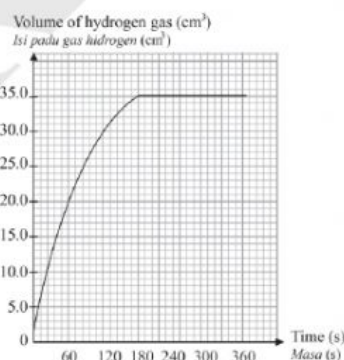


Diagram 1/ Rajah 1

Calculate the average rate of reaction for the first 3 minutes.

Hitung kadar tindak balas purata pada 3 minit yang pertama.

- A  $0.097 \text{ cm}^3 \text{ s}^{-1}$  C  $0.194 \text{ cm}^3 \text{ s}^{-1}$   
B  $0.146 \text{ cm}^3 \text{ s}^{-1}$  D  $1.167 \text{ cm}^3 \text{ s}^{-1}$

- 6 0.7 g of magnesium powder reacts completely with excess dilute hydrochloric acid in 45 seconds. Calculate the rate of reaction of this reaction.

0.7 g serbuk magnesium bertindak balas dengan asid hidroklorik cair berlebihan sehingga lengkap dalam masa 45 saat. Hitung kadar tindak balas bagi tindak balas ini.

- A  $0.0133 \text{ g s}^{-1}$  C  $0.0175 \text{ g s}^{-1}$   
B  $0.0156 \text{ g s}^{-1}$  D  $0.0214 \text{ g s}^{-1}$

- 7 Table 1 shows the result obtained from the decomposition of hydrogen peroxide.

Jadual 1 menunjukkan keputusan yang diperoleh daripada penguraian hidrogen peroksida.

| Time (min)<br>Masa (min) | Volume of O <sub>2</sub> (cm <sup>3</sup> )<br>Isi padu O <sub>2</sub> (cm <sup>3</sup> ) |
|--------------------------|-------------------------------------------------------------------------------------------|
| 0                        | 0                                                                                         |
| 1                        | 4                                                                                         |
| 2                        | 8                                                                                         |
| 3                        | 11                                                                                        |
| 4                        | 12                                                                                        |
| 5                        | 12                                                                                        |
| 6                        | 12                                                                                        |

Table 1/ Jadual 1

Calculate the average rate of reaction of decomposition of hydrogen peroxide.

Hitung kadar tindak balas purata bagi penguraian hidrogen peroksida.

- A 2.0 cm<sup>3</sup> min<sup>-1</sup>  
B 3.0 cm<sup>3</sup> min<sup>-1</sup>  
C 6.0 cm<sup>3</sup> min<sup>-1</sup>  
D 12.0 cm<sup>3</sup> min<sup>-1</sup>
- 8 Which of the following factors does **not** affect the rate of reaction for the reaction between zinc and dilute hydrochloric acid?  
Antara faktor berikut, yang manakah **tidak** mempengaruhi kadar tindak balas bagi tindak balas antara zink dengan asid hidroklorik cair?
- A Pressure of the reaction  
Tekanan tindak balas  
B Temperature of the hydrochloric acid  
Suhu asid hidroklorik  
C Presence of copper(II) sulphate as catalyst  
Kehadiran kuprum(II) sulfat sebagai mangkin  
D Size of zinc  
Saiz zink
- 9 Diagram 2 shows the reaction between zinc and dilute hydrochloric acid.  
Rajah 2 menunjukkan tindak balas antara zink dengan asid hidroklorik cair.

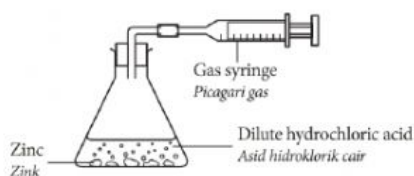


Diagram 2/ Rajah 2

Which of the following gas is collected in the gas syringe?

Antara berikut, gas yang manakah terkumpul di dalam picagari gas?

- A Chlorine  
Klorin  
B Carbon dioxide  
Karbon dioksida  
C Oxygen  
Oksigen  
D Hydrogen  
Hidrogen
- 10 Which of the following produces the highest rate of reaction?  
Antara berikut, yang manakah menghasilkan kadar tindak balas paling tinggi?
- A 20 cm<sup>3</sup> of 0.18 mol dm<sup>-3</sup> sodium thiosulphate solution and 5 cm<sup>3</sup> of 1.0 mol dm<sup>-3</sup> sulphuric acid.  
20 cm<sup>3</sup> larutan natrium tiosulfat 0.18 mol dm<sup>-3</sup> dan 5 cm<sup>3</sup> asid sulfurik 1.0 mol dm<sup>-3</sup>.  
B 20 cm<sup>3</sup> of 0.16 mol dm<sup>-3</sup> sodium thiosulphate solution and 5 cm<sup>3</sup> of 1.0 mol dm<sup>-3</sup> sulphuric acid.  
20 cm<sup>3</sup> larutan natrium tiosulfat 0.16 mol dm<sup>-3</sup> dan 5 cm<sup>3</sup> asid sulfurik 1.0 mol dm<sup>-3</sup>.  
C 20 cm<sup>3</sup> of 0.08 mol dm<sup>-3</sup> sodium thiosulphate solution and 5 cm<sup>3</sup> of 1.0 mol dm<sup>-3</sup> sulphuric acid.  
20 cm<sup>3</sup> larutan natrium tiosulfat 0.08 mol dm<sup>-3</sup> dan 5 cm<sup>3</sup> asid sulfurik 1.0 mol dm<sup>-3</sup>.  
D 20 cm<sup>3</sup> of 0.20 mol dm<sup>-3</sup> sodium thiosulphate solution and 5 cm<sup>3</sup> of 1.0 mol dm<sup>-3</sup> sulphuric acid.  
20 cm<sup>3</sup> larutan natrium tiosulfat 0.20 mol dm<sup>-3</sup> dan 5 cm<sup>3</sup> asid sulfurik 1.0 mol dm<sup>-3</sup>.
- 11 Diagram 3 shows the graph of volume of hydrogen gas produced against time when excess zinc reacts with dilute hydrochloric acid.  
Rajah 3 menunjukkan graf isi padu gas hidrogen yang terhasil melawan masa apabila zink berlebihan bertindak balas dengan asid hidroklorik cair.

Total volume of hydrogen gas (cm<sup>3</sup>)  
Jumlah isi padu gas hidrogen (cm<sup>3</sup>)

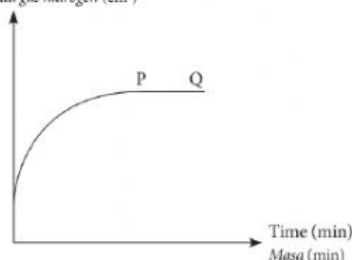


Diagram 3/ Rajah 3

Which of the following statement is **correct** about section PQ?

Antara berikut, pernyataan yang manakah **betul** mengenai bahagian PQ?

- I No more hydrogen gas is being produced.  
*Tiada lagi gas hidrogen dihasilkan.*
- II All the hydrochloric acid has reacted.  
*Semua asid hidroklorik telah bertindak balas.*
- III The rate of reaction is decreasing.  
*Kadar tindak balas berkurang.*
- IV The rate of reaction is increasing.  
*Kadar tindak balas bertambah.*
- A I and II  
*I dan II*
- B II and III  
*II dan III*
- C III and IV  
*III dan IV*
- D I, II and III  
*I, II dan III*

How to increase the time reaction between a magnesium ribbon and 25 cm<sup>3</sup> of 2.0 mol dm<sup>-3</sup> nitric acid?

Bagaimanakah masa tindak balas antara jalur magnesium dan 25 cm<sup>3</sup> asid nitrik 2.0 mol dm<sup>-3</sup> dapat dipanjangkan?

- A Heat the acid solution.  
*Panaskan larutan asid.*
- B Add distilled water into the acid solution.  
*Tambahkan air suling ke dalam larutan asid.*
- C Add copper(II) sulphate into the mixture.  
*Tambahkan kuprum(II) sulfat ke dalam larutan.*
- D Add a few drops of concentrated hydrochloric acid into the mixture.  
*Tambahkan beberapa titis asid hidroklorik pekat ke dalam campuran.*

Why the rate of reaction for gas reactant is affected by pressure?

Mengapakah kadar tindak balas bagi bahan tindak balas berkeadaan gas dipengaruhi oleh tekanan?

- A Pressure affects the size of gas particles to increase the frequency of effective collisions.  
*Tekanan mempengaruhi saiz zarah gas bagi meningkatkan frekuensi perlanggaran berkesan.*
- B Pressure affects the distance between gas particles to increase the frequency of collisions between gas particles.  
*Tekanan mempengaruhi jarak antara zarah gas untuk meningkatkan frekuensi perlanggaran antara zarah-zarah gas.*
- C Pressure converts gas particles into solid.  
*Tekanan menukarkan zarah gas menjadi pepejal.*
- D Pressure converts gas particles into liquid.  
*Tekanan menukarkan zarah gas menjadi cecair.*

Understand the statement below.

Fahami pernyataan di bawah.

- Meat cooks faster in hot oil than hot water.  
*Daging lebih cepat masak di dalam minyak panas berbanding dengan air panas.*
- Sliced meat cooks faster than chunk meat.  
*Hirisan daging masak lebih cepat berbanding dengan ketulan daging.*

Choose the **correct** statements.

Pilih pernyataan yang **betul**.

- I Oil acts as catalyst.  
*Minyak bertindak sebagai mangkin.*
- II Oil breaks down the protein in the meat.  
*Minyak menguraikan protein dalam daging.*
- III The temperature of oil is higher than water.  
*Suhu minyak lebih tinggi daripada air.*
- IV Sliced meat has a greater surface area than chunk meat.  
*Hirisan daging mempunyai luas permukaan yang lebih besar daripada ketulan daging.*
- A I and III  
*I dan III*
- B II and III  
*II dan III*
- C II and IV  
*II dan IV*
- D III and IV  
*III dan IV*

15 Which of the following process is used to produced sulphuric acid?

Antara proses berikut, yang manakah digunakan untuk menghasilkan asid sulfurik?

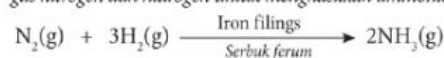
- A Haber Process  
*Proses Haber*
- B Contact Process  
*Proses Sentuh*
- C Photosynthesis process  
*Proses fotosintesis*
- D Neutralisation process  
*Proses peneutralan*

16 Which of the following increases the production of ammonia?

Antara yang berikut, yang manakah meningkatkan penghasilan ammonia?

- A 200 atm, 450 °C and the presence of iron filings.  
*200 atm, 450 °C dan kehadiran serbuk ferum.*
- B 400 atm, 450 °C and the presence of iron filings.  
*400 atm, 450 °C dan kehadiran serbuk ferum.*
- C 1 atm, 450 °C and the presence of iron filings.  
*1 atm, 450 °C dan kehadiran serbuk ferum.*
- D 200 atm, 450 °C and the presence of vanadium(V) oxide.  
*200 atm, 450 °C dan kehadiran vanadium(V) oksida.*

17 The chemical equation below shows the reaction between nitrogen and hydrogen gas to form ammonia. Persamaan kimia di bawah menunjukkan tindak balas antara gas nitrogen dan hidrogen untuk menghasilkan ammonia.



Why iron filings is used in this reaction?

Mengapakah serbuk ferum digunakan dalam tindak balas ini?

- A Increase the kinetic energy of nitrogen and hydrogen molecules.  
*Meningkatkan tenaga kinetik molekul nitrogen dan hidrogen.*
- B Increase the concentration of nitrogen and hydrogen gas.  
*Meningkatkan kepekatan gas hidrogen dan nitrogen.*

- C The activation energy of the reaction is lowered.  
Tenaga pengaktifan tindak balas direndahkan.
- D Helps in producing more ammonia gas.  
Membantu menghasilkan gas ammonia yang banyak.

Which of the following will **not** affect the rate of reaction between nitrogen and hydrogen gas to form ammonia in Haber Process?

Antara berikut, yang manakah **tidak** mempengaruhi kadar tindak balas antara gas nitrogen dan hidrogen bagi menghasilkan ammonia dalam Proses Haber?

- A Volume of the gases  
Isi padu gas
- B Pressure of the reactant  
Tekanan terhadap bahan tindak balas
- C Presence of iron filings  
Kehadiran serbuk ferum
- D Concentration of the gases  
Kepekatan gas

## Paper 2

### Section A

Diagram 1 shows an experiment conducted by a group of students to study the effect of temperature of reactant on rate of reaction between sodium thiosulfate solution and sulphuric acid.

Rajah 1 menunjukkan eksperimen yang dijalankan oleh sekumpulan murid untuk mengkaji kesan suhu bahan tindak balas terhadap kadar tindak balas antara larutan natrium tiosulfat dengan asid sulfurik.

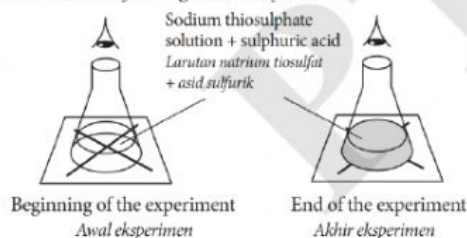


Diagram 1/ Rajah 1

Table 1 shows the results of the experiment.

Jadual 1 menunjukkan keputusan eksperimen tersebut.

| Reactant temperature<br>Suhu bahan tindak balas<br>(°C) | Time taken for 'x' mark to disappear from view<br>Masa yang diambil untuk tanda 'x' hilang dari pandangan (s) | $\frac{1}{\text{Time}}$<br>$\frac{1}{\text{Masa}}$<br>(s <sup>-1</sup> ) |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|
| 28.0                                                    | 42                                                                                                            | 0.024                                                                    |
| 35.0                                                    | 26                                                                                                            | 0.038                                                                    |
| 40.0                                                    | 21                                                                                                            | 0.047                                                                    |
| 45.0                                                    | 19                                                                                                            |                                                                          |

Table 1/ Jadual 1

- 19 Iron filings is used as a catalyst in Haber Process. Which of the following statements are **correct** about iron filings?

Serbuk ferum digunakan sebagai mangkin dalam Proses Haber. Antara pernyataan berikut yang manakah **betul** mengenai serbuk ferum?

- I Increases the production of ammonia.  
Meningkatkan penghasilan ammonia.
- II Increases the rate of formation of ammonia.  
Meningkatkan kadar pembentukan ammonia.
- III The iron filings is a more effective catalyst than iron plate.  
Serbuk ferum ialah pemangkin yang lebih berkesan berbanding dengan kepingan ferum.
- IV The mass of iron filings remain unchanged after the reaction.  
Jisim serbuk ferum tidak berubah selepas tindak balas.
- A I, II and III  
I, II dan III
- B I, III and IV  
I, III dan IV
- C II, III and IV  
II, III dan IV
- D I, II, III and IV  
I, II, III dan IV

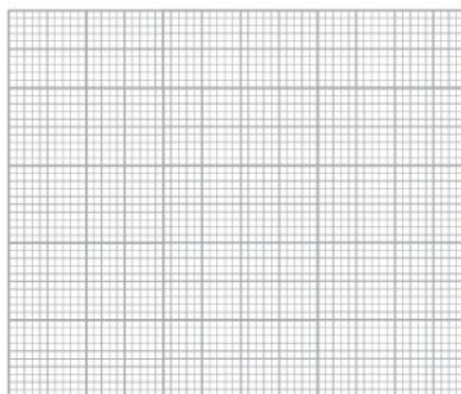
- (a) Complete Table 1 by calculating the value of  $\frac{1}{\text{time}}$  for the reaction at 45 °C.

Lengkapkan Jadual 1 dengan menghitung nilai  $\frac{1}{\text{masa}}$  bagi tindak balas pada suhu 45 °C.

[1 mark/markah]

- (b) Based on the data in Table 1, plot a graph of temperature against  $\frac{1}{\text{time}}$  on the graph paper.

Berdasarkan data dalam Jadual 1, plotkan satu graf suhu melawan  $\frac{1}{\text{masa}}$  pada kertas graf.



[2 marks/markah]

- (c) State **one** observation from this experiment.  
Nyatakan **satu** pemerhatian daripada eksperimen ini.

[1 mark/markah]

FORM 5

