

**SULIT**  
**4541/1**  
**Kimia**  
**Kertas 1**  
**OGOS**  
**2023**  
**1 1/4 jam**

Nama

Tingkatan



**PEPERIKSAAN PERTENGAHAN TAHUN  
TINGKATAN 5**

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**KIMIA**

Kertas 1  
Satu jam lima belas minit

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1. *Kertas soalan ini adalah dwibahasa.*
2. *Soalan dalam Bahasa Melayu mendahului soalan yang sepadan dalam Bahasa Inggeris.*
3. *Jawab semua soalan*

Prepared by:

Checked by:

Certified by:

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**Soalan ini mengandungi 14 halaman bercetak**

1. Table 1 shows the information about two types of particles, G and H.

Particle	Proton number	Electron arrangement
G	8	2.8
H	16	2.8.8

Table 1

Which of the following statements is true about particles G and H?

- A. Both are isotopes
- B. Both are atoms of noble gases
- C. Both are positive ions
- D. Both are negative ions

2. Element M have two isotopes,  $^{38}M$  and  $^{40}M$ . The relative atomic mass of M is 38.8. What is the percentage abundance of  $^{40}M$  isotope?

- A. 20 %
- B. 40 %
- C. 60 %
- D. 80 %

3. When 1.5 g of element X is burnt completely, 3.2 g of oxide of X is formed. What is the empirical formula of the metal oxide?  
[Relative atomic mass: X= 31, O=16]

- A.  $XO_2$
- B.  $X_2O$
- C.  $X_2O_4$
- D.  $X_4O_2$

4. The relative molecular mass of  $J_2(SO_4)_3$  is 342. What is the relative atomic mass of element J?  
[Relative atomic mass: O = 16, S = 32]

- A. 27
- B. 54
- C. 118
- D. 123

5. Why do potassium reacts more vigorously with oxygen compared to sodium?

- A. Potassium has more shells filled with electrons
- B. The relative atomic mass of potassium is greater
- C. The nuclear attraction of potassium with its valence electrons is weaker
- D. Potassium has more protons

6. Which statement is **not** the special characteristic of transition elements?

- A. Acts as catalyst
- B. Have low densities
- C. Form coloured compound
- D. Have more than one oxidation number

7. Table 2 shows the electron arrangement of atoms of element R and S.

Atom R	Atom S
2.4	2.8.7

Table 2

What is the formula and the type of bond of the compound formed from the reaction between R and S?

	Formula	Type of bond
A	RS <sub>4</sub>	Covalent
B	R <sub>4</sub> S	Covalent
C	R <sub>2</sub> S	Ionic
D	RS <sub>2</sub>	Ionic

8. Which of the following statements are true about the physical properties of the alkali metals down the group?

- I. The atomic size decreases.
- II. The melting point decreases.
- III. The density increases.
- IV. The electropositivity increases.

- A. I, II and III only
- B. I, II and IV only
- C. II, III and IV only
- D. I, III and IV only

9. Diagram 1 shows an incomplete Periodic Table of Elements. P and Q are not the actual symbol for the elements.

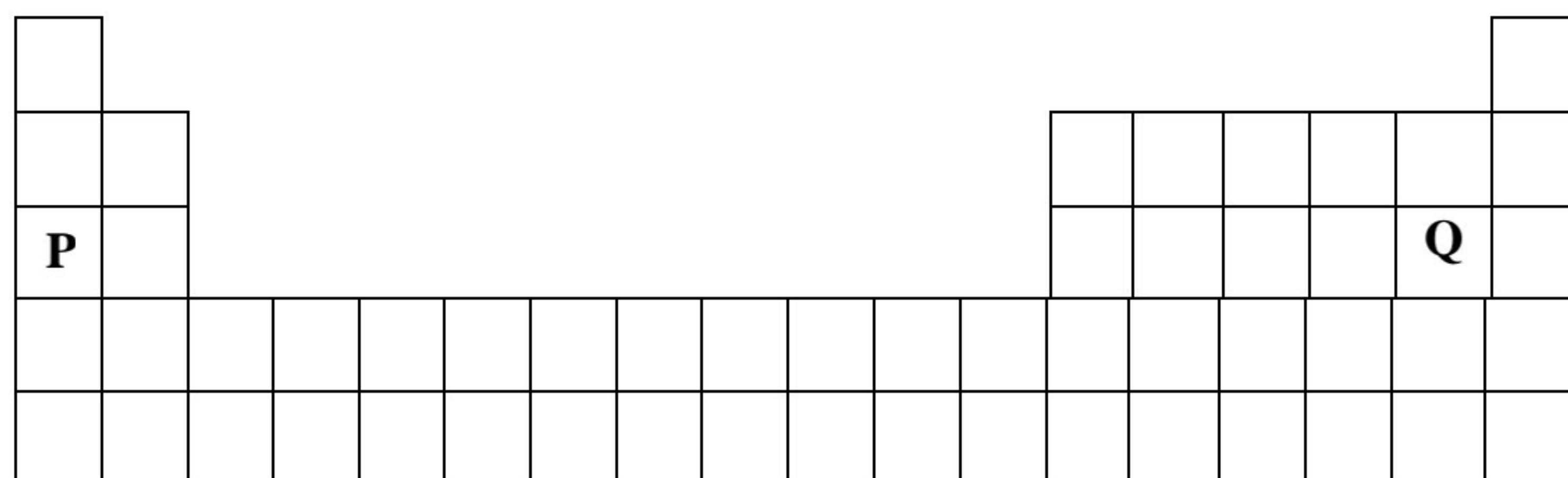


Diagram 1

Element P can react with element Q to produce an ionic compound. Which of the following is the chemical equation for this reaction?

- A.  $P + Q \rightarrow PQ$
- B.  $P + Q_2 \rightarrow PQ_2$
- C.  $P + 2Q \rightarrow PQ_2$
- D.  $2P + Q_2 \rightarrow 2PQ$

10. . Which of the following particles are formed from a dative bond?

- I.  $H_3O^+$
- II.  $NH_4^+$
- III.  $NO_3^-$
- IV.  $CH_3COO^-$

- A. I and II
- B. I and IV
- C. II and III
- D. III and IV

11. A student conducts a laboratory activity to build a simple battery using solid naphthalene,  $C_{10}H_8$ . After complete circuit is assembled, the voltmeter needle is not deflected. Which of the following statements is the step that the student should take so that the voltmeter needle is deflected?

- A. Dissolve naphthalene in distilled water
- B. Heat solid naphthalene until melted
- C. Replace solid naphthalene with solid magnesium chloride
- D. Replace solid naphthalene with magnesium chloride solution

12. Diagram 2 shows the information of element X and element Y. Which of the following is the electron arrangement of the compound formed when element X and element Y react?

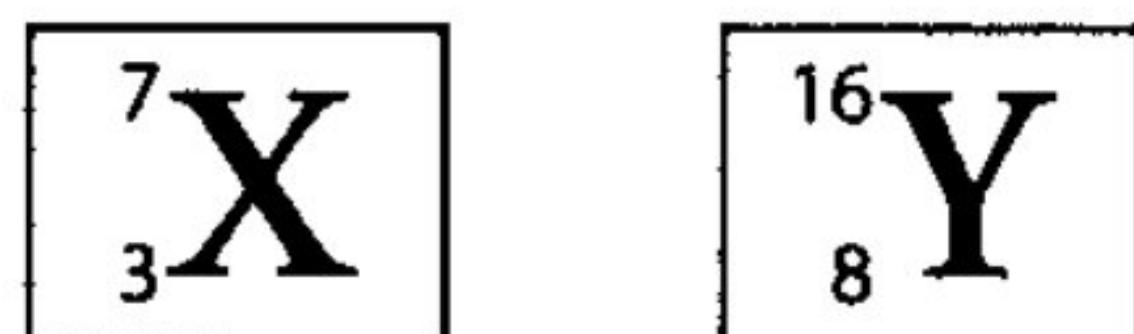
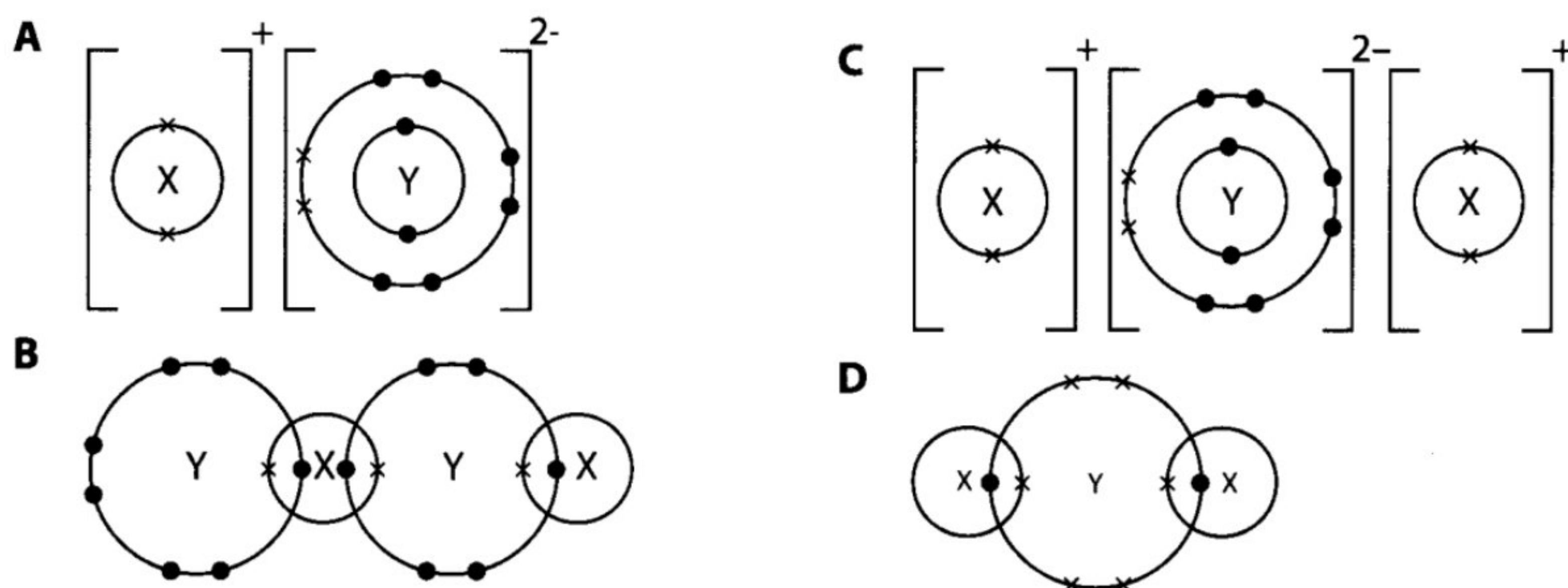


Diagram 2



13. Diagram 3 shows the observation obtained when some oxide powder J is added to a beaker containing distilled water. J is a Period 3 element.

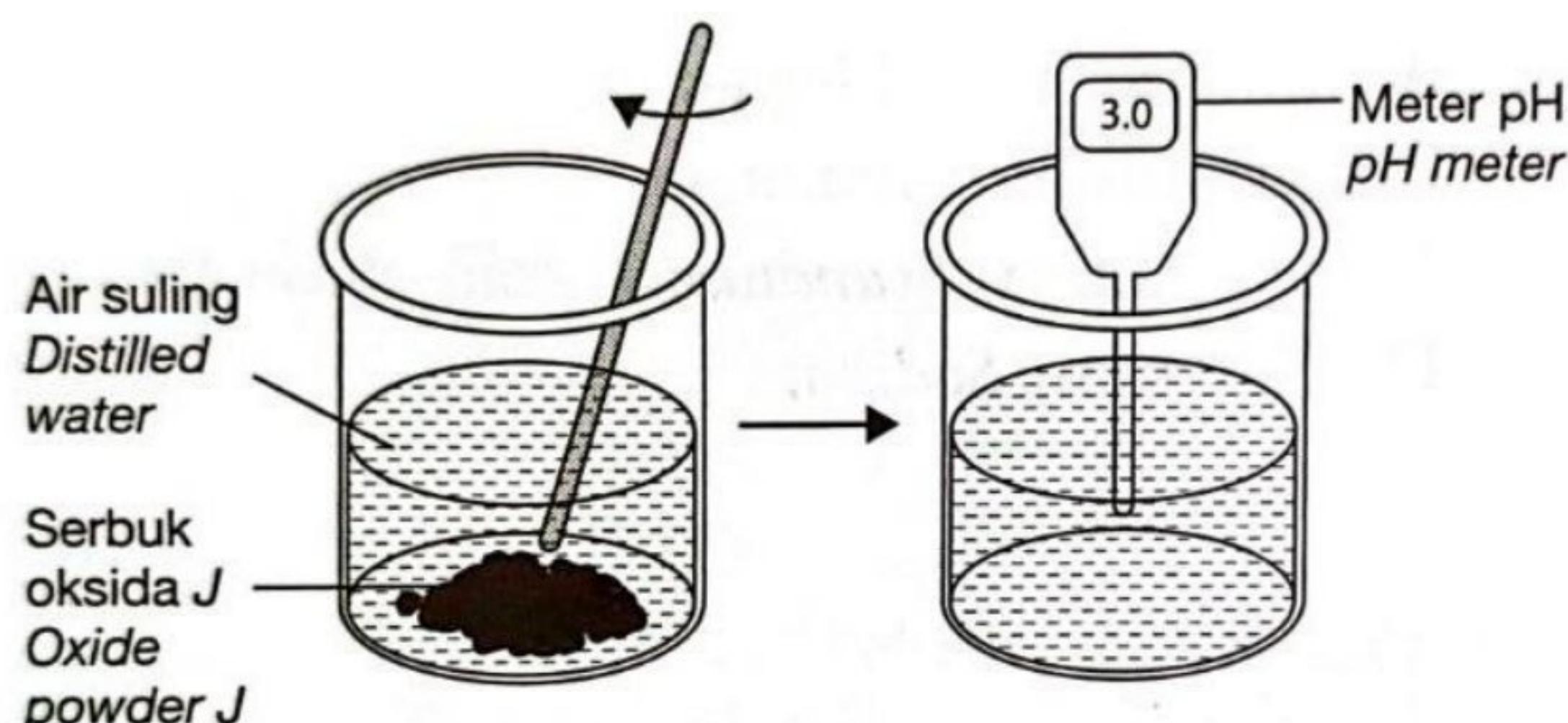


Diagram 3

What is oxide powder J?

- A. Silicon dioxide
- B. Sodium oxide
- C. Magnesium oxide
- D. Phosphorus pentoxide

14. A student was stung by a wasp. Which substance is best applied to treat the student immediately?

- A. Baking powder
- B. Toothpaste
- C. Vinegar

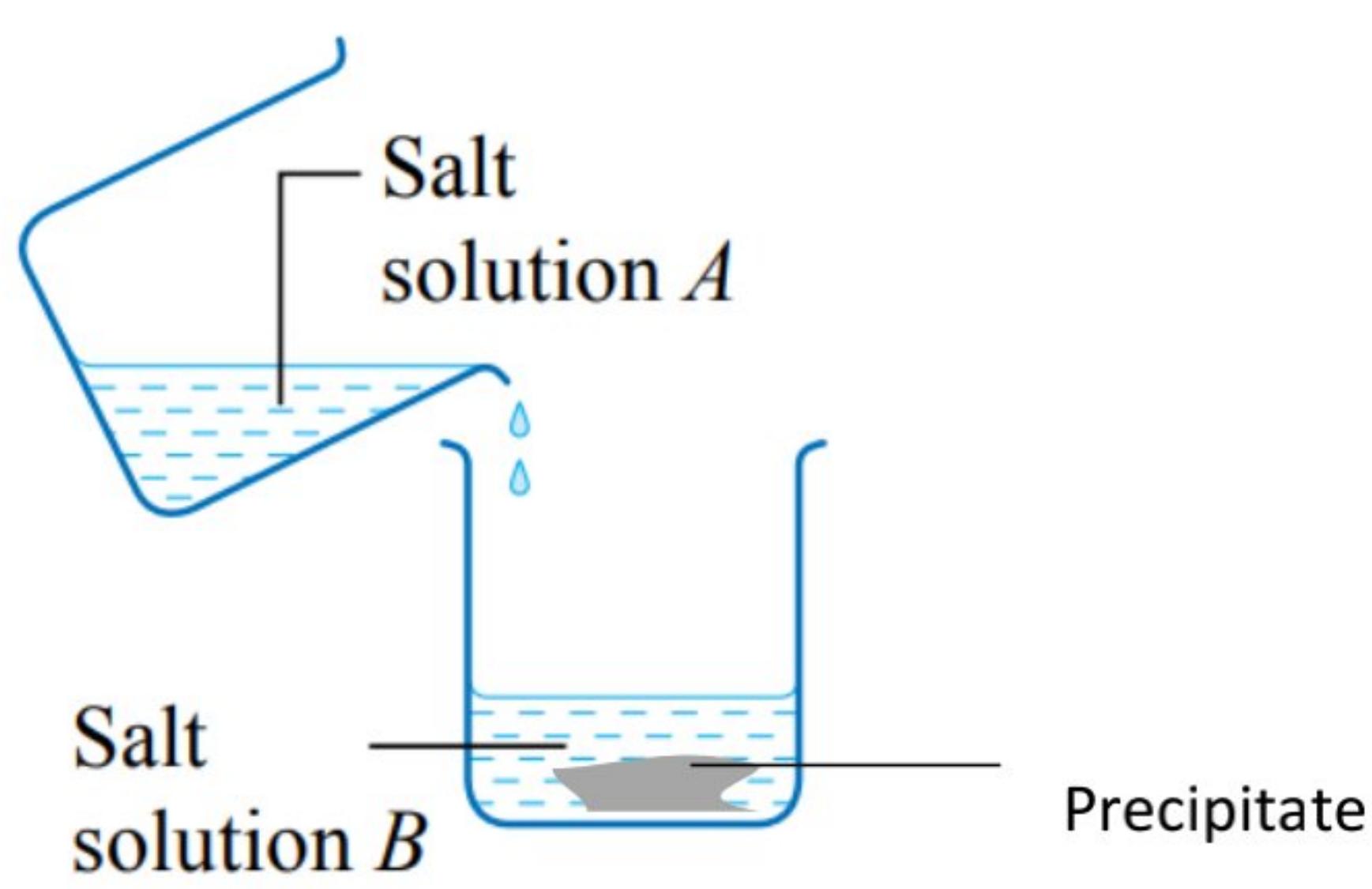
15. When a white powder of salt P is heated strongly, a brown gas is released. The residue was yellow when hot and white when cold. What is salt P?

- A. Lead (II) carbonate
- B. Lead (II) nitrate
- C. Zinc carbonate
- D. Zinc nitrate

16. Which of the following is true about glacial ethanoic acid?

- A. It turns dry blue litmus paper red.
- B. It can conduct electricity.
- C. It is made up of covalent molecules only.
- D. It is a strong acid.

17. Diagram 4 shows a reaction to prepare a salt.



What salt can be produced by this reaction?

- A. Iron (II) chloride
- B. Ammonium carbonate
- C. Magnesium nitrate
- D. Calcium sulphate

18. Diagram 5 shows the apparatus setup of an experiment to determine the rate of reaction.

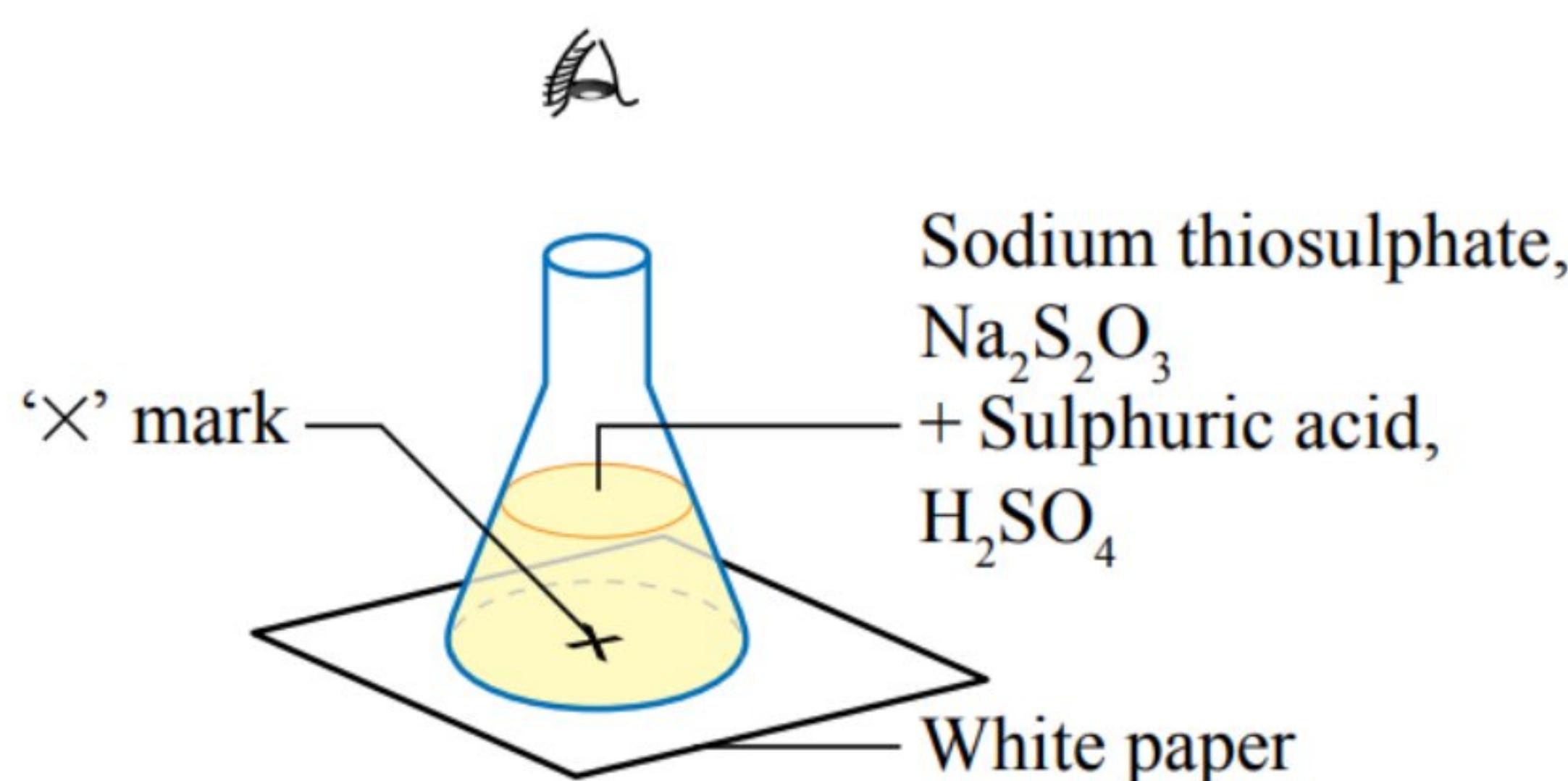


Diagram 5

Which of the following can increase the rate of reaction?

- A. Pour hydrochloric acid quickly and carefully
- B. Record the time taken immediately when the cross mark cannot be seen
- C. Add distilled water into the conical flask
- D. Heat sodium thiosulphate solution before hydrochloric acid is added

19. Curve I in Diagram 6 is obtained when excess of zinc powder reacts with 10 cm<sup>3</sup> of 0.1 mol dm<sup>-3</sup> nitric acid.

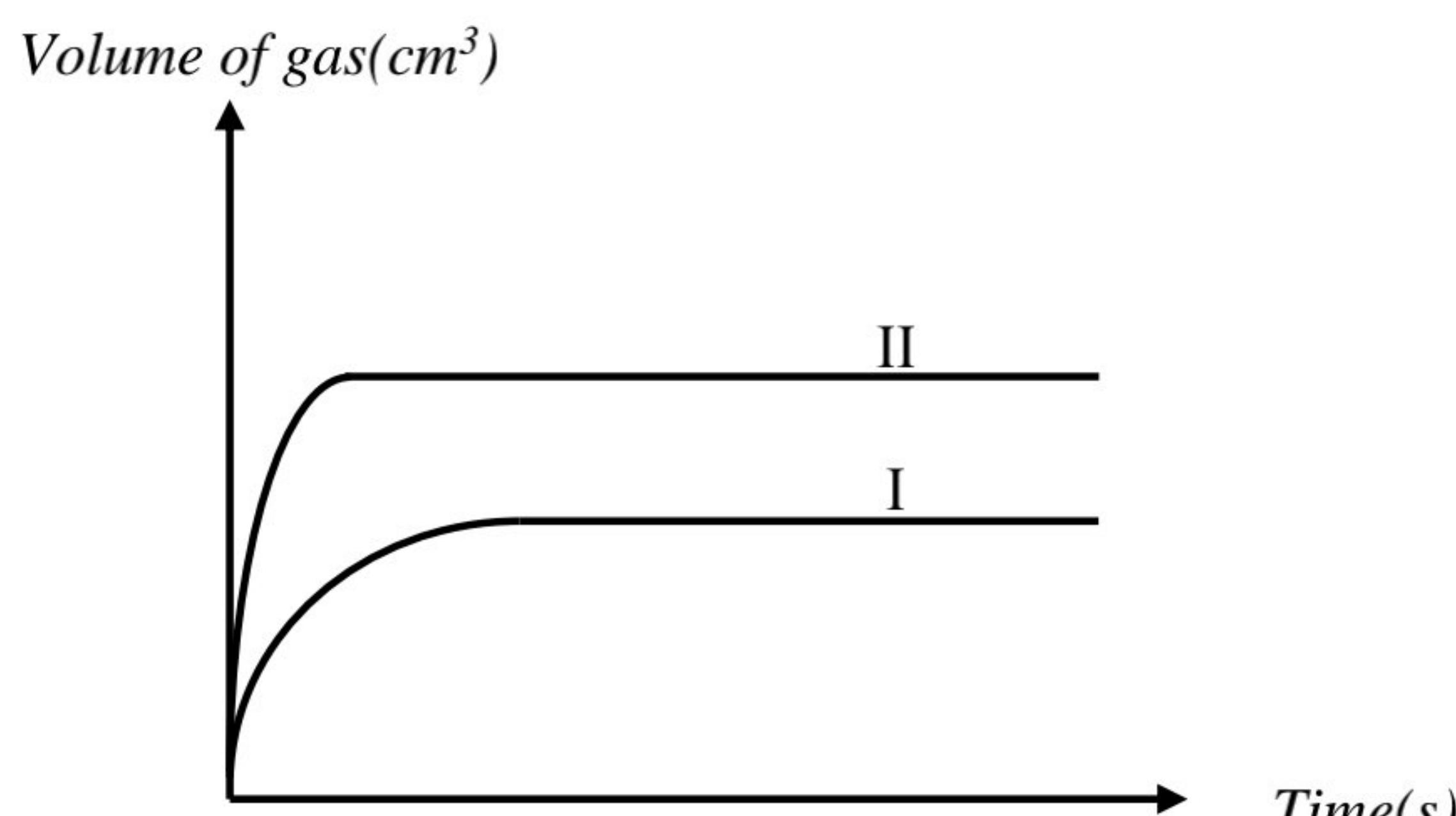


Diagram 6

Which of the following will produce curve II in Diagram 6?

- A. Zinc powder and 20 cm<sup>3</sup> of 0.1 mol dm<sup>-3</sup> nitric acid
- B. Zinc powder and 20 cm<sup>3</sup> of 0.2 mol dm<sup>-3</sup> nitric acid
- C. Zinc powder and 10 cm<sup>3</sup> of 0.2 mol dm<sup>-3</sup> nitric acid
- D. Zinc powder and 10 cm<sup>3</sup> of 0.1 mol dm<sup>-3</sup> nitric acid

20. Which of the following pairs is the correct type of glass and its use?

	Use	Type of glass
A		Soda lime glass
B		Lead crystal glass
C		Borosilicate glass
D		Fused silica glass

21. Table 3 shows the value of standard electrode potential,  $E^0$  of several half equation reactions.

Persamaan sel setengah Half-cell equation	$E^0$ (V) (298 K)
$Mg^{2+} + 2e \rightleftharpoons Mg$	-2.38
$Zn^{2+} + 2e \rightleftharpoons Zn$	-0.76
$Ag^+ + e \rightleftharpoons Ag$	+0.80
$Cu^{2+} + 2e \rightleftharpoons Cu$	+0.34

Table 3

Which of the following pair of metals will produces the highest voltage in chemical cell?

- I. Magnesium
- II. Zinc
- III. Silver
- IV. Copper

A. I and III	C. II and III
B. I and IV	D. III and IV

22. What substance is added to glass to produce photochromic glass?

- A. Silver chloride
- B. Aluminium chloride
- C. Sodium bromide
- D. Calcium bromide

23. Diagram 7 shows a structural formula of compound X.

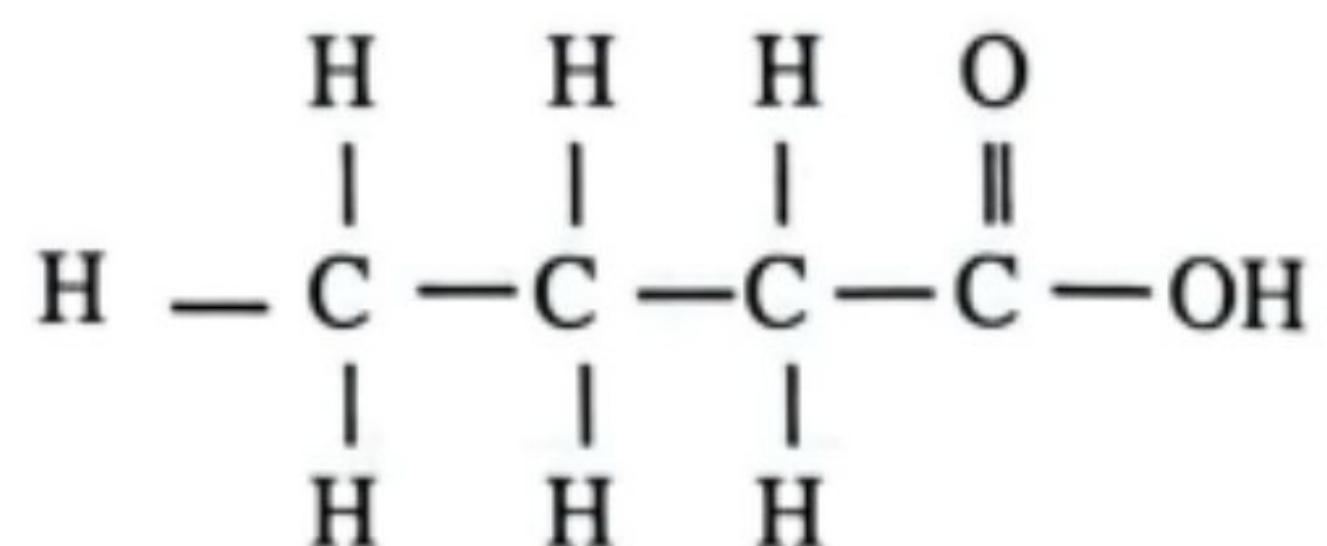
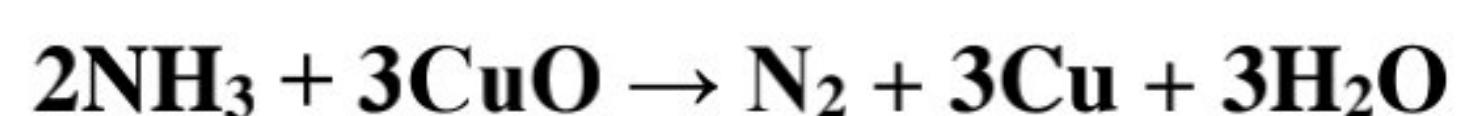


Diagram 7

What is the product formed when X reacts with alcohol that has 3 carbon atoms per molecule?

- A. Propanol
- B. Butanoic acid
- C. Propyl butanoate
- D. Butyl propanoate

24. The following equation represents a redox reaction.



Which of the following pairs of reactants is correctly matched to its reaction?

	$\text{NH}_3$	$\text{CuO}$
A	Undergoes oxidation	Undergoes reduction
B	Acts as an oxidising agent	Acts as a reducing agent
C	Undergoes reduction	Acts as an oxidising agent
D	Acts as a reducing agent	Undergoes oxidation

25. The reaction between acid X and sodium hydroxide solution released 114 kJ of heat while the reaction between acid Z and sodium hydroxide solution released 57 kJ of heat.

Which of the following pairs are correct about the acids?

	X	Z	Basicity of acid Z
A	Hydrochloric acid	Sulphuric acid	Diprotic
B	Ethanoic acid	Hydrochloric acid	Monoprotic
C	Sulphuric acid	Hydrochloric acid	Monoprotic
D	Ethanoic acid	Sulphuric acid	Diprotic

26. What is the fuel value for butan-1-ol?

[Given that heat of combustion of butan-1-ol =  $-2675 \text{ kJ mol}^{-1}$ ; Relative atomic mass: H=1, C=12, O=16]

- A.  $55.73 \text{ kJ g}^{-1}$
- B.  $46.93 \text{ kJ g}^{-1}$
- C.  $41.15 \text{ kJ g}^{-1}$
- D.  $36.15 \text{ kJ g}^{-1}$

27. The following equation shows the reaction between hydrogen and oxygen.



How many moles of oxygen are needed to produce 3.6 g of water?

[Relative atomic mass of H = 1 and O = 16]

- A. 0.1
- C. 1.8
- B. 0.2
- D. 3.6

28. 4.0 cm<sup>3</sup> of sulphuric acid is required to completely neutralise 20.0 cm<sup>3</sup> of 0.1 mol dm<sup>-3</sup> sodium hydroxide solution. What is the concentration of the sulphuric acid?

[Relative atomic mass: H, 1; O, 16; S, 32]

- A. 24.5 g dm<sup>-3</sup>
- B. 49.0 g dm<sup>-3</sup>
- C. 73.5 g dm<sup>-3</sup>
- D. 98.0 g dm<sup>-3</sup>

29. When but-1-ene is shaken with acidic potassium manganate (VII) solution. The purple colour solution turns into colourless. Name the product of this reaction.

- A. Butane-1,2-diol
- C. Butanol
- B. Pentane-1,2-diol
- D. Butanoic acid

30. Diagram 8 shows the structural formula of an organic compound.

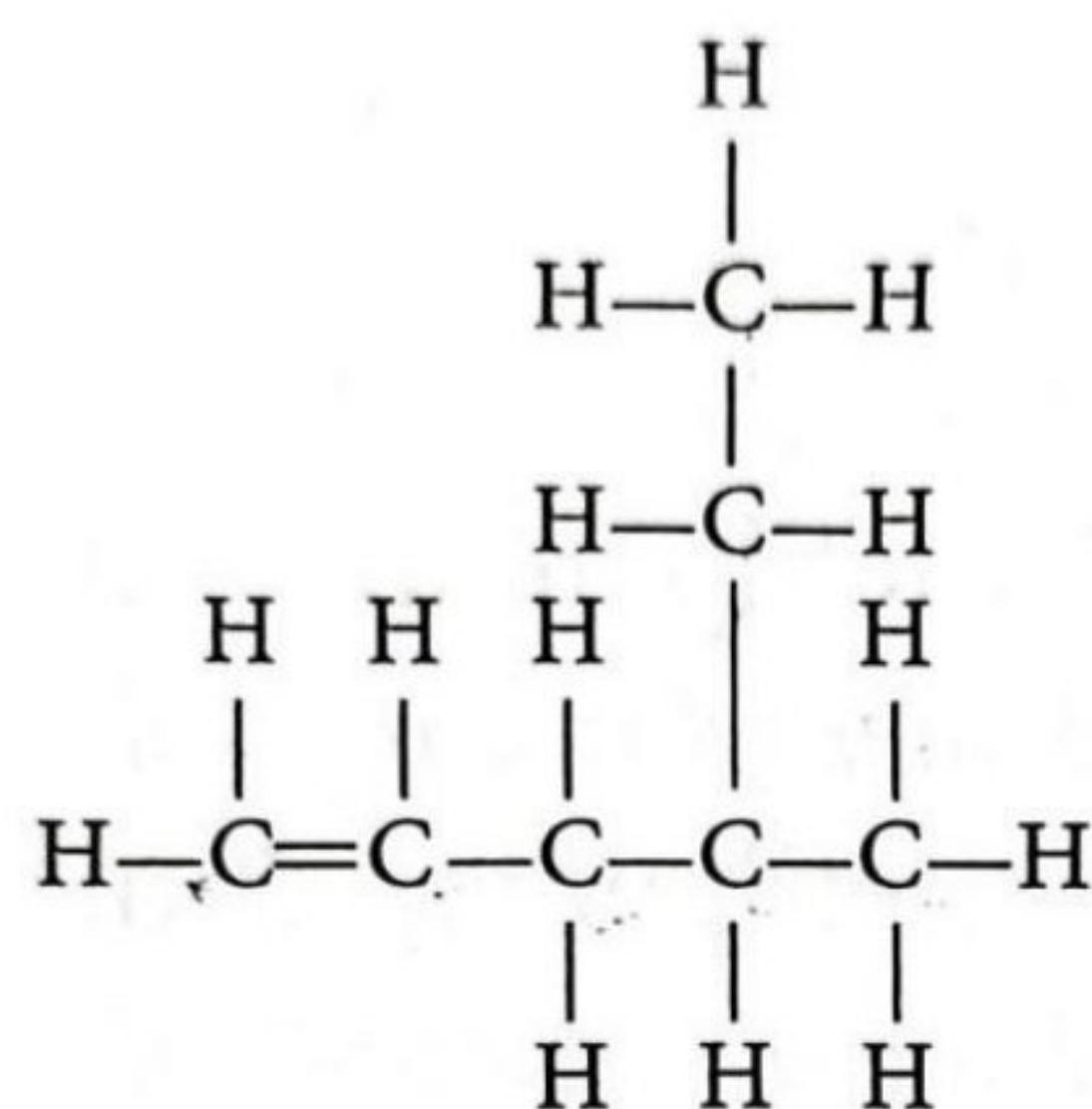


Diagram 8

What is the name of the compound according to the IUPAC nomenclature?

- A. 2-ethylpent-1-ene
- C. 3-methylhex-1-ene
- B. 4-ethylpent-1-ene
- D. 4-methylhex-1-ene

31. Diagram 9 shows a uses of carbon compound in daily life



Diagram 9

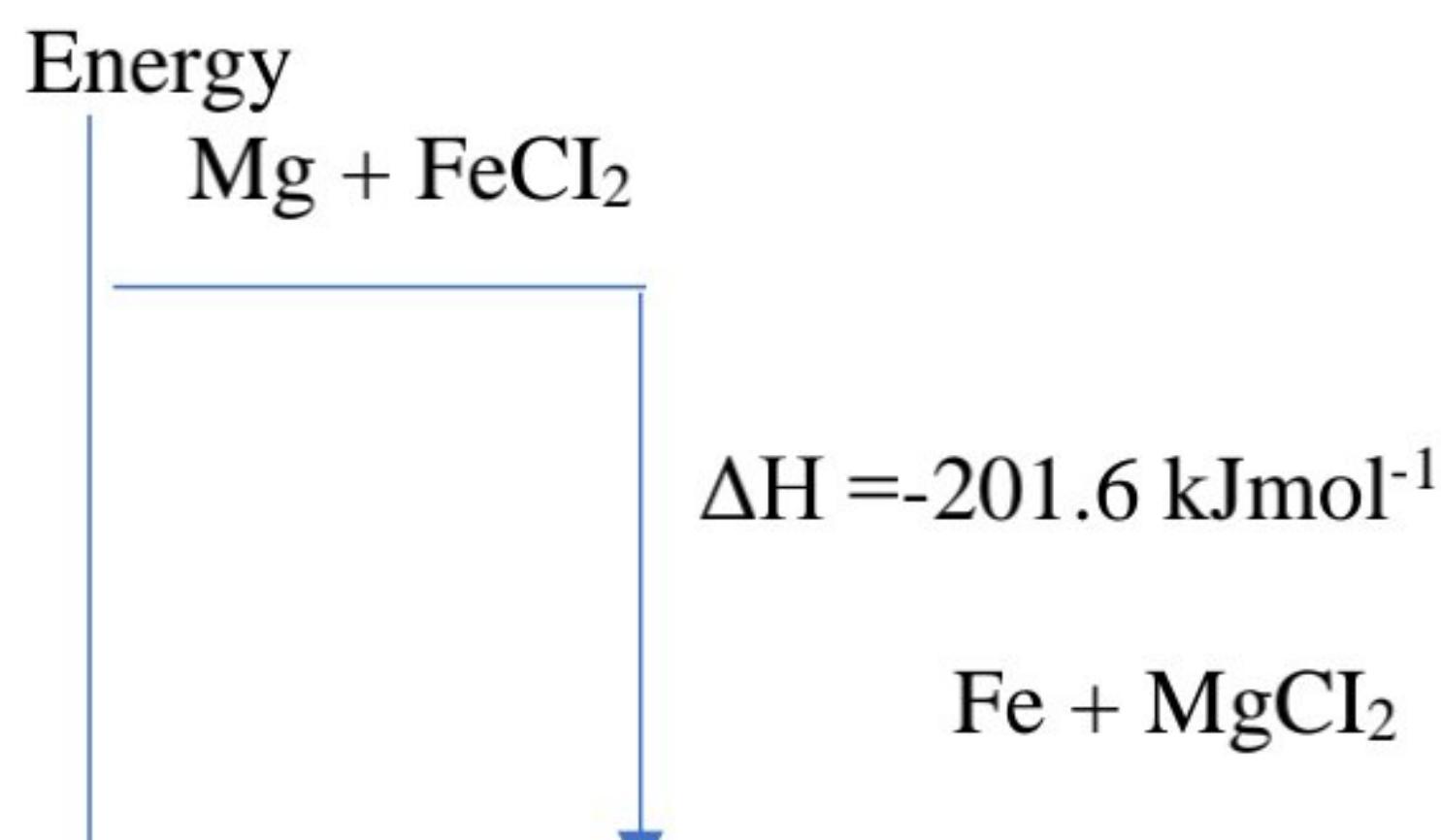
What is the homologous series for this carbon compound

- A. Ester
- C. Alcohol
- B. Alkane
- D. Carboxylic acid

32. Which of the following processes is endothermic?

- A. Dissolving sodium hydroxide powder in water
- B. Dissolving ammonium nitrate in water
- C. Adding a magnesium ribbon to dilute sulphuric acid
- D. Adding sodium hydroxide solution to dilute sulphuric acid

33. Diagram 10 shows the energy level diagram of the displacement reaction between magnesium and Iron(II) chloride solution.



What is the increase in temperature if  $50 \text{ cm}^3$  of  $0.25 \text{ mol dm}^{-3}$  Iron(II) chloride solution is reacted with excess magnesium?

- A.  $12 \text{ }^\circ\text{C}$
- B.  $16 \text{ }^\circ\text{C}$
- C.  $22 \text{ }^\circ\text{C}$
- D.  $24 \text{ }^\circ\text{C}$

34. Table 4 shows the reactants and heat of neutralization of the reaction between sodium hydroxide solution with methanoic acid and hydrochloric acid.

Reactants	Heat of neutralization /kJmol <sup>-1</sup>
Methanoic acid and sodium hydroxide solution	-54
Hydrochloric acid and sodium hydroxide solution	-57

Table 4

Which of the following statements is **true**?

- A. Methanoic acid partially dissociates in water
- B. Methanoic acid releases energy to the surroundings
- C. Methanoic acid produces  $\text{H}^+$  ions which can be replaced by  $\text{Na}^+$  ions
- D. Methanoic acid absorbed some of the heat energy released to complete its dissociation in water

35. Diagram 11 shows the mechanism of rusting of iron.

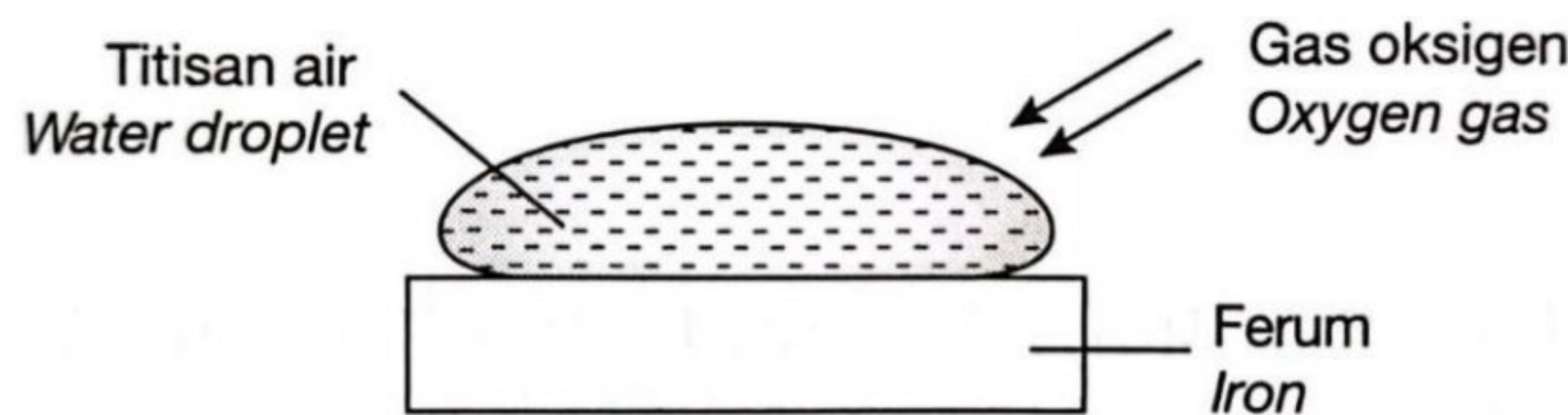


Diagram 11

Which reaction occurred at the anode?

- A.  $\text{Fe} \rightarrow \text{Fe}^{2+} + 2\text{e}$
- B.  $\text{Fe} \rightarrow \text{Fe}^{2+} + 3\text{e}$
- C.  $\text{H}_2 \rightarrow 2\text{H}^+ + 2\text{e}$
- D.  $4\text{OH}^- \rightarrow 2\text{H}_2\text{O} + \text{O}_2 + 4\text{e}$

36. The equation shows the decomposition of a nitrate salt of metal X



Calculate the volume of nitrogen dioxide,  $\text{NO}_2$  gas at room condition if 18.8 g of  $\text{X}(\text{NO}_3)_2$  salt is heated.

[Relative atomic mass: X=64; N=14; O=16; Molar volume =  $24 \text{ dm}^3 \text{ mol}^{-1}$  at room condition]

- A.  $0.6 \text{ dm}^3$
- B.  $1.2 \text{ dm}^3$
- C.  $4.8 \text{ dm}^3$
- D.  $9.6 \text{ dm}^3$

37. Which of the following is observed when copper(II) sulphate solution is electrolysed using copper electrodes?

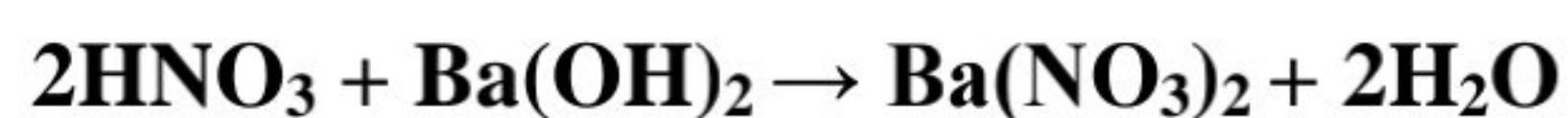
- A. The blue intensity of copper(II) sulphate increases.
- B. Hydrogen gas is released at the cathode.
- C. The mass of the anode decreases.
- D. The blue intensity of copper(II) sulphate remains unchanged.

38. When excess magnesium powder is added to  $50 \text{ cm}^3$  of  $0.1 \text{ mol dm}^{-3}$  copper(II) nitrate solution, a temperature increase of  $T^\circ\text{C}$  is recorded.

What is the temperature increase if excess magnesium powder is added to  $25 \text{ cm}^3$  of  $0.1 \text{ mol dm}^{-3}$  copper(II) nitrate solution?

- A.  $\frac{1}{2} T^\circ\text{C}$
- B.  $T^\circ\text{C}$
- C.  $2 T^\circ\text{C}$
- D.  $4 T^\circ\text{C}$

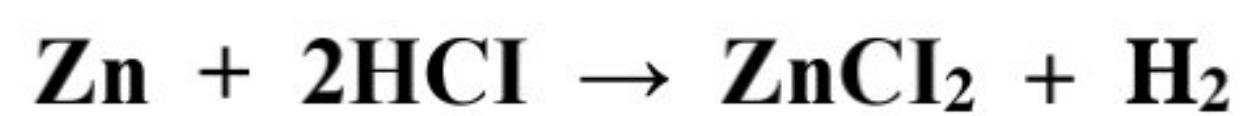
39. The equation represents a neutralization reaction.



10.0 cm<sup>3</sup> of barium hydroxide solution 0.1 mol dm<sup>-3</sup> is titrated with nitric acid 0.1 mol dm<sup>-3</sup>. If the initial reading of the burette is 10.00 cm<sup>3</sup>, what is the final reading of the burette?

- A. 20.00 cm<sup>3</sup>
- B. 30.00 cm<sup>3</sup>
- C. 40.00 cm<sup>3</sup>
- D. 50.00 cm<sup>3</sup>

40. The following equation represents the reaction between zinc granule and hydrochloric acid.



What is the volume of the gas produced when 50 cm<sup>3</sup> of 1.0 mol dm<sup>-3</sup> hydrochloric acid reacted completely with 5 g of zinc granule at room temperature?  
[Relative atomic mass: Zn=65, Molar volume of gas at room condition=24 dm<sup>3</sup> mol<sup>-1</sup>]

- A. 1.88 dm<sup>3</sup>
- B. 0.60 dm<sup>3</sup>
- C. 1.20 dm<sup>3</sup>
- D. 3.75 dm<sup>3</sup>

***END OF QUESTION PAPER***