

CHEMISTRY PAPER 1

8:30 am – 11:00 am (2 hours 30 minutes)

This paper must be answered in English

GENERAL INSTRUCTIONS

1. There are **TWO** sections, A and B, in this Paper. You are advised to finish Section A in about 45 minutes.
2. Section A consists of multiple-choice questions in this question paper, while Section B contains conventional questions printed separately in Question-Answer Book **B**.
3. Answers to Section A should be marked on the Multiple-choice Answer Sheet while answers to Section B should be written in the spaces provided in Question-Answer Book **B**. **The Answer Sheet for Section A and the Question-Answer Book for Section B will be collected separately at the end of the examination.**
4. A Periodic Table is printed on page 20 of Question-Answer Book **B**. Atomic numbers and relative atomic masses of elements can be obtained from the Periodic Table.

INSTRUCTIONS FOR SECTION A (MULTIPLE-CHOICE QUESTIONS)

1. Read carefully the instructions on the Answer Sheet. After the announcement of the start of the examination, you should first stick a barcode label and insert the information required in the spaces provided. No extra time will be given for sticking on the barcode label after the 'Time is up' announcement.
2. When told to open this book, you should check that all the questions are there. Look for the words '**END OF SECTION A**' after the last question.
3. All questions carry equal marks.
4. **ANSWER ALL QUESTIONS.** You are advised to use an HB pencil to mark all the answers on the Answer Sheet, so that wrong marks can be completely erased with a clean rubber. You must mark the answers clearly; otherwise you will lose marks if the answers cannot be captured.
5. You should mark only **ONE** answer for each question. If you mark more than one answer, you will receive **NO MARKS** for that question.
6. No marks will be deducted for wrong answers.

This section consists of two parts. There are 24 questions in PART I and 12 questions in PART II.

Choose the best answer for each question.

Candidates may refer to the Periodic Table printed on page 20 of Question-Answer Book B.

PART I

- Which of the following statements concerning quicklime is INCORRECT ?
 - Heating marble strongly can form quicklime.
 - Reacting quicklime with sulphur dioxide can form calcium sulphate.
 - Reacting quicklime with carbon dioxide can form calcium carbonate.
 - A large amount of heat evolves when quicklime is put into water.
- Which of the following statements concerning quartz is correct ?
 - Quartz is soluble in hexane.
 - Quartz consists of SiO_2 molecules.
 - Quartz conducts electricity by delocalised electrons.
 - Quartz is hard because it has a giant covalent network structure.
- What is the mass of oxygen in 24.0 g of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}(\text{s})$?
(Relative atomic masses : H = 1.0, O = 16.0, S = 32.1, Cu = 63.5)
 - 6.2 g
 - 9.6 g
 - 13.8 g
 - 21.7 g
- Which of the following combinations would give a brown gas when putting X in Y ?

	X	Y
A.	magnesium	concentrated nitric acid
B.	magnesium	concentrated sulphuric acid
C.	magnesium oxide	concentrated sulphuric acid
D.	magnesium oxide	concentrated nitric acid
- Which of the following statements concerning francium (atomic number = 87) is correct ?
 - Francium has a higher melting point than potassium.
 - Francium forms cations more readily than potassium.
 - Francium is a weaker oxidising agent than potassium.
 - Francium has a fewer number of occupied electron shells than potassium.
- What is the product of the reaction between chloroethene and bromine dissolved in an organic solvent ?
 - 2-chloro-1,2-dibromoethane
 - 1,2-dibromo-1-chloroethane
 - 2-chloro-1,1-dibromoethane
 - 2,2-dibromo-1-chloroethane

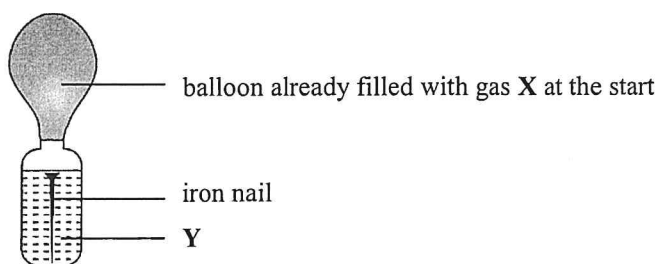
7. Refer to the information in the table below :

Material	Rank order of Hardness (1 = hardest)	Density / g cm ⁻³	Rank order of Price (1 = cheapest)
P	4	8.9	4
Q	3	7.8	1
R	2	10.5	3
S	1	2.7	2

Which is the best material to make aircraft body ?

- A. P
- B. Q
- C. R
- D. S

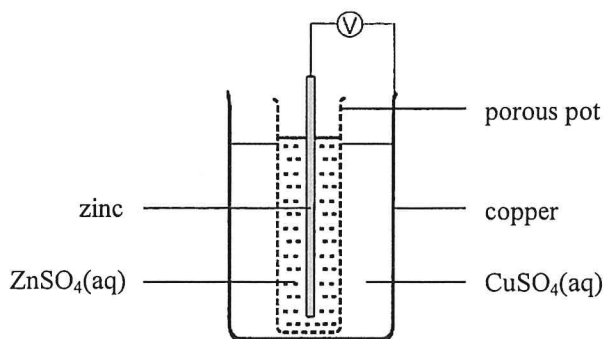
8. Consider the following experimental set-up :



In which of the following combinations would the iron nail rust the fastest ?

- | | X | | Y |
|----|----------|--|-----------------|
| A. | hydrogen | | petrol |
| B. | hydrogen | | distilled water |
| C. | oxygen | | petrol |
| D. | oxygen | | distilled water |

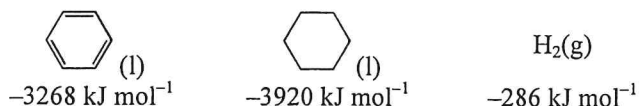
9. Refer to the following chemical cell :



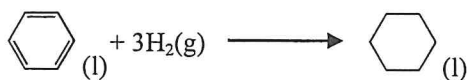
Which of the following statements is correct ?

- A. Copper is the cathode of the cell.
- B. Zinc ions act as the oxidising agent in the cell.
- C. Only zinc ions can pass through the porous pot.
- D. Electrons flow from copper to zinc through the external circuit.

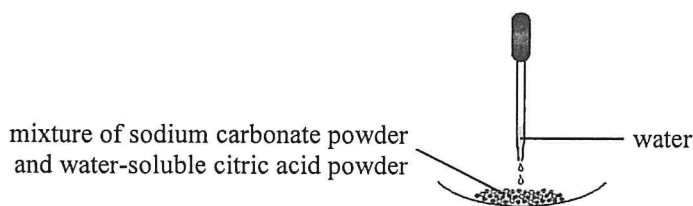
10. Refer to the standard enthalpy changes of combustion below :



What is the standard enthalpy change of the following reaction ?

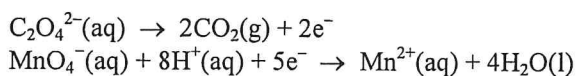


- A. -206 kJ mol^{-1}
 B. -652 kJ mol^{-1}
 C. $+206 \text{ kJ mol}^{-1}$
 D. $+652 \text{ kJ mol}^{-1}$
11. A reaction occurs when water is dropped into the mixture in the set-up below. A colourless gas is given out.



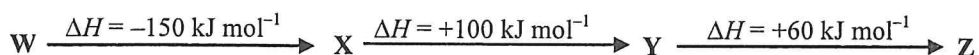
What is the role of water in this reaction ?

- A. Water reacts with sodium carbonate to give the colourless gas.
 B. Water reacts with citric acid to give the colourless gas.
 C. Water is a medium for the formation of carbonate ions from sodium carbonate.
 D. Water is a medium for the formation of hydrogen ions from citric acid.
12. Refer to the following half equations :



What is the minimum volume of 0.010 M acidified $\text{KMnO}_4(\text{aq})$ required to completely oxidise 15.00 cm^3 of 0.020 M $\text{Na}_2\text{C}_2\text{O}_4(\text{aq})$?

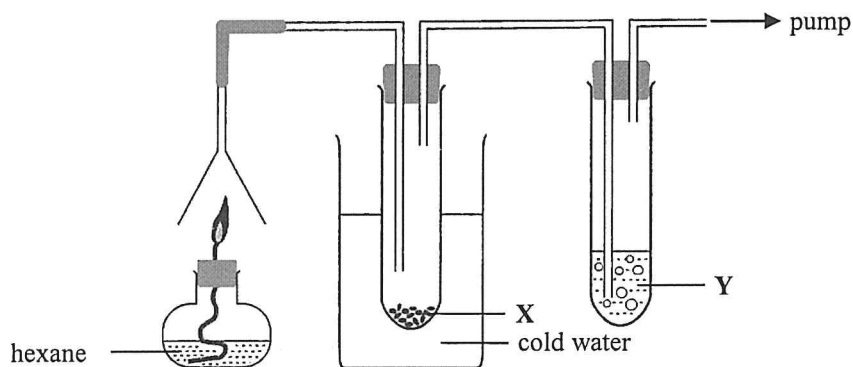
- A. 6.00 cm^3
 B. 12.00 cm^3
 C. 15.00 cm^3
 D. 75.00 cm^3
13. The enthalpy changes for some conversions are shown below :



Which of the following combinations is correct ?

- | | | |
|----|-------------------------------------|-------------------------------------|
| | $\text{W} \longrightarrow \text{Z}$ | $\text{Z} \longrightarrow \text{X}$ |
| A. | exothermic | endothermic |
| B. | exothermic | exothermic |
| C. | endothermic | exothermic |
| D. | endothermic | endothermic |

14. The set-up below is used to show that hexane (C_6H_{14}) contains carbon and hydrogen. What are X and Y ?



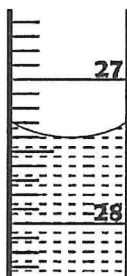
- | | X | Y |
|----|-----------------------|---------------|
| A. | $PbSO_4(s)$ | limewater |
| B. | $NaOH(s)$ | bromine water |
| C. | anhydrous $CoCl_2(s)$ | limewater |
| D. | anhydrous $CuSO_4(s)$ | bromine water |

15. The observations of heating three metal carbonates are shown below :

Metal carbonate	Observation
X_2CO_3	A gas was given out and a shiny silvery solid was formed.
Y_2CO_3	There was no observable change.
ZCO_3	A gas was given out and a yellow solid was formed.

Which of the following shows the decreasing order of reactivity of the metals ?

- A. $Z > Y > X$
 B. $Y > X > Z$
 C. $Z > X > Y$
 D. $Y > Z > X$
16. The initial burette reading in a titration is 4.80 cm^3 , and the corresponding final burette reading can be found from the diagram below :



What is the volume of the reagent used in the titration ?

- A. 23.90 cm^3
 B. 23.80 cm^3
 C. 22.60 cm^3
 D. 22.50 cm^3

17. Which of the following ways is / are acceptable in the storage of the chemical concerned ?

- (1) Store concentrated $\text{H}_2\text{SO}_4(\text{l})$ in a copper container.
- (2) Store concentrated $\text{AgNO}_3(\text{aq})$ in a brown glass container.
- (3) Store concentrated $\text{Pb}(\text{NO}_3)_2(\text{aq})$ in an iron container.

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

18. Which of the following steps can be involved in preparing copper(II) chloride crystals ?

- (1) Add $\text{CuCO}_3(\text{s})$ to $\text{HCl}(\text{aq})$.
- (2) Add $\text{Cu}(\text{NO}_3)_2(\text{s})$ to $\text{NaCl}(\text{aq})$.
- (3) Add $\text{Cu}(\text{s})$ to $\text{HCl}(\text{aq})$.

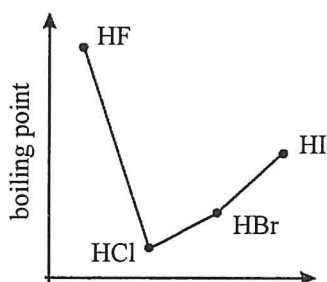
- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

19. Which of the following processes can form a halogen ?

- (1) Electrolyse concentrated $\text{KCl}(\text{aq})$.
- (2) Add $\text{Na}_2\text{SO}_4(\text{s})$ to concentrated $\text{HBr}(\text{aq})$.
- (3) Add $\text{KI}(\text{s})$ to acidified $\text{KMnO}_4(\text{aq})$.

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

20. Refer to the sketch below :



Which of the following can explain the variation of the boiling points of the hydrogen halides ?

- (1) The boiling point of HF is higher than that of HCl because the hydrogen bonds between HF molecules are stronger than the van der Waals' forces between HCl molecules.
- (2) The boiling point of HI is higher than that of HBr because HI molecules are more polar than HBr molecules.
- (3) HCl has the lowest boiling point because it has the smallest molecular size.

- A. (1) only
- B. (2) only
- C. (1) and (3) only
- D. (2) and (3) only

21. Which of the following statements are correct ?

- (1) The standard enthalpy change of formation of $\text{NH}_3(\text{g})$ can be determined directly from experiment.
- (2) The standard enthalpy change of combustion of $\text{H}_2\text{NNH}_2(\text{l})$ is negative.
- (3) The standard enthalpy change of formation of $\text{N}_2(\text{g})$ is zero.

- A. (1) and (2) only
- B. (1) and (3) only
- C. (2) and (3) only
- D. (1), (2) and (3)

22. Which of the following statements concerning ice and water at 0°C are correct ?

- (1) The density of ice is lower than that of water because ice has an open structure but water does not.
- (2) In ice, the hydrogen bonds between the molecules are weaker than the covalent bonds in the molecules.
- (3) In ice, each molecule links up with only two neighbouring molecules by hydrogen bonds.

- A. (1) and (2) only
- B. (1) and (3) only
- C. (2) and (3) only
- D. (1), (2) and (3)

23. Which of the following hazard warning labels should be displayed on a bottle containing methanol ?



- A. (1) and (2) only
- B. (1) and (3) only
- C. (2) and (3) only
- D. (1), (2) and (3)

24. Consider the following statements and choose the best answer :

1st statement

Perspex can be used to make shopping bags.

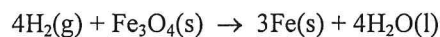
2nd statement

Perspex is a condensation polymer.

- A. Both statements are true and the 2nd statement is a correct explanation of the 1st statement.
- B. Both statements are true but the 2nd statement is NOT a correct explanation of the 1st statement.
- C. The 1st statement is false but the 2nd statement is true.
- D. Both statements are false.

PART II

25. Consider the following reaction :

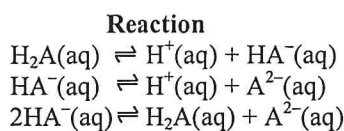


What is the minimum volume of $\text{H}_2(\text{g})$ at room conditions required to form 0.168 g of $\text{Fe}(\text{s})$?

(Molar volume of gas at room conditions = 24 dm^3 ;
Relative atomic mass : Fe = 55.8)

- A. 24 cm^3
- B. 48 cm^3
- C. 96 cm^3
- D. 192 cm^3

26. Consider the information below :



Equilibrium constant at 25°C

$$1.3 \times 10^{-3} \text{ mol dm}^{-3}$$

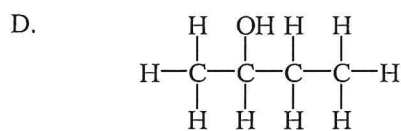
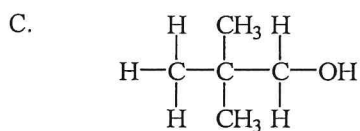
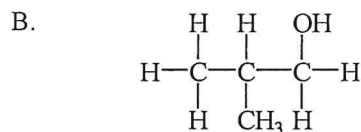
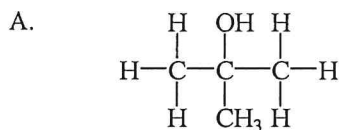
$$3.1 \times 10^{-6} \text{ mol dm}^{-3}$$

X

What is the numerical value of X ?

- A. 4.2×10^2
- B. 2.4×10^{-3}
- C. 4.0×10^{-9}
- D. 2.5×10^8

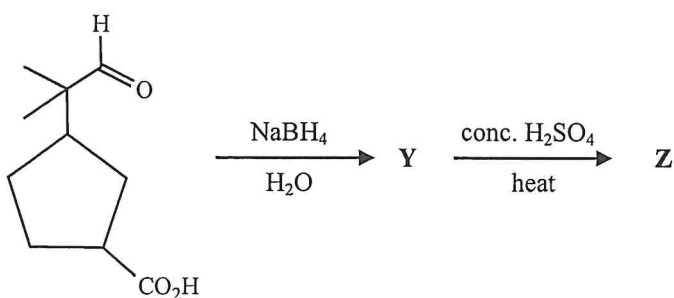
27. Which of the following alkanols can form a ketone by warming with acidified sodium dichromate solution ?



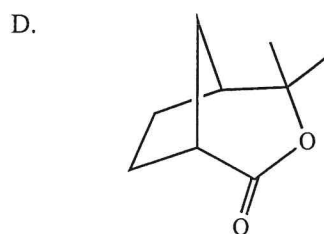
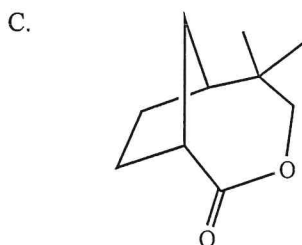
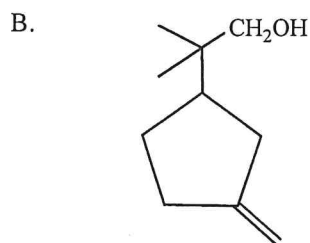
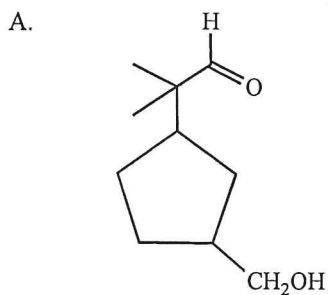
28. Which of the following statements concerning the oxides of elements in the third period of the Periodic Table is correct ?

- A. $\text{SiO}_2(\text{s})$ dissolves in water to form a neutral solution.
- B. $\text{P}_4\text{O}_{10}(\text{s})$ dissolves in water to form an acidic solution.
- C. $\text{Al}_2\text{O}_3(\text{s})$ dissolves in water to form an alkaline solution.
- D. $\text{Cl}_2\text{O}(\text{g})$ dissolves in water to form $\text{Cl}_2(\text{aq})$ and $\text{O}_2(\text{g})$ only.

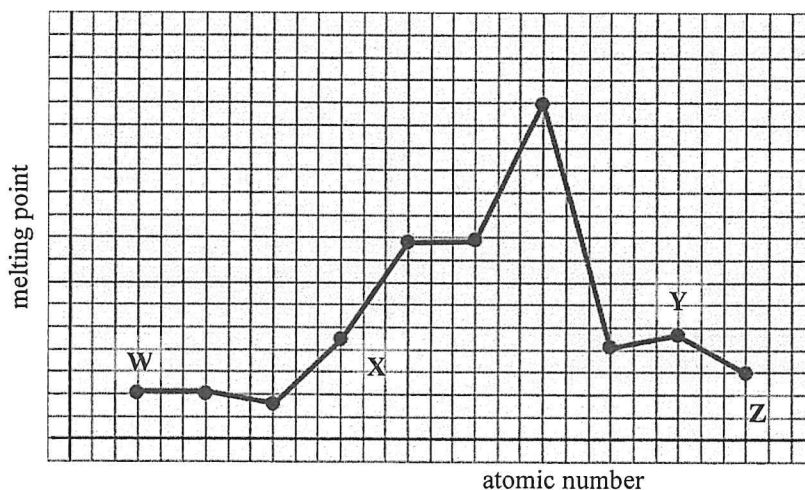
29. Refer to the following conversions :



Which of the following is a possible structure of **Z** ?

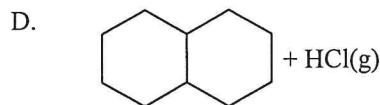
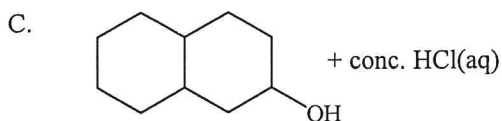
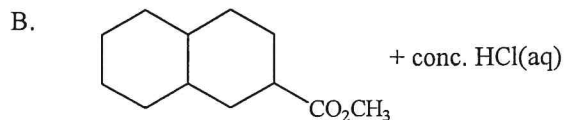
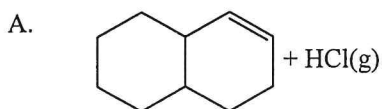


30. The sketch below shows the melting points of ten consecutive elements in the second and third periods of the Periodic Table, arranged in the order of increasing atomic numbers. Sodium is one of these ten elements. Which of **W**, **X**, **Y** or **Z** may represent sodium ?

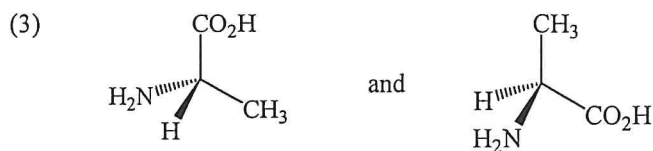
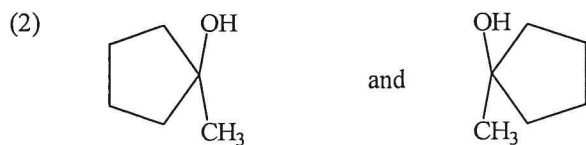
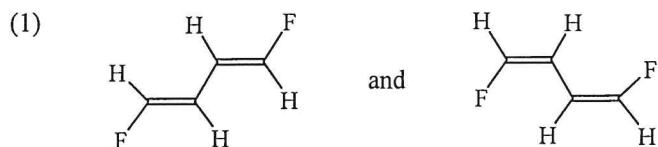


- A. **W**
 B. **X**
 C. **Y**
 D. **Z**

31. Which of the following pairs of reagents would NOT react with each other ?

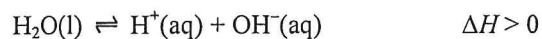


32. Which of the following pairs of compounds are isomers ?



- A. (1) only
 B. (2) only
 C. (1) and (3) only
 D. (2) and (3) only

33. Refer to the following chemical reaction :



The pH of a pure water sample is 7.0 at 25 °C. Which of the following statements is / are correct when the sample has been heated to 50 °C ?

- (1) The $[\text{OH}^-(\text{aq})]$ of the sample is $1.0 \times 10^{-7} \text{ mol dm}^{-3}$.
 (2) The pH of the sample is smaller than 7.0.
 (3) The sample remains neutral.

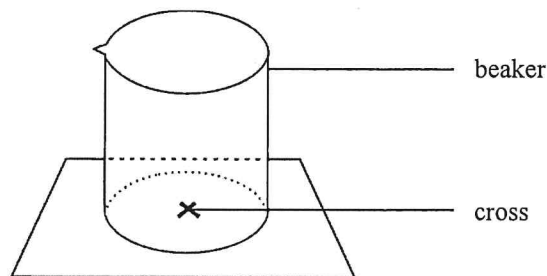
- A. (1) only
 B. (2) only
 C. (1) and (3) only
 D. (2) and (3) only

34. Which of the following statements concerning nylon-6,6 are correct ?

- (1) Fishing net can be made from nylon-6,6.
- (2) $\text{H}_2\text{N}(\text{CH}_2)_6\text{NH}_2$ is one of the monomers of nylon-6,6.
- (3) The intermolecular attractions in nylon-6,6 are covalent bonds.

- A. (1) and (2) only
- B. (1) and (3) only
- C. (2) and (3) only
- D. (1), (2) and (3)

35. Refer to the following set-up :



Which of the following reactions can the effect of concentration on rate be studied by the above set-up ?

- (1) $\text{MgO}(\text{s}) + 2\text{HCl}(\text{aq}) \rightarrow \text{MgCl}_2(\text{aq}) + \text{H}_2\text{O}(\text{l})$
- (2) $\text{Na}_2\text{S}_2\text{O}_3(\text{aq}) + 2\text{HCl}(\text{aq}) \rightarrow \text{S}(\text{s}) + \text{SO}_2(\text{g}) + \text{H}_2\text{O}(\text{l}) + 2\text{NaCl}(\text{aq})$
- (3) $\text{Mg}(\text{s}) + \text{ZnSO}_4(\text{aq}) \rightarrow \text{MgSO}_4(\text{aq}) + \text{Zn}(\text{s})$

- A. (1) and (2) only
- B. (1) and (3) only
- C. (2) and (3) only
- D. (1), (2) and (3)

36. Consider the following statements and choose the best answer :

1st statement

The rate of conversion from glucose to ethanol is increased by adding yeast.

2nd statement

The conversion from glucose to ethanol is catalysed by enzymes in yeast.

- A. Both statements are true and the 2nd statement is a correct explanation of the 1st statement.
- B. Both statements are true but the 2nd statement is NOT a correct explanation of the 1st statement.
- C. The 1st statement is false but the 2nd statement is true.
- D. Both statements are false.

END OF SECTION A

