

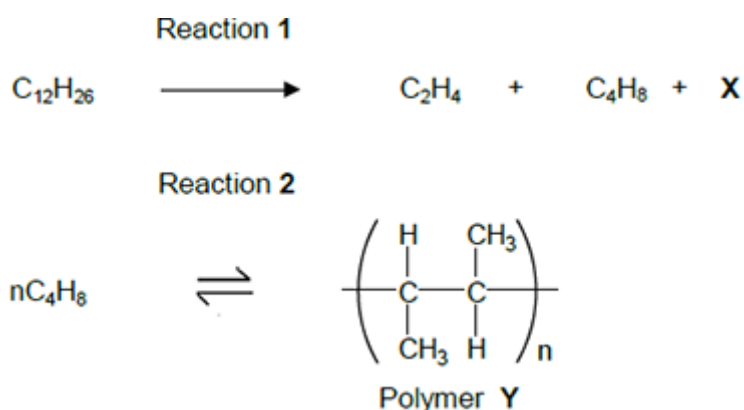
Name of the Student: _____

Max. Marks : 23 Marks

Time : 23 Minutes

Q1.

Dodecane ($C_{12}H_{26}$) is a hydrocarbon found in the naphtha fraction of crude oil. Dodecane can be used as a starting material to produce a wide variety of useful products. The scheme below shows how one such product, polymer Y, can be produced from dodecane.



- (a) Name the homologous series that both C_2H_4 and C_4H_8 belong to.
Draw a functional group isomer of C_4H_8 that does **not** belong to this homologous series.

Name _____

Functional group isomer

(2)

- (b) Identify compound X.

(1)

- (c) Name polymer Y.

(1)

- (d) Reaction 1 is an example of thermal cracking and is carried out at a temperature of $750^\circ C$.

State **one other** reaction condition needed.

(1)

- (e) Reaction **2** is exothermic. A typical compromise temperature of 200 °C is used industrially for this reaction.

Explain the effect of a change of temperature on both the position of equilibrium and the rate of reaction, and justify why a compromise temperature is used industrially.

(6)

(Total 11 marks)

Q3.

A student carried out an experiment to determine the number of C=C double bonds in a molecule of a cooking oil by measuring the volume of bromine water decolourised.

The student followed these instructions:

- Use a dropping pipette to add 5 drops of oil to 5.0 cm³ of inert organic solvent in a conical flask.
- Use a funnel to fill a burette with bromine water.
- Add bromine water from a burette to the solution in the conical flask and swirl the flask after each addition to measure the volume of bromine water that is decolourised.

The student's results are shown in the table below.

Experiment	Volume of bromine water / cm ³
1	39.40
2	43.50
3	41.20

- (a) In a trial experiment, the student failed to fill the burette correctly so that the gap between the tap and the tip of the burette still contained air.

Suggest what effect this would have on the measured volume of bromine water in this trial. Explain your answer.

(2)

- (b) Other than incorrect use of the burette, suggest a reason for the inconsistency in the student's results.

(1)

- (c) Outline how the student could improve this practical procedure to determine the number of C=C double bonds in a molecule of the oil so that more consistent results are obtained.

(4)

- (d) The oil has a density of 0.92 g cm^{-3} and each of the 5 drops of oil has a volume of $5.0 \times 10^{-2} \text{ cm}^3$.
The approximate M_r of the oil is 885.
The concentration of bromine water used was $2.0 \times 10^{-2} \text{ mol dm}^{-3}$.

Use these data and the results from experiment 1 to deduce the number of C=C double bonds in a molecule of the oil.
Show your working.

(5)

(Total 12 marks)