

Name of the Student: _____

Max. Marks : 23 Marks

Time : 23 Minutes

Q1.

Some oil-fired heaters use paraffin as a fuel.

One of the compounds in paraffin is the straight-chain alkane, dodecane ($C_{12}H_{26}$).

- (a) Give the name of the substance from which paraffin is obtained.
State the name of the process used to obtain paraffin from this substance.

Substance _____

Process _____

(2)

- (b) The combustion of dodecane produces several products.

Write an equation for the **incomplete** combustion of dodecane to produce gaseous products only.

(1)

- (c) Oxides of nitrogen are also produced during the combustion of paraffin in air.

- (i) Explain how these oxides of nitrogen are formed.

(2)

- (ii) Write an equation to show how nitrogen monoxide in the air is converted into nitrogen dioxide.

(1)

- (iii) Nitric acid (HNO_3) contributes to acidity in rainwater.

Deduce an equation to show how nitrogen dioxide reacts with oxygen and water to form nitric acid.

(1)

(d) Dodecane ($C_{12}H_{26}$) can be cracked to form other compounds.

(i) Give the general formula for the homologous series that contains dodecane.

(1)

(ii) Write an equation for the cracking of one molecule of dodecane into equal amounts of two different molecules each containing the same number of carbon atoms. State the empirical formula of the straight-chain alkane that is formed. Name the catalyst used in this reaction.

Equation _____

Empirical formula of alkane _____

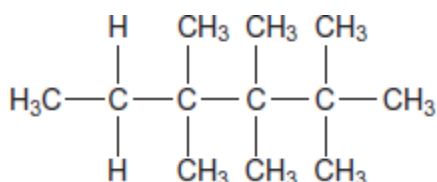
Catalyst _____

(3)

(iii) Explain why the melting point of dodecane is higher than the melting point of the straight-chain alkane produced by cracking dodecane.

(2)

(e) Give the IUPAC name for the following compound and state the type of structural isomerism shown by this compound and dodecane.



IUPAC name _____

Type of structural isomerism _____

(2)

(f) Dodecane can be converted into halododecanes.

Deduce the formula of a substance that could be reacted with dodecane to produce 1-chlorododecane and hydrogen chloride only.

(1)

(Total 16 marks)

Q2.

Trifluoromethane (CHF_3) can be used to make the refrigerant chlorotrifluoromethane(CClF_3).

- (a) Chlorotrifluoromethane is formed when trifluoromethane reacts with chlorine.



The reaction is a free-radical substitution reaction similar to the reaction of methane with chlorine.

- (i) Write an equation for each of the following steps in the mechanism for the reaction of CHF_3 with Cl_2

Initiation step

First propagation step

Second propagation step

Termination step to form hexafluoroethane

(4)

- (ii) Give **one** essential condition for this reaction.

(1)

- (b) In some refrigeration systems, CHF_3 has replaced CClF_3 because of concerns about ozone depletion.

- (i) Identify the species formed from CClF_3 that is responsible for the catalytic decomposition of ozone in the upper atmosphere.

(1)

- (ii) Write an overall equation to represent the decomposition of ozone into oxygen.

(1)

(Total 7 marks)