

Name of the Student: _____

Max. Marks : 20 Marks

Time : 20 Minutes

Q1.

Central heating fuel, obtained by the fractional distillation of crude oil, contains saturated hydrocarbons with the molecular formula $C_{16}H_{34}$

- (a) Give the meaning of the terms **saturated** and **hydrocarbon** as applied to saturated hydrocarbons.

Saturated _____

Hydrocarbon _____

(2)

- (b) If the boiler for a central heating system is faulty, a poisonous gas may be produced during the combustion of $C_{16}H_{34}$

Write an equation for the reaction that forms this poisonous gas and one other product only.

(1)

- (c) Explain why the sulfur compounds found in crude oil should be removed from the fractions before they are used for central heating fuel.

(2)

- (d) A hydrocarbon $C_{16}H_{34}$ can be cracked to form C_8H_{18} , ethene and propene.

- (i) Write an equation to show this cracking reaction.

(1)

- (ii) Suggest **one** important substance manufactured on a large scale from propene.

(1)

(iii) Draw the **displayed formula** of the functional group isomer of propene.

(1)

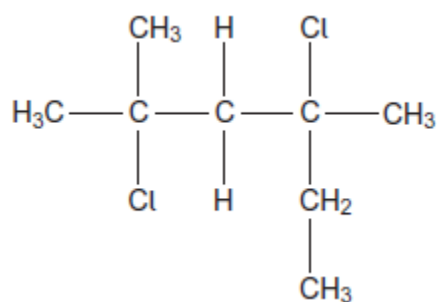
(e) There are many structural isomers with the molecular formula C_8H_{18}

Draw the structure of 2,3,3-trimethylpentane.

(1)

(f) A compound C_8H_{18} reacts with chlorine to give several haloalkanes.

Give the IUPAC name of the following haloalkane.



(1)

(Total 10 marks)

Q2.

There are many uses of halogenated organic compounds despite environmental concerns.

- (a) Bromotrifluoromethane is used in fire extinguishers in aircraft.
Bromotrifluoromethane is formed when trifluoromethane reacts with bromine.



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 Br_2

Initiation step

First propagation step

Second propagation step

A termination step

(4)

- (ii) State **one** condition necessary for the initiation of this reaction.

(1)

- (b) Bromine-containing and chlorine-containing organic compounds may have a role in the decomposition of ozone in the upper atmosphere.

- (i) Draw an appropriate **displayed formula** in the space provided to complete the following equation to show how CBrF_3 may produce bromine atoms in the upper atmosphere.



(1)

- (ii) In the upper atmosphere, it is more likely for CBrF_3 to produce bromine atoms than it is for CClF_3 to produce chlorine atoms.

Suggest **one** reason for this.

(1)

- (iii) Bromine atoms have a similar role to chlorine atoms in the decomposition of ozone.

The overall equation for the decomposition of ozone is



Write **two** equations to show how bromine atoms ($\text{Br}\cdot$) act as a catalyst in the decomposition of ozone.

Explain how these two decomposition equations show that bromine atoms behave as a catalyst.

Equation 1

Equation 2

Explanation

(3)

(Total 10 marks)