Gateways School

**Alkanes & Halogenoalkanes**

**Revision PPQ**

41 marks

**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_**

**Q1.**

(a)    The hydrocarbon but-1-ene (C4H8) is a member of the homologous series of alkenes. But-1-ene has structural isomers.

(i)      State the meaning of the term *structural isomers*.

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**(2)**

(ii)     Give the IUPAC name of the **position** isomer of but-1-ene.

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**(1)**

(iii)    Give the IUPAC name of the **chain** isomer of but-1-ene.

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**(1)**

(iv)    Draw the displayed formula of a **functional group** isomer of but-1-ene.

**(1)**

(b)     But-1-ene burns in a limited supply of air to produce a solid and water only.

(i)      Write an equation for this reaction.

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**(1)**

(ii)     State **one** hazard associated with the solid product in part (b)(i).

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**(1)**

(c)     One mole of compound **Y** is cracked to produce two moles of ethene, one mole of but-1-ene and one mole of octane (C8H18) only.

(i)      Deduce the molecular formula of **Y**.

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**(1)**

(ii)     Other than cracking, give **one** common use of **Y**.

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**(1)**

(d)     In cars fitted with catalytic converters, unburned octane reacts with nitrogen monoxide to form carbon dioxide, water and nitrogen only.

(i)      Write an equation for this reaction.

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**(1)**

(ii)     Identify a catalyst used in a catalytic converter.

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**(1)**

**(Total 11 marks)**

**Q2.**

One of the first substances used as an anaesthetic in medicine was chloroform (trichloromethane, CHCl3). By 1950, *halothane* was in common use but by 1990 this had been replaced by more acceptable anaesthetics such as *desflurane*.

                                      CF3CHBrCl                                   CF3CHFOCHF2                              *halothane*                                        *desflurane*

One reason for replacing *halothane* was that it is an organic compound that contains chlorine. Chlorine-containing organic compounds are thought to cause damage to the ozone layer in the upper atmosphere.

(a)     Name and outline a mechanism for the reaction of chlorine with methane to form chloromethane (CH3Cl).

Write an overall equation for the reaction of chlorine with methane to form trichloromethane (CHCl3).

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**(5)**

(b)     Explain how chlorine atoms are formed from chlorine-containing organic compounds in the upper atmosphere.

Explain, with the aid of equations, how chlorine atoms act as a catalyst in the decomposition of ozone into oxygen.

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**(6)**

(c)     Use the formulae of the two anaesthetics, *halothane* and *desflurane*, to help to explain why *desflurane* is considered to be a more **environmentally** acceptable anaesthetic than *halothane*.

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**(2)**

**(Total 13 marks)**

**Q3.**

(a)     Name and outline a mechanism for the reaction of 2-bromo-2-methylpropane with ethanolic potassium hydroxide to form the alkene 2-methylpropene, (CH3)2C=CH2

*Name of mechanism* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Mechanism*

**(4)**

(b)     Two stereoisomers of but-2-ene are formed when 2-bromobutane reacts with ethanolic potassium hydroxide.

(i)      Explain what is meant by the term *stereoisomers*.

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(ii)     Draw the structures and give the names of the **two** stereoisomers of
but-2-ene.

*Stereoisomer 1*                                    *Stereoisomer 2*

*Name* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *Name* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(iii)     Name this type of stereoisomerism.

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**(5)**

(c)     When 2-bromo-2-methylpropane reacts with aqueous potassium hydroxide,
2-methylpropan-2-ol is formed as shown by the following equation.



State the role of the hydroxide ions in this reaction.

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**(1)**

(d)     Write an equation for the reaction that occurs when CH3CH2CH2CH2Br reacts with an excess of ammonia. Name the organic product of this reaction.

*Equation* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Name of product* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**(3)**

**(Total 13 marks)**

**Q4.**

Which one of the following statements explains best why fluoroalkanes are the least reactive haloalkanes?

**A**       Fluorine is much more electronegative than carbon.

**B**       The F− ion is the most stable halide ion.

**C**       The C–F bond is the most polar carbon–halogen bond.

**D**       The C–F bond is the strongest carbon–halogen bond.

**(Total 1 mark)**

**Q5.**

How many different alkenes are formed when 2-bromo-3-methylbutane reacts with ethanolic potassium hydroxide?

**A**       2

**B**       3

**C**       4

**D**       5

**(Total 1 mark)**

**Q6.**

The number of structural isomers of C3H2Cl6 is

**A**       2

**B**       3

**C**       4

**D**       5

**(Total 1 mark)**

**Q7.**

The number of structural isomers of molecular formula C4H9Br is

**A**       5

**B**       4

**C**       3

**D**       2

**(Total 1 mark)**