AQA – Alkanes – AS Chemistry P2

1. June/ 2020/Paper_2/No.1(1.3_1.5)

0 1 . 3 1-chloropropane can also be produced by the reaction between propane and chlorine in the presence of ultraviolet light.

State why ultraviolet light is needed for this reaction to occur.

Give an equation for each propagation step in the formation of 1-chloropropane from propane.

[3 marks]

Why ultraviolet light is needed _____

_____

_____

Propagation step 1

_____

Propagation step 2

_____

0 1 . 4 The C–Cl bond in 1-chloropropane is polar because carbon and chlorine have different electronegativities.

Define the term electronegativity.

[1 mark]

_____

_____

_____

0 1 . 5 Ammonia reacts with 1-chloropropane to form propylamine.

Name and outline the mechanism for this reaction.

[5 marks]

Name of mechanism _____

Outline of mechanism

2. June/ 2020/Paper_2/No.5

Explain the differences between structural isomerism and stereoisomerism.
Use examples to show how compounds with the molecular formula C_4H_8 exhibit stereoisomerism and the three types of structural isomerism.

[6 marks]

3. June/ 2020/Paper_2/No.7

0 7 This question is about ethanedioic acid ($H_2C_2O_4$) which is a dicarboxylic acid.

0 7 . 1 Draw the skeletal formula of ethanedioic acid.

[1 mark]

0 7 . 2 Ethanedioic acid is formed by the oxidation of ethane-1,2-diol ($HOCH_2CH_2OH$).

State suitable reagent(s) and a condition for this reaction.

[2 marks]

Reagent(s) _____

_____

Condition _____

_____

0 7 . 3 Ethanedioic acid reacts with an excess of sodium hydroxide to form sodium ethanedioate.

$$H_2C_2O_4\,(aq) + 2\,NaOH\,(aq) \rightarrow Na_2C_2O_4\,(aq) + 2\,H_2O\,(l)$$

A student mixes 10.0 cm^3 of 0.400 mol dm^{-3} ethanedioic acid with 50.0 cm^3 of 0.200 mol dm^{-3} sodium hydroxide.

Show that the sodium hydroxide is in excess.

Calculate the mass, in mg, of sodium ethanedioate that can be formed in this reaction.

[5 marks]

Mass of sodium ethanedioate _____ mg

4. June/ 2020/Paper_2/No.9

Which statement is correct about thermal cracking?

[1 mark]

A A pressure between 100 and 200 kPa is used. ⬭

B Aromatic hydrocarbons are the major products. ⬭

C C–C bonds are broken. ⬭

D Zeolite catalysts are used. ⬭

5. June/ 2020/Paper_2/No.14

An excess of methane reacts with chlorine in the presence of ultraviolet radiation.

What are the main products of this reaction?

[1 mark]

A CCl_4 and H_2 ⬭

B CCl_4 and HCl ⬭

C CH_3Cl and H_2 ⬭

D CH_3Cl and HCl ⬭

6. June/ 2019/Paper_2/No.13

Which compound is **not** an isomer of the following compound?

[1 mark]

A $CH_3CH_2COCH_3$ ⬭

B $CH_3CH{=}CHCH_2OH$ ⬭

C $(CH_3)_2CHCHO$ ⬭

D $CH_2{=}CHCH_2CHO$ ⬭

7. June/ 2019/Paper_2/No.15

Which equation represents a propagation step?

[1 mark]

A $\bullet CH_2Cl + Cl\bullet \rightarrow CH_2Cl_2$ ⬭

B $\bullet CH_3 + \bullet CH_3 \rightarrow C_2H_6$ ⬭

C $Cl_2 \rightarrow Cl\bullet + Cl\bullet$ ⬭

D $CH_3Cl + Cl\bullet \rightarrow \bullet CH_2Cl + HCl$ ⬭

8. June/ 2021/Paper_2/No.6

0 6 Trichlorofluoromethane (CCl_3F) was developed as a refrigerant. The production and use of CCl_3F is now restricted.

0 6 . 1 The equation for a process used to manufacture CCl_3F is

$$SbF_3Br_2 + CCl_4 \rightarrow CCl_3F + SbF_2Br_2Cl$$

Calculate the percentage atom economy for the production of CCl_3F in this reaction. Give your answer to 3 significant figures.

[2 marks]

Percentage atom economy _____

An alternative synthesis of CCl_3F is the free-radical substitution reaction between fluoromethane (CH_3F) and chlorine.

0 6 . 2 An intermediate in this alternative synthesis is dichlorofluoromethane ($CHCl_2F$)

Give equations to represent the two propagation steps in the conversion of $CHCl_2F$ into CCl_3F

[2 marks]

Propagation step 1

_____

Propagation step 2

_____

0 6 . 3 Analysis of the products of this reaction shows the formation of a compound with the empirical formula CCl_2F

Give an equation to represent a termination step forming this compound.
Show the structural formula of the product in the equation.

[1 mark]

9. June/ 2021/Paper_2/No.8

When hexadecane ($C_{16}H_{34}$) is heated to a high temperature, one molecule of hexadecane decomposes to form an alkane containing eight carbon atoms and two different unsaturated compounds.

Which equation could represent this reaction?

[1 mark]

A $C_{16}H_{34} \rightarrow C_8H_{16} + C_5H_{12} + C_3H_6$ ⬭

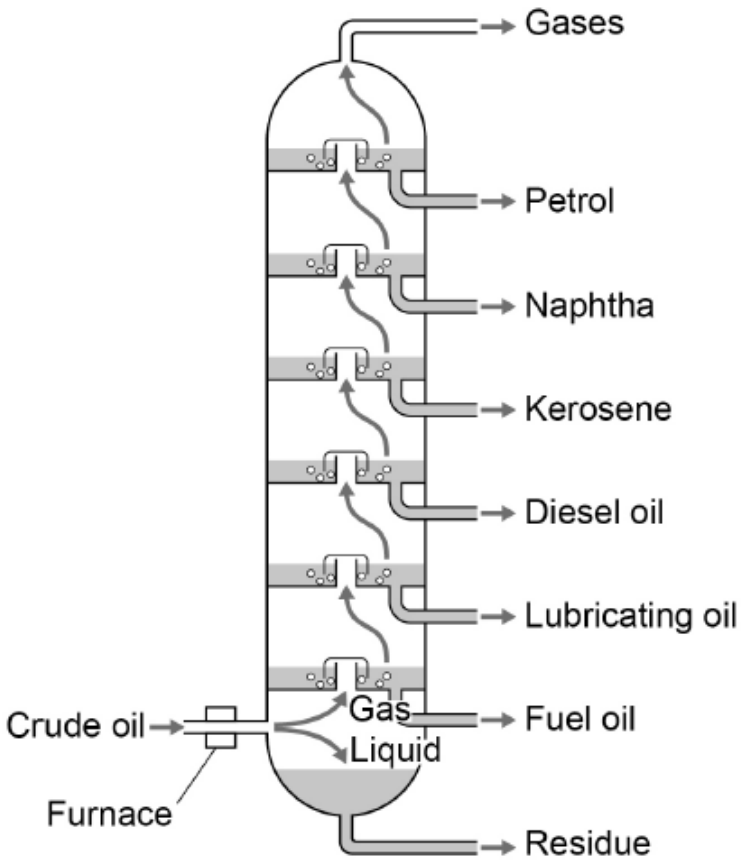
B $C_{16}H_{34} \rightarrow C_8H_{18} + C_6H_{10} + C_2H_6$ ⬭

C $C_{16}H_{34} \rightarrow C_8H_{18} + 2\,C_2H_4 + C_4H_8$ ⬭

D $C_{16}H_{34} \rightarrow C_8H_{18} + C_6H_{14} + C_2H_2$ ⬭

10. June/ 2021/Paper_2/No.9

The diagram shows a fractionating column used in the industrial fractional distillation of crude oil.



Which statement is correct?

[1 mark]

A The most viscous product is fuel oil. ⬭

B The boiling point of naphtha is higher than diesel oil. ⬭

C Molecules in diesel oil are held together by hydrogen bonds. ⬭

D Kerosene is a mixture of compounds. ⬭