InkChemistry

QUESTION WORKBOOK

# Alkenes: structure, electrophilic addition and Markovnikov's rule

Alkenes and alcohols · Unit C18

AQA 3.3.4.1, 3.3.4.2 · OCR A 4.1.3

20 questions · 64 marks

NAVY SCREEN EDITION

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## SECTION A · Short, 1 to 2 marks

**A1** ASE-Q1

State the general formula of the alkenes, and state what is meant by the term unsaturated. [2]

**A2** ASE-Q15

Explain why a tertiary carbocation is more stable than a primary carbocation. [2]

**A3** ASE-Q18

State the colour change, and name the organic product, when ethene is shaken with cold, dilute, acidified potassium manganate(VII). [2]

**A4** ASE-Q19

Suggest the structure of an alkene, $C_5H_{10}$, that gives propanone and ethanoic acid when it is heated with hot, concentrated, acidified potassium manganate(VII). [2]

## SECTION B · Standard, 3 to 5 marks

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**B1** ASE-Q4

Outline the mechanism for the reaction of propene with hydrogen bromide to form 2-bromopropane. [4]

**B2** ASE-Q6

Outline the mechanism for the reaction of ethene with bromine to form 1,2-dibromoethane. [4]

**B3** ASE-Q8

Suggest the major organic product when hydrogen bromide adds to each of pent-1-ene, $CH_2=CHCH_2CH_2CH_3$, and 2-methylpent-2-ene, $(CH_3)_2C=CHCH_2CH_3$, naming the type of carbocation each product forms through. [4]

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**B4** ASE-Q9

Describe a test to show that a liquid hydrocarbon is unsaturated, and explain why the main product of cyclohexene with bromine water is not 1,2-dibromocyclohexane. [4]

**B5** ASE-Q16

Outline the mechanism for the reaction of ethene with concentrated sulfuric acid to form ethyl hydrogensulfate. [4]

**B6** ASE-Q2

Describe the bonding in the C=C double bond of ethene, and state the bond angle about each carbon atom. [3]

**B7** ASE-Q3

Explain why alkenes react with electrophiles but alkanes do not. [3]

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**B8** ASE-Q5 Explain how a bromine molecule, which has no permanent dipole, is able to act as an electrophile towards ethene. [3]

**B9** ASE-Q7 Explain why 2-bromopropane, not 1-bromopropane, is the major product when propene reacts with hydrogen bromide. [3]

**B10** ASE-Q10 Suggest why three different organic products form when ethene is bubbled into bromine water that also contains dissolved sodium chloride. [3]

**B11** ASE-Q12 Calculate the mass of bromine that reacts with 2.10 g of propene. Mr of propene is 42.0 and Mr of $Br_2$ is 159.8. [3]

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**B12** ASE-Q14 Compare the organic products formed when hydrogen bromide reacts with but-1-ene and with but-2-ene. [3]

**B13** ASE-Q17 State the catalyst, the temperature and the pressure used to make ethanol industrially from ethene and steam. [3]

**B14** ASE-Q20 Explain how hot, concentrated, acidified potassium manganate(VII) could be used to distinguish pent-1-ene from pent-2-ene. [3]

**B15** ASE-Q21 Describe the bonding in the C=C bond of ethene in terms of hybridised orbitals. [3]

## SECTION C · Long, 6 marks or more

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**C1**
ASE-Q11

Draw the mechanism for the reaction of 2-methylbut-1-ene, $CH_2=C(CH_3)CH_2CH_3$, with hydrogen bromide to form the major product, and explain why this product, rather than its isomer, is the major one. [6]

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