 Alkene profile

Specification references

* C7.2.2 Reactions of alkenes
* WS1.2

Aims

Alkenes are hydrocarbons with a carbon-carbon double bond. Due to the presence of the double bond their reactions are very different from the alkanes, which you met in the previous topic. In this activity you will work in small groups to create a profile of alkenes to illustrate their characteristic properties and reactions.

Learning outcomes

After completing this activity, you should be able to:

* state a definition of an alkene
* give the names and draw the displayed formulae of the first four alkenes
* draw the displayed structural formulae for the products of the addition reactions between alkenes and hydrogen, water (steam), or a halogen
* state the products of a combustion reaction of an alkene
* predict the word and balanced symbol equations for the complete combustion of an alkene when the number of carbon atoms is given
* predict the word and balanced symbol equations, and describe the conditions, for the reactions between alkenes and hydrogen, water (steam), or a halogen.

Task

1. Complete the table below to show the molecular and displayed formulae of the first four alkenes. In each case, draw the double bond at the right-hand end of the displayed formula.

|  |  |  |
| --- | --- | --- |
| Name | Molecular formula | Displayed formula |
| ethene |  |  |
| propene |  |  |
| butene |  |  |
| pentene |  |  |

1. Create a profile for alkenes using **ethene** as your example. You should include the following points:
	1. Combustion
* Write the equation for complete combustion of ethene.
* Explain why ethene’s flame is smokier than ethane’s.
* Explain why alkenes are not used as fuels.
	1. Reaction with hydrogen
* Give the temperature and catalyst needed for the reaction of ethene with hydrogen.
* Draw the displayed formula of the product of this reaction, and state its name.
* Write a balanced symbol equation for the reaction.
	1. Reaction with halogens (chlorine, bromine, and iodine)
* State what you would observe when ethene reacts with bromine water.
* Draw the displayed formula of the product of the reaction between ethene and bromine.
* Write a balanced symbol equation for this reaction.
	1. Reaction with water (steam)
* Give the conditions and catalyst needed for the reaction of ethene with steam.
* Draw the displayed formula of the product of this reaction and state its name.
* Write a balanced symbol equation for the reaction.
* Explain why this is an important industrial reaction.

Questions

You can use models to help you answer some of these questions.

1. State what is meant by:
	1. a functional group

 (*1 mark*)

* 1. a homologous series

 (*1 mark*)

* 1. a displayed formula.

 (*1 mark*)

1. a i Give the general formula of alkenes.

 (*1 mark*)

 ii Octene is an alkene with eight carbons. Give its molecular formula.

 (*1 mark*)

 b Explain why alkenes are said to be unsaturated.

 (*1 mark*)

 c i Explain why the reactions of alkenes are described as addition reactions.

 (*1 mark*)

 ii Illustrate your answer by writing an equation between ethene and chlorine.

 (*1 mark*)

1. Describe the test you would use to distinguish an alkene from an alkane.

 (*2 marks*)

1. Draw a displayed formula of the product formed when:
	1. propene reacts with chlorine

 (*1 mark*)

* 1. butene reacts with iodine

 (*1 mark*)

* 1. pentene reacts with hydrogen.

 (*1 mark*)

1. When propene reacts with steam, two products are formed. Draw the displayed formulae of these two products. (*2 marks*)
2. a Give a balanced symbol equation for the complete combustion of pentene.

 (*1 mark*)

b Explain why pentene burns with a smoky flame.

 (*1 mark*)

1. Make a table to list the similarities and differences between alkanes and alkenes. You should consider their general formulae, their structures and their chemical reactions. When you have finished, compare your table with others in the class and amend yours as appropriate. (*6 marks*)