



1. (a) Alkenes are unsaturated hydrocarbons. Explain what is meant by unsaturated.

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- (b) (i) What is the general formula for alkenes?

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- (ii) What is the ratio of carbon atoms to hydrogen atoms in alkenes?

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2. Complete the table below to show the information of the first three members in the alkene homologous series.

Chemical name	Chemical formula	Structural formula

3. (a) State three trends, in terms of physical properties, of alkene molecules down the homologous series, from the smallest molecules to the largest molecules.

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- (b) Alkenes are hydrocarbons. What is meant by hydrocarbons?

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- (c) Explain why alkenes are more reactive than alkanes generally.

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- (d) Name a process that can produce alkene molecules.

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4. (a) Write the chemical equations for the complete combustion of the following alkenes.

(i) Ethene

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(ii) Propene

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- (b) What would be the possible products from incomplete combustion of alkenes?

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- (c) (i) Calculate the percentage of mass of carbon in each molecule.

Molecules	Homologous series	Percentage of carbon
C_2H_4	Alkene	
C_2H_6	Alkane	

- (ii) Explain why alkenes burn with a more smoky flame than alkanes during incomplete combustion.

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5. Alkenes can undergo addition reactions.

(a) (i) Explain what is meant by an addition reaction.

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(ii) Explain why alkenes becomes saturated organic compounds after undergoing addition reaction.

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(b) Alkenes can undergo the addition reaction with hydrogen.

(i) What is the term to describe the addition of hydrogen to alkenes?

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(ii) Name the catalyst needed for this reaction.

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(iii) Name one other condition needed for this reaction.

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(iv) Write an equation to show the reaction between ethene and hydrogen.

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6. Vegetable oils are polysaturated fats. Margarine is produced from the reaction of vegetable oils and hydrogen.

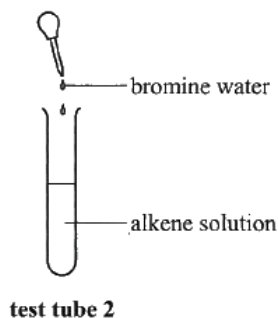
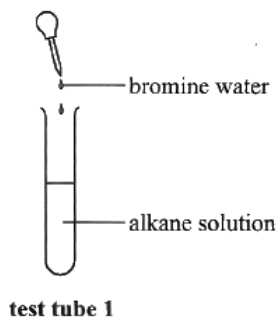
(a) What is meant by polysaturated fats?

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(b) Which fats, saturated or unsaturated, is more healthy to be consumed in food?

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- (c) Explain why hydrogen is used to react with vegetable oils to produce margarine.
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- (d) Describe briefly how margarine is produced.
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- (e) Why does margarine have a higher melting point than vegetable oils?
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- (f) Explain why margarine is still considered a healthy product after addition reaction.
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7. Alkenes can undergo the addition reaction with steam. This reaction is used in the industries to produce alcohols.
- (a) What is the term to describe the addition of steam to alkenes?
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- (b) (i) Name the catalyst needed for this reaction.
- (ii) Name two other conditions that are needed for this reaction.
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- (iii) Write an equation to show the reaction between propene and steam.
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8. Alkenes can undergo the addition reaction with bromine.
- (a) What is the term to describe the addition of bromine to alkenes?
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- (b) Complete the word equation to represent the addition of bromine to alkenes.
- Alkenes + Bromine → , where x and y are the positions of bromine atoms on the carbon atoms in a carbon chain
- (c) The diagrams below show the addition of bromine to solutions of alkanes and alkenes.





Complete the table below to show the observations between the reaction of bromine with alkanes and alkenes.

Test tube	Colour of bromine water	
	Before adding into the solution	After adding into the solution and shaken
1		
2		

(d) Why bromination is important in the study of alkanes and alkenes?

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(e) Complete the following chemical reactions.

