In context

Subject area: Organic chemistry | **Level: 14-16 years (Foundation)**

Topic: Alkenes | **Source: rsc.li/3jI6P77**

1. Many fresh fruit and vegetables produce ethene.

This gas may then ripen other fruit which is unripe.

The table below shows how much ethene (in cm^3) is produced from 1 kg of fruit each hour.

Source: Envato Elements

Name of fruit or vegetable	Volume of ethene produced by 1 kg of fruit in 1 hour (in cm^3)
Apricot	30
Avocado	150
Rhubarb	0.25
Banana	3.2
Pineapple	1.2×10^{-3}
Passion fruit	235
Pear	85

a) Write the volume of ethene produced by 1 kg of pineapple per hour as a normal number (that is, one not in standard form).

Answer: *0.0012.*

b) Place the fruit in order of the volume of ethene they produce each hour, smallest first.

Answer: *Pineapple, rhubarb, banana, apricot, pear, avocado, passion fruit.*

c) Calculate the volume of ethene produced by the following masses of fruit.

Remember to give units in your answers.

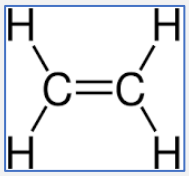
i) 2 kg of bananas in 1 hour
Answer: 6.4 cm^3.

ii) 200 g of apricots in 1 hour
Answer: *6 cm^3.*

iii) 4 kg of pears in 2 hours
Answer: 680 cm^3.

d) Ethene has the molecular formula C_2H_4.

Draw the structure of an ethene molecule showing the chemical bonds.



e) Ethene is described as an unsaturated hydrocarbon, define each term in the table below.

Unsaturated	***Answer:*** *A molecule containing one or more carbon single bonds.*
Hydrocarbon	***Answer:*** *A substance containing hydrogen and carbon only.*

f) State the name of a chemical substance that could be used to show that ethene is unsaturated.

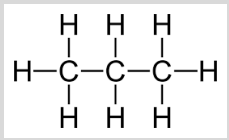
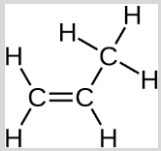
Answer: *Bromine water.*

g) Give the result of the test when using the substance in part f).

Answer: *Bromine water goes from orange to colourless.*

2. This question is about the two molecules in the table below.

a) Complete the table.

	 **Molecule 1**	 **Molecule 2**
Homologous series	***Answer:*** *Alkanes.*	***Answer:*** *Alkenes.*
General formula of homologous series	***Answer:*** *$C_nH_{(2n+2)}$*	***Answer:*** *C_nH_{2n}*
Name of substance	***Answer:*** *Propane.*	***Answer:*** *Propene.*
Molecular formula	***Answer:*** *C_3H_8*	***Answer:*** *C_3H_6*
Burns with smoky flame (Y/N)	***Answer:*** *No.*	***Answer:*** *Yes.*

b) Give the name of a substance that would change molecule 2 into molecule 1.

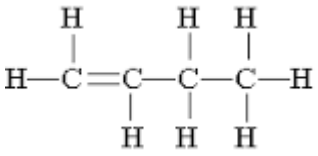
Answer: *Hydrogen.*

c) Which of the molecules is the more reactive?

Give a reason.

Answer: *Molecule 2.*
It contains a carbon double bond.

Parts d) and e) are about the molecule shown.



d) What is the name of this molecule?

Answer: *Butene or but-1-ene.*

e) Which molecule in the table (molecule 1 or molecule 2) is this molecule most similar to?

Give a reason for your answer.

Answer: *Molecule 2.*
Molecule 2 and but-1-ene both have carbon double bonds, or contain the same functional group.