

In context

Subject area: Organic chemistry

Level: 14–16 years (Higher)

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.

| 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 |



Source: Envato Elements

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).

b) 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**

ii) **200 g of apricots in 1 hour**

iii) **4 kg of pears in 2 hours**

iv) **150 g of apricots in 30 minutes**

- c) Calculate the mass of passion fruits that will produce exactly 1.00 dm^3 (1 litre) of ethene in 1 hour.

Give your answer to 3 significant figures.

- d) Scientists have produced ethene scavengers that are based on the metal called palladium.

These can reduce the ethene concentration by 95%.

- i) A sample of gas contains 5000 dm^3 of ethene.

Calculate the volume of ethene that remains after the ethene scavengers have been used.

Show your working.

- ii) Explain why companies that transport fruit and vegetables may use palladium-based ethene scavengers.

2. Propene has the molecular formula C_3H_6 .

a) Draw the structure of a propene molecule showing the chemical bonds.

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

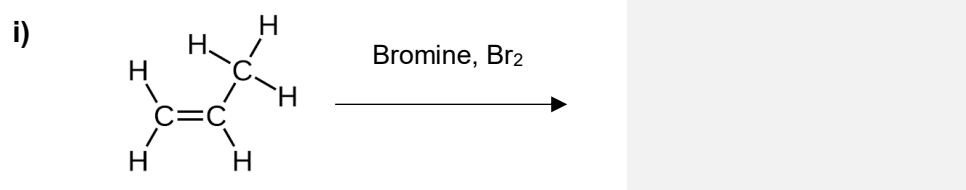
| | |
|-------------|--|
| Unsaturated | |
| Hydrocarbon | |

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

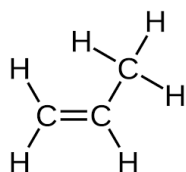
d) Give the result of the test when using the substance in part f).

e) Consider some reactions of propene with other molecules.

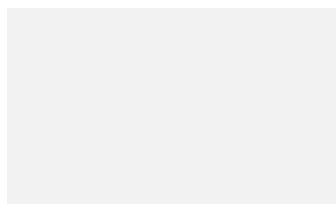
Draw the structure of the product molecules in each case.



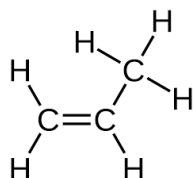
ii)



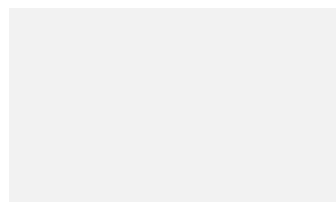
Chlorine, Cl₂



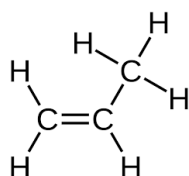
iii)



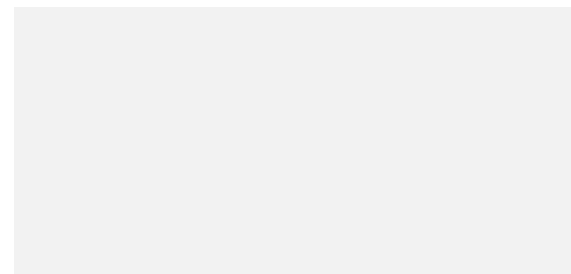
Hydrogen gas and
nickel catalyst at
150°C



iv)



Steam with a
phosphoric acid
catalyst



f) Explain why alkenes often burn with a smoky flame, whereas the corresponding alkanes do not.