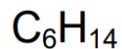


(Alkanes (general formula, structures, combustion))

Q1. (2019)



Q2. (2019)

high temperature

any **one** from:

- steam
- catalyst

Q3. (2019)

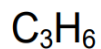
greater demand (for smaller molecules)

any **one** from:

(because smaller molecules are)

- more useful
- better fuels
- used to make alkenes
- used to make polymers

Q4. (2019)

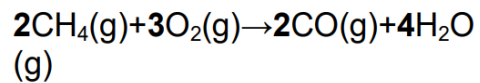


Q5. (2019)

not enough oxygen

(so) incomplete combustion

Q6. (2019)



Q7. (2019)

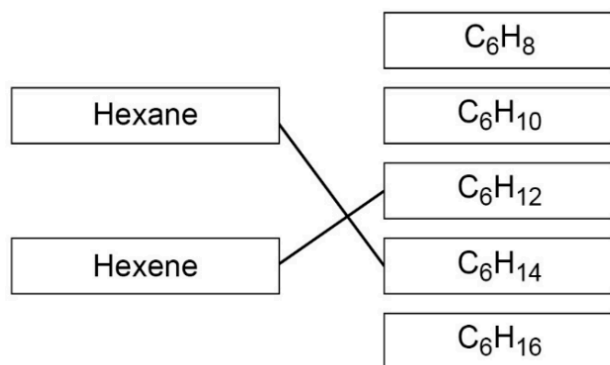
ratio of $\text{O}_2 : \text{CO}_2 = 5 : 3$

$$\begin{aligned} \text{(oxygen needed)} &= \frac{3.60 \times 5}{3} \\ &= 6.0 \text{ (dm}^3\text{)} \end{aligned}$$

$$\begin{aligned} \text{(oxygen unreacted)} &= 7.25 - 6.0 \\ &= 1.25 \text{ (dm}^3\text{)} \end{aligned}$$

$$\begin{aligned} \text{(oxygen unreacted)} &= 1.25 \times \\ &1000 \\ &= 1250 \text{ (cm}^3\text{)} \end{aligned}$$

Q8. a). (2020)



Q8. b). (2020)

(remains) orange

(becomes) colourless

Q9. (2020)

Structure and bonding

- both are hydrocarbons
- both contain two carbon atoms (per molecule)
- ethane contains six hydrogen atoms (per molecule)
- (but) ethene contains four hydrogen atoms (per molecule)
- both have covalent bonds
- ethane contains a single C—C bond
- (but) ethene contains a double bond
- both contain C—H bonds
- both small molecules

Reactions

- both react with oxygen in complete combustion reactions
- to produce water and carbon dioxide
- both react with oxygen in incomplete combustion reactions
- to produce water, carbon monoxide and carbon
- incomplete combustion is more likely with ethene
- ethene decolourises bromine water
- (but) ethane does not decolourise bromine water
- ethene is more reactive (than ethane)
- ethene can react with hydrogen (to produce ethane)
- ethene can react with water (to produce ethanol)
- ethene can react with halogens (to produce halogenoalkanes)
- ethene can undergo addition reactions
- ethene can polymerise (to produce poly(ethene))

ignore physical properties
ignore references to flammability

Q10. a). (2021)

all five points plotted correctly

Q10. b). (2021)

98 (°C)

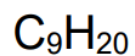
Q10. c). (2021)

the boiling point is lower
than 0 (°C)

Q10. d). (2021)

gas

Q10. e). (2021)



Q10. f). (2021)

(nonane) has a higher boiling point

(so nonane) condenses where the column has a higher temperature