**Combustion**

**2019**

(a) Butane can be used as a fuel and can undergo both complete and incomplete combustion.

Compare and contrast the complete and incomplete combustion of butane.

In your answer, you should:

• outline the conditions that would cause complete and incomplete combustion to occur

• name the products that are formed under the different conditions

• describe the appearance of the flames, and link this to any relevant products formed

• explain the effects of the products of **incomplete** combustion of butane on the environment.

(b) Other alkanes and alkenes can also be used as fuels.

(i) Complete the following equations:

A word equation to show pentane undergoing complete combustion.

pentane + oxygen 🡪

A balanced symbol equation to show ethene undergoing complete combustion.

C2H4 + O2 🡪

(ii) Write balanced symbol equations for the following combustion reactions:

Propane forming water, carbon dioxide, and carbon monoxide.

Butane forming water and carbon monoxide.

**2018**

(a) Fuels such as butane react with oxygen to release energy.

(i) Draw the structural formula of butane.

(ii) When butane reacts with oxygen, water vapour is produced, as well as carbon dioxide, carbon monoxide,

and / or carbon particles (soot), depending on the conditions.

Explain under what conditions these various products are produced.

In your answer, you should state the type of reaction(s) occurring and give balanced symbol equations for the reaction(s).

(b) A variety of fuels can be used in car engines. The table below shows some properties of two of these fuels.



Evaluate the feasibility of replacing petrol with ethanol as a fuel for use in cars.

In your answer, you should:

• refer to relevant data from the table above

• consider the combustion reactions of each fuel

• include the effects of each fuel on human health and on the environment.

**2017**

Both heptane and methanol can be used as fuels and can undergo both complete and incomplete combustion.

Analyse the combustion reactions of the two fuels – heptane and methanol.

In your answer, you should include:

• a description of the observations that would be made for both complete and incomplete combustion of

EITHER heptane OR methanol

• an explanation of the effect on human health for TWO combustion products from the **incomplete** combustion

of EITHER heptane OR methanol

• an explanation of the advantages of using methanol as a fuel compared to heptane

• a balanced symbol equation for the **complete** combustion of each fuel.

**2016**

Alkanes can be used as fuels. Compare and contrast: the complete combustion of alkanes, which produces

carbon dioxide; and the incomplete combustion,

which produces carbon monoxide and carbon in addition to carbon dioxide. In your answer, you should:

• use butane as an example to illustrate your answer

• give an explanation of an effect on the environment for TWO combustion products

• include balanced symbol equations for the reactions occurring, in the labelled boxes below.

**2015**

Butane and propane are both used as fuel in camping burners. Camping burners usually have a warning notice

instructing people to always use them in a well-ventilated place (plenty of oxygen) otherwise serious injury

or death may occur. Elaborate on why this warning is given on camping burners.

Use a burner that contains **propane** as an example. In your answer, you should:

• state the type of combustion reaction that occurs when there is a shortage of oxygen

• describe the observations that may be seen if there was a shortage of oxygen, and link these to the reaction

occurring

• explain two effects that the combustion products can have on human health when there is a shortage of

oxygen

• write a word equation and a balanced symbol equation for the reaction occurring.

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