



New Document 1

Name: _____

Class: _____

Date: _____

Time: **37 minutes**

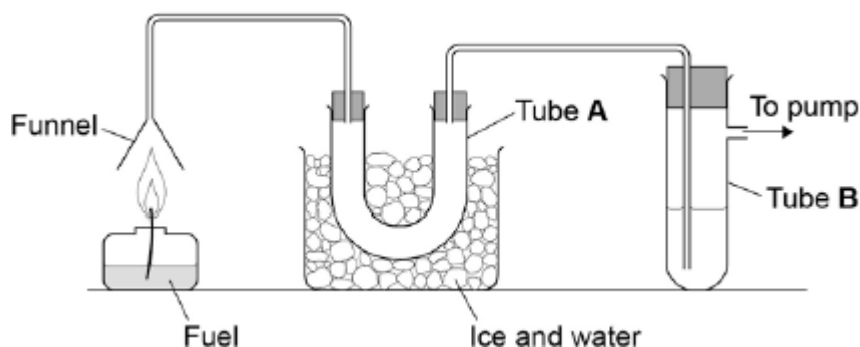
Marks: **37 marks**

Comments:

Q1.

A student investigated the substances produced when fuels burn.

The figure below shows the apparatus the student used.



- (a) The complete combustion of a hydrocarbon produces carbon dioxide and one other substance.

Look at the figure above. What would the student see in tube **A**?

(1)

- (b) When the student burned the fuel she saw soot in the funnel.

Explain why soot forms.

(2)

- (c) The student burned another fuel which contained impurities.

The substance in tube **B** is water containing universal indicator.

The indicator turned red.

Which gas made the indicator turn red?

Tick **one** box.

Ammonia

Carbon monoxide

Nitrogen

Sulfur dioxide

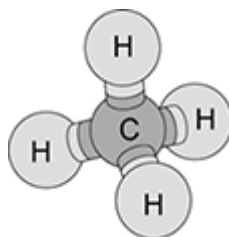
(1)
(Total 4 marks)

Q2.

There are several different forms of carbon and many different carbon compounds.

- (a) **Figure 1** shows a 3D model of a molecule of methane (CH_4).

Figure 1



Draw the 2D structure of a methane molecule.

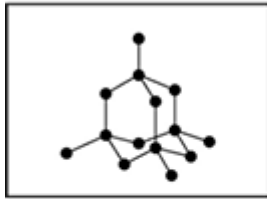
(1)

- (b) Different forms of carbon have different bonding and structure.

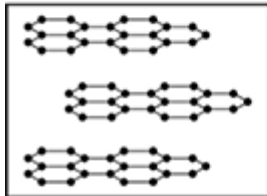
Draw **one** line from the form of carbon to the bonding and structure.

Form of carbon

Bonding and structure

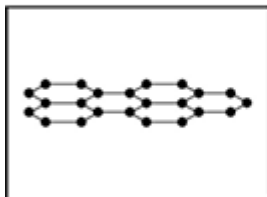


Each carbon atom is bonded to three other carbon atoms in a single layer



Each carbon atom is bonded to four other carbon atoms

Layers of carbon atoms with no covalent bonds between the layers



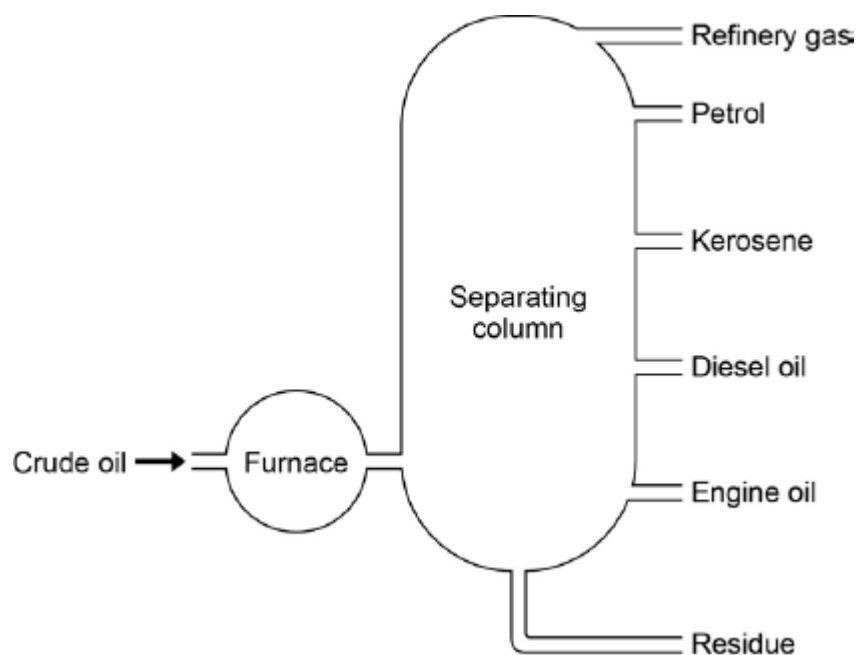
Carbon ions held together by strong electrostatic forces

Pairs of carbon atoms with no covalent bonds between the molecules

(3)

- (c) Crude oil is a mixture of many different carbon compounds.
 Crude oil can be separated into useful fractions by fractional distillation.
Figure 2 shows a column used to separate crude oil.

Figure 2



Complete the sentences.

Use words from the box.

condense	evaporate	freeze
-----------------	------------------	---------------

Crude oil is heated so that most of the compounds _____

At different temperatures the compounds cool and _____

(2)

(d) Which fraction is the most **viscous**?

Tick **one** box.

- | | |
|------------|--------------------------|
| Engine oil | <input type="checkbox"/> |
| Diesel oil | <input type="checkbox"/> |
| Kerosene | <input type="checkbox"/> |
| Petrol | <input type="checkbox"/> |

(1)

(e) Which fraction is the most **flammable**?

Tick **one** box.

- | | |
|--------------|--------------------------|
| Diesel oil | <input type="checkbox"/> |
| Kerosene | <input type="checkbox"/> |
| Petrol | <input type="checkbox"/> |
| Refinery gas | <input type="checkbox"/> |

(1)

(f) Why does kerosene separate out of the mixture before diesel oil?

(1)

(Total 9 marks)

Q3.

Crude oil is a fossil fuel.

(a) To make crude oil more useful it is separated into fractions.

Use the correct word from the box to complete each sentence.

boiling	compound	decomposition	distillation
	filtration	mixture	molecule

(i) Crude oil is a _____ of different substances.

(1)

(ii) The substances in crude oil have different _____ points.

(1)

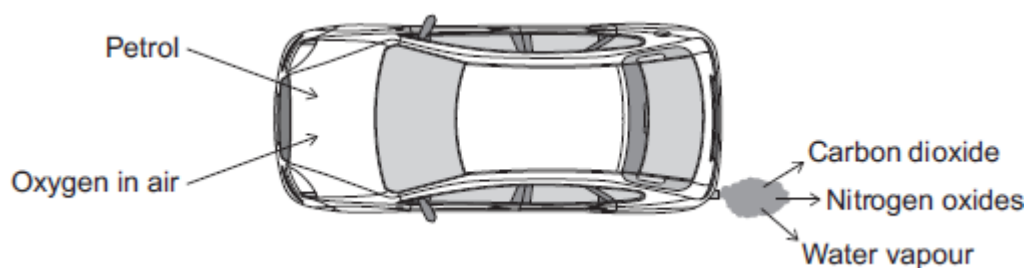
(iii) Crude oil is separated by fractional _____.

(1)

(b) Petrol is one of the fractions produced from crude oil.

Car engines use a mixture of petrol and air.

The diagram shows some of the gases produced.



(i) What type of reaction happens to petrol in a car engine?

Tick (✓) **one** box.

combustion

decomposition

neutralisation

(1)

(ii) Petrol contains octane (C_8H_{18}).

Complete the word equation for the reaction of octane with oxygen.

octane + _____ \rightarrow _____ + _____

(2)

(iii) Cars use sulfur-free petrol as a fuel.

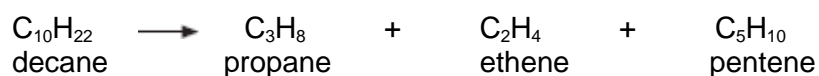
Describe why sulfur should be removed from petrol.

(2)

(c) Some fractions from crude oil contain large hydrocarbon molecules.

These molecules can be cracked to produce smaller, more useful molecules.

An equation for cracking decane is:



(i) Why is propane useful?

Tick (✓) **one** box.

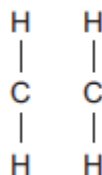
Propane is a polymer.

Propane is an alloy.

Propane is a fuel.

(1)

(ii) Draw bonds to complete the displayed structure of ethene.



(1)

(iii) What is the colour change when bromine water reacts with ethene?

Tick (✓) **one** box.

Orange to colourless

Orange to green

Orange to red

(1)

(iv) Complete the sentence.

Pentene is useful because many pentene molecules can join together to form _____.

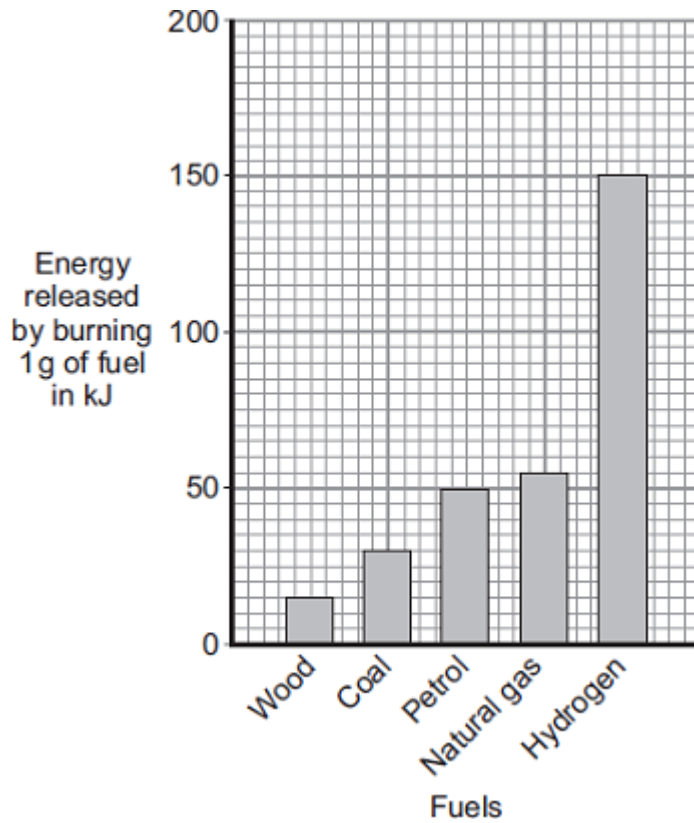
(1)

(Total 12 marks)

Q4.

Energy is released by burning fuels.

(a) The bar chart shows the energy in kilojoules, kJ, released by burning 1 g of five different fuels.



(i) Which fuel releases least energy by burning 1 g?

(1)

(ii) How much energy is released by burning 1 g of coal?

Energy = _____ kJ

(1)

- (iii) Calculate the mass of petrol that will release the same amount of energy as 1 g of hydrogen.

Use information from the bar chart to help you.

Mass = _____ g

(1)

- (b) Coal burns in oxygen and produces the gases shown in the table.

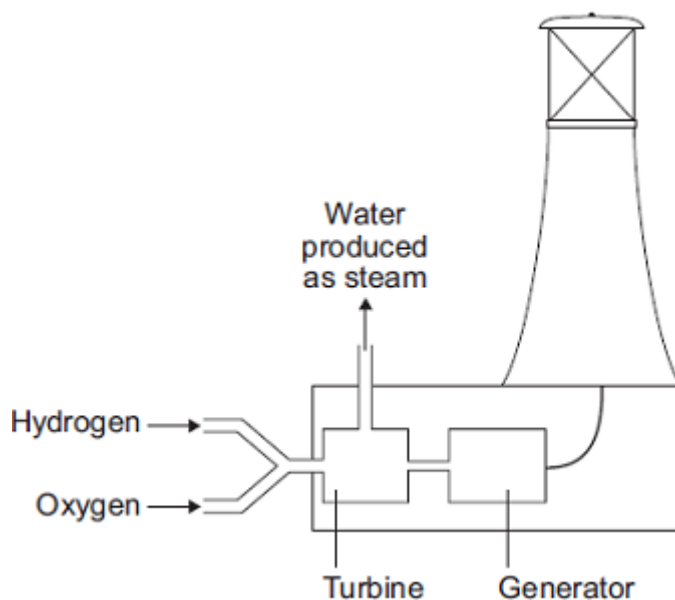
Name	Formula
Carbon dioxide	CO ₂
Water vapour	H ₂ O
Sulfur dioxide	SO ₂

Use information from the table to name **one** element that is in coal.

(1)

- (c) Hydrogen can be made from fossil fuels.
Hydrogen burns rapidly in oxygen to produce water only.

A lighthouse uses electricity generated by burning hydrogen.



Suggest **two** advantages of using hydrogen as a fuel.

Use information from the bar chart and the diagram above to help you.

1. _____

2. _____

(2)

(Total 6 marks)

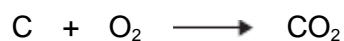
Q5.

Barbecues are heated by burning charcoal or burning hydrocarbons.



- (a) Use the Chemistry Data Sheet to help you to answer this question.

The chemical equation for charcoal burning is:



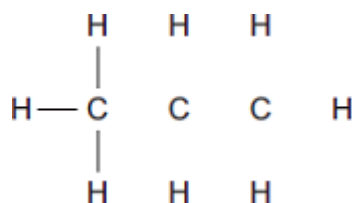
Complete the word equation for this reaction.



(1)

- (b) Propane is a hydrocarbon.

- (i) Complete the displayed structure of propane. Draw in the missing bonds.



(1)

- (ii) Write the chemical formula of propane. _____

(1)

- (iii) Draw a ring around the correct answer to complete the sentence.

Propane burns in air to produce carbon dioxide and

hydrogen.

hydroxide.

water.

(1)

(c) The table shows information about six hydrocarbons.

Hydrocarbon	State at room temperature (20°C)	Boiling point in °C
Ethane (C ₂ H ₆)	gas	-89
Ethene (C ₂ H ₄)	gas	-104
Butane (C ₄ H ₁₀)	gas	-1
Butene (C ₄ H ₈)	gas	-6
Hexane (C ₆ H ₁₄)	liquid	+69
Hexene (C ₆ H ₁₂)	liquid	+64

Tick (✓) **two** correct statements about the six hydrocarbons.

Statement	Tick (✓)
Ethane and butane boil at temperatures less than 20°C.	
Hexene and butene are alkanes.	
Butane and hexane are liquid at 0°C.	
Ethene and hexene each have a carbon-carbon double bond.	

(2)
(Total 6 marks)

Mark schemes

Q1.

(a) Colourless liquid / condensation / water

1

(b) incomplete combustion of the fuel

1

because not enough oxygen

1

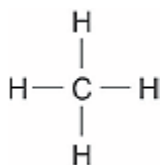
(c) Sulfur dioxide

1

[4]

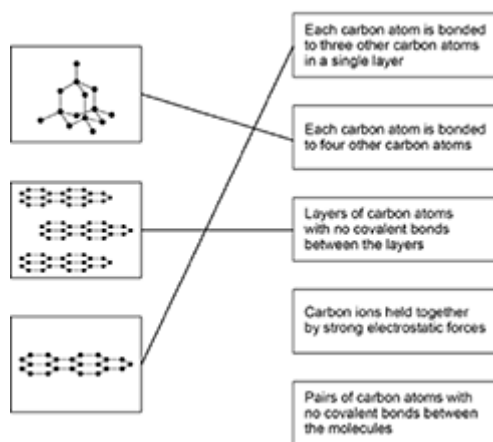
Q2.

(a)



1

(b) **Form of carbon** **Bonding and structure**



extra lines from the left negate the mark

3

(c) evaporate

1

condense

1

(d) Engine oil

1

(e) Refinery gas

1

(f) because its boiling point is lower

1

[9]

Q3.

- (a) (i) mixture (of different substances) 1
- (ii) boiling (points) 1
- (iii) distillation 1
- (b) (i) combustion 1
- (ii) (reactant)
oxygen
allow correct formulae 1
- (products)
products in any order
- carbon dioxide
allow carbon or carbon monoxide
and
water
allow water vapour or steam or hydrogen oxide 1
- (iii) (burning sulfur) produces sulfur dioxide / SO_2
allow it / sulfur reacts with oxygen ignore sulfur oxide 1
- causes acid rain 1
- (c) (i) propane is a fuel 1
- (ii) double bond drawn between carbon atoms
do not allow any other bonds or symbols 1
- (iii) orange to colourless 1
- (iv) poly(pentene)
allow polymer(s) 1

[12]**Q4.**

- (a) (i) wood 1
- (ii) 30 (kJ) 1
- (iii) 3 / three (g)

(b) carbon / C
or hydrogen / H
or sulfur / S
allow oxygen / O

1

1

(c) releases most energy
accept releases a lot of energy / burns rapidly
ignore references to cost

1

no harmful gases / no or less pollution formed / no global warming / no climate change / no greenhouse gas

accept produces water (only) / steam

accept does not produce sulfur dioxide / carbon dioxide / carbon monoxide / particles / smoke

1

[6]

Q5.

(a) oxygen
must be name
*do **not** accept oxide or dioxide*

1

(b) (i) 2 x C–C
and
5 x C–H
all single (line) bonds

1

(ii) C₃ H₈
must be formula
*do **not** accept lower case h*

1

(iii) water

1

(c) ethane and butane boil at temperatures less than 20°C

1

ethene and hexene each have a carbon-carbon double bond

1

[6]