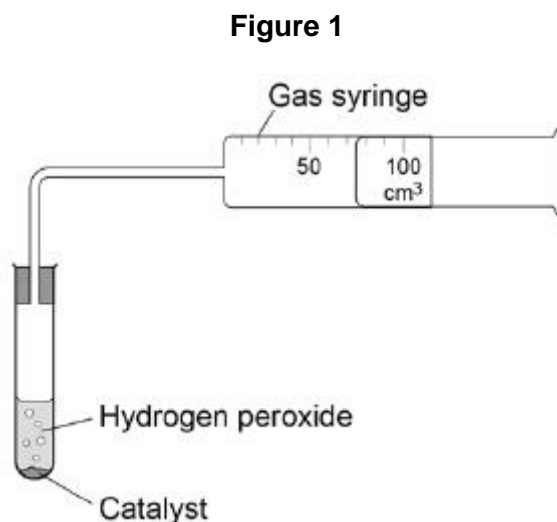


60 Minutes on Chemistry ready for AP2 = Test on Wednesday 27th February (12 days away)

Q1.

A student investigated the effect of different catalysts on the decomposition of hydrogen peroxide.

Figure 1 shows the apparatus the student used.



- (a) Oxygen gas is produced.

Table 1 shows the student's observations.

Table 1

Catalyst	Observation
Manganese dioxide	A lot of gas and hydrogen peroxide bubbles up into gas syringe
Potato	Steady bubbles of gas
Copper oxide	Few bubbles of gas
Sodium chloride	Very few bubbles of gas

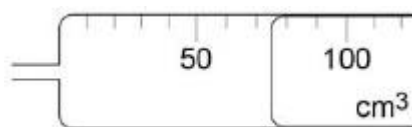
Which is the most useful catalyst?

Explain your answer.

(2)

(b) **Figure 2** shows the gas syringe during the investigation.

Figure 2



What is the volume of gas?

Tick **one** box.

52 cm³ 55 cm³ 70 cm³ 75 cm³

(1)

(c) For one of the catalysts the student measures the volume of gas given off every 20 seconds for 2 minutes.

The volume of gas was zero at the start of the experiment.

The measured volumes of gas are:

23 cm³ 42 cm³ 59 cm³ 72 cm³ 80 cm³ 88 cm³

Complete **Table 2** to show these results.

Table 2

(4)

(d) Suggest why the readings might be lower than expected.

(1)

(e) The student did the experiment with four different catalysts.

Give **two** variables the student should keep constant.

1. _____

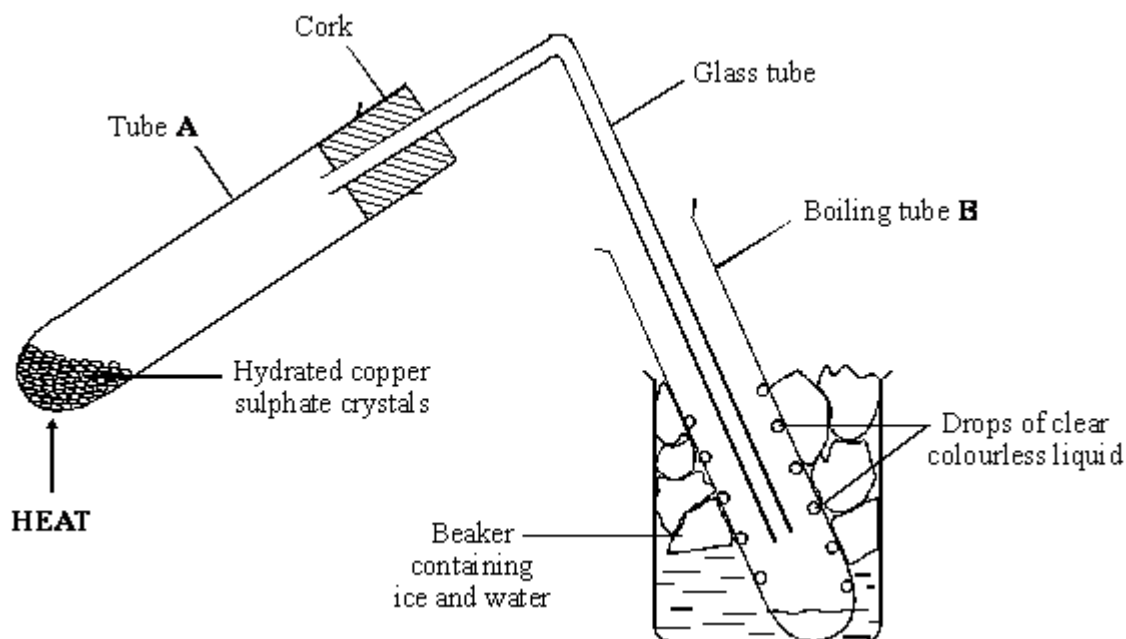
2. _____

(2)

(Total 10 marks)

Q2.

The diagram shows the apparatus for an experiment. Hydrated copper sulphate crystals were heated. They became anhydrous copper sulphate.



(a) Name a suitable piece of equipment to heat tube A.

(1)

(b) Use words from the box to complete the **two** spaces in the table. You may use each word once or not at all.

black	blue	orange	red	purple	white
-------	------	--------	-----	--------	-------

Name	Colour
Hydrated copper sulphate crystals	_____
Anhydrous copper sulphate	_____

(2)

(c) What is the purpose of the ice and water in the beaker?

(1)

(d) Drops of a clear, colourless liquid formed on the inside of tube **B**.

(i) Name the liquid.

(1)

(ii) Explain how the liquid came to be inside tube **B**.

(2)

(e) Anhydrous copper sulphate can be turned into hydrated copper sulphate. What would you need to add? Apart from the change in colour, what could you observe?

(2)

(f) Copper sulphate can be made from black copper oxide by reacting it with an acid. Name the acid.

(1)

Q3.

Crude oil and natural gas are natural resources in many countries.

The table shows percentages of hydrocarbons in natural gas from three different countries.

Hydrocarbon	Percentage (%) of hydrocarbon in natural gas		
	Country X	Country Y	Country Z
Methane	78.03	88.10	94.36
Ethane	9.70	5.30	2.37
Propane	4.82	2.16	0.15
Butane	1.33	0.72	0.02
Pentane	0.30	0.18	0.00

- (a) Calculate the mean percentage of propane from countries X, Y and Z.

Give your answer to 2 decimal places.

Mean percentage of propane = _____ %

(2)

- (b) Suggest why natural gas from different countries has different percentages of hydrocarbons.

(1)

- (c) Complete the sentence.

Choose the answer from the box.

an atom an electron an ion a molecule

The formula CH_4 represents _____ of methane.

(1)

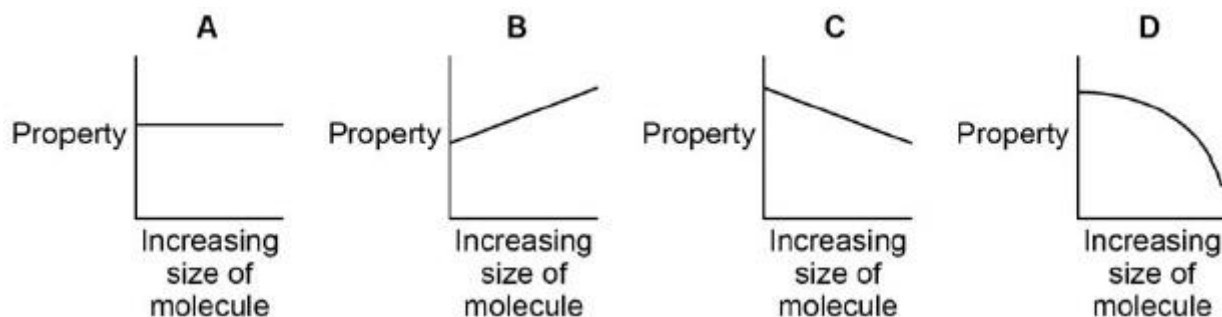
- (d) Complete the sentence.

The hydrocarbons in the table belong to the homologous series of _____.

(1)

Figure 1 shows how properties vary with the increasing size of molecule in this homologous series.

Figure 1



(e) Which graph shows how boiling points vary?

Tick **one** box.

A B C D

(1)

(f) Which graph shows how viscosity varies?

Tick **one** box.

A B C D

(1)

(g) Crude oil is fractionally distilled.

Fractions with larger molecules are cracked.

Describe **two** differences between fractional distillation and cracking.

1. _____

2. _____

(2)

(h) Ethene is a product of crude oil.

Complete the sentence.

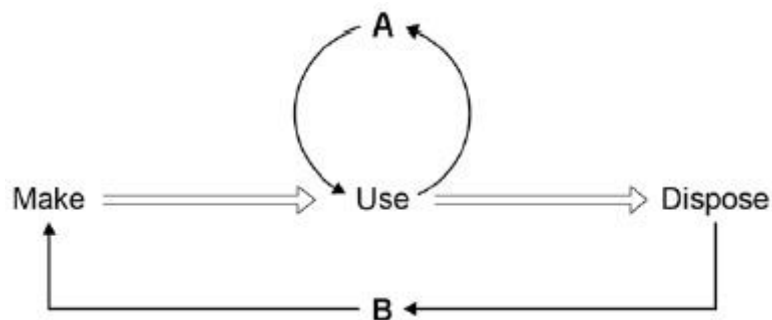
Ethene polymerises to produce _____ .

(1)

(i) The production of plastic bags uses limited resources.

Figure 2 shows two ways (**A** and **B**) of saving limited resources.

Figure 2



Name **A** and **B**.

Choose the answers from the box.

recycle	reduce	release	reuse	reverse
---------	--------	---------	-------	---------

A _____

B _____

(2)
(Total 12 marks)

Q4.

Hydrocarbons are used to make useful products.

(a) What are the elements in hydrocarbons?

Tick **one** box.

Carbon and hydrogen only

Carbon, hydrogen and oxygen

Carbon and nitrogen only

Carbon, nitrogen and oxygen

(1)

(b) **Table 1** gives some information about four hydrocarbons.

Table 1

Hydrocarbon	Melting point in °C	Boiling point in °C
Methane	-183	-162
Ethene	-169	-104
Octane	-57	+126
Decane	-30	+174

What are two correct statements about the four compounds?

Tick **two** boxes.

Methane has the lowest boiling point and decane has the highest melting point

Methane and decane are both gases at 20 °C

Ethene and octane are both alkanes

Decane and ethene are both liquids at 0 °C

Octane is liquid over a larger temperature range than methane

(2)

(c) Ethene can be produced from long-chain hydrocarbons by cracking.

Give the conditions needed for cracking.

(2)

(d) Poly(ethene) is a polymer made from ethene. Poly(ethene) is used to make plastic bags.

Table 2 is from a life cycle assessment comparing paper bags and plastic bags.

Table 2

	Paper bag	Plastic bag
Raw material	Wood (renewable)	Oil or gas (non-renewable)
Energy used to make in MJ	1.7	1.5
Solid waste produced in g	50	14
Carbon dioxide produced in kg	0.23	0.53

Evaluate which type of bag is more environmentally friendly.

Tick **one** box.

$\frac{1}{10}$	<input type="checkbox"/>	$\frac{1}{100}$	<input type="checkbox"/>	$\frac{1}{1000}$	<input type="checkbox"/>	$\frac{1}{10\ 000}$	<input type="checkbox"/>
----------------	--------------------------	-----------------	--------------------------	------------------	--------------------------	---------------------	--------------------------

(1)

- (c) The tablets also contain sugar.

Suggest why.

(1)

- (d) Sodium hydrogencarbonate cures indigestion by reacting with acid in the stomach.

What type of reaction is this?

Tick **one** box.

Combustion	<input type="checkbox"/>
Displacement	<input type="checkbox"/>
Neutralisation	<input type="checkbox"/>

(1)

A student adds an indigestion tablet to dilute hydrochloric acid.

- (e) The gas produced is bubbled through limewater.

The gas turns the limewater milky.

Name the gas produced.

(1)

- (f) Water is also produced.

Which **two** statements are reasons why water is a liquid at room temperature?

Tick **two** boxes.

Water has a boiling point of 100 °C

Water has a giant covalent structure

Water has a melting point lower than room temperature

Water has delocalised electrons

Water is made of ions

(2)

(g) Calcium chloride is also produced.

- The formula for a calcium ion is Ca^{2+}
- The formula for a chloride ion is Cl^-

What is the formula of calcium chloride?

Tick **one** box.

CaCl

Ca_2Cl

CaCl_2

Ca_2Cl_2

(1)

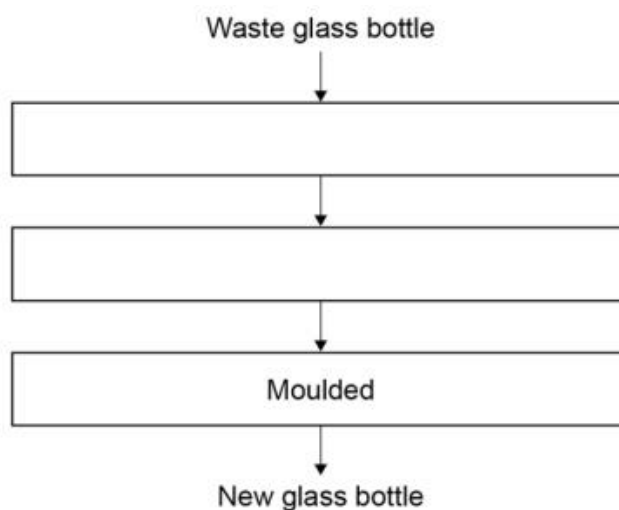
(h) The tablets are stored in glass bottles.

The flow chart shows part of a flowchart for recycling glass.

Complete the flow chart.

Choose the answers from the box.

crushed electrolysed frozen melted oxidised



Q6.

The table shows the gases in the Earth's atmosphere today.

Gas	Percentage (%)
N ₂	78.0
O ₂	21.0
Ar	0.9
Other gases	X

(a) What is the percentage of X?

Tick **one** box.

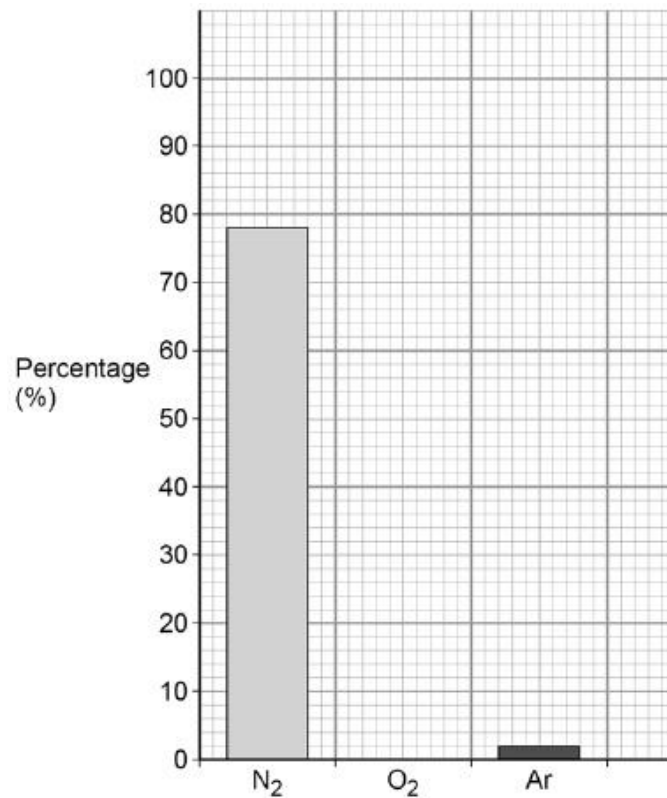
0.01% 0.1% 1% 10%

(1)

(b) Complete **Figure 1**.

Plot the data from the table on **Figure 1**.

Figure 1



(1)

(c) What is the name of the gas with symbol Ar?

Tick **one** box.

Aluminium

Argon

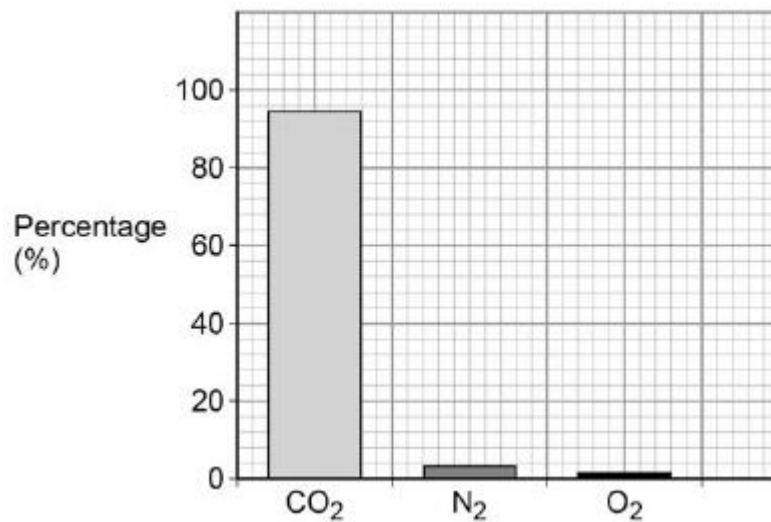
Arsenic

Astatine

(1)

(d) **Figure 2** shows the gases in the atmosphere of Mars today.

Figure 2



Some theories suggest that the Earth's early atmosphere was the same as the atmosphere of Mars today.

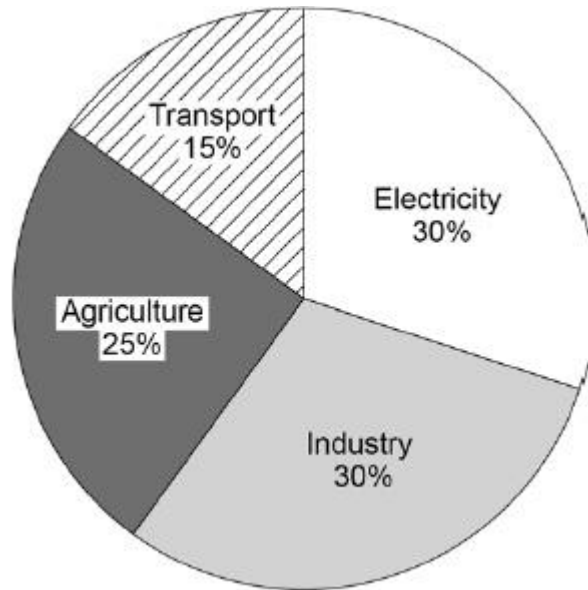
Describe the change in the percentage of oxygen from the Earth's early atmosphere to the Earth's atmosphere today.

Use values from the table and **Figure 2**.

(2)

(e) **Figure 3** shows the percentage of greenhouse gases from human activities.

Figure 3



Compare the contribution of each activity to the total amount of greenhouse gases.

Use data from **Figure 3**.

(4)

(f) Suggest **one** way greenhouse gas emissions could be reduced.

(1)

(g) Give **one** reason why it is difficult for some countries to reduce emissions of greenhouse gases.

(1)

Q7.

This is part of an article about food additives.

THE PERIL OF FOOD ADDITIVES

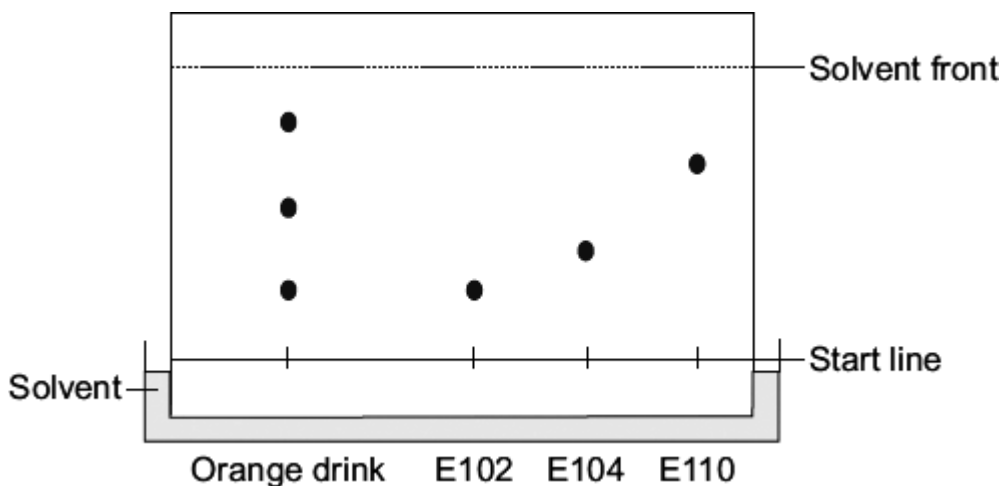
Some orange drinks contain the additives E102 (Tartrazine), E104 (Quinoline Yellow) and E110 (Sunset Yellow). These three additives are thought to cause hyperactivity in children.

(a) Tick (✓) **two** reasons why a manufacturer of orange drinks uses these additives.

Reason	Tick (✓)
to make the drink healthier	
to improve the appearance of the drink	
because they are permitted colours	
because they are expensive	

(2)

(b) A scientist tested an orange drink to find out if it contained these additives. The result of the test is shown.



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

The test that the scientist did is called

- chromatography.
- cracking.
- distillation.

(1)

(ii) How many coloured additives are there in the orange drink? _____

(1)

(iii) The scientist concluded that the orange drink contained only **one** of the additives E102, E104 and E110.

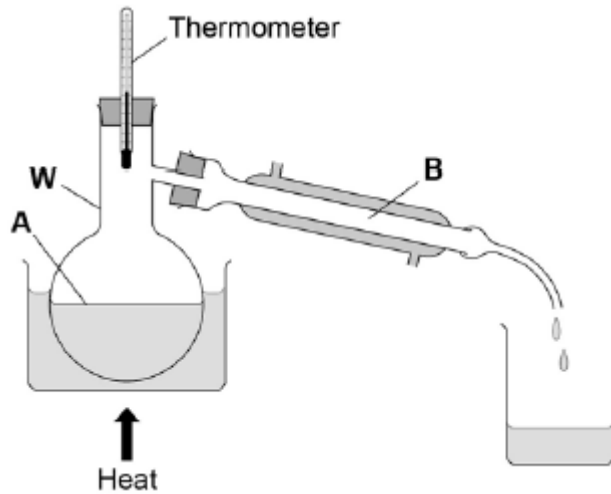
Explain why.

(2)

(Total 6 marks)

Q8.

The apparatus in the figure below is used to separate a mixture of liquids in a fuel.



(a) What is apparatus **W** on above the figure above?

Tick **one** box.

Beaker

Boiling Tube

Flask

Jug

(1)

(b) What is the name of this method of separation?

Tick **one** box.

Crystallisation

Electrolysis

Filtration

Distillation

(1)

(c) Name the changes of state taking place at **A** and **B** in the figure above.

Use words from the box.

boiling	condensing	freezing	melting
----------------	-------------------	-----------------	----------------

Change of state at **A**: _____

Change of state at **B**: _____

(2)

(d) **Table 1** shows the boiling points of the hydrocarbons in the fuel.

Table 1

Hydrocarbon	Boiling point in °C
Pentane	36
Hexane	69
Heptane	98
Octane	125

Which hydrocarbon will be the last to collect in the beaker?

Tick **one** box.

Pentane

Hexane

Heptane

Octane

(1)

(e) The fuel is a mixture of liquids that has been designed as a useful product.

What name is given to this type of mixture?

Tick **one** box.

Catalyst

Formulation

Polymer

Solvent

(1)

(f) Describe how this fuel is different from crude oil.

(2)

(g) A student measured the melting point of a solid hydrocarbon four times.

The student's results are in **Table 2**.

Table 2

	Trial 1	Trial 2	Trial 3	Trial 4
Melting point in °C	35	48	37	37

Calculate the mean melting point of the hydrocarbon, leaving out any anomalous result.

Give your answer to two significant figures.

Mean melting point = _____ °C

(2)

(Total 10 marks)

Mark schemes

Q1.

(a) potato

1

effective, but manageable and safe

allow 1 for manganese dioxide is effective

1

(b) 75 cm³

1

(c) headings: time, volume

1

units: s or seconds, cm³

1

correct values for times, including 0

1

correct values for volumes

Time in seconds	Volume in cm ³
0	0
20	23
40	42
60	59
80	72
100	80
120	88

1

(d) any **one** from:

- gas escaped
- leak
- slow to put on bung
- systematic error

1

(e) any **two** from:

- concentration of peroxide
- volume of peroxide
- temperature
- mass of catalyst
- surface area of catalyst

2

[10]

Q2.

(a) Bunsen (burner)

accept spirit burner do not credit candle

1

- (b) blue 1
- white
credit (1) if both colours correct but answers are reversed 1
- to cool the tube (B)
accept answers which anticipate part (d) e.g. 'to condense the water vapour' or gases or vapours 1
- (d) (i) water
do not credit 'condensation' 1
- (ii) (Water) vapour from the crystals (from tube A)
accept steam or steam from tube A 1
- condenses or cools
accept turns to (liquid) water 1
- (e) add water
 gets hot or hotter or warm or warmer turns into solution
 dissolves
*or the temperature rises or there is an exothermic reaction
 accept steams or hisses ignore any reference to colour(s)* 2
- (f) sulphuric acid
accept H₂SO₄ only if correct in every detail 1

[10]

Q3.

- (a) 2.38
if answer incorrect, allow 1 mark for 2.37 to full calculator display
 or
for (4.82 + 2.16 + 0.15) / 3 2
- (b) different types of biomass / plankton
allow they are mixtures 1
- (c) a molecule 1
- (d) alkanes 1

(e)	B	1
(f)	B	1
(g)	any two from:	
	• cracking uses a catalyst, fractional distillation doesn't	
	• cracking breaks up molecules, fractional distillation separates them	
	• cracking is a chemical process, fractional distillation is a physical process	2
(h)	poly(ethene)	1
(i)	(A=) reuse	1
	(B=) recycle	1
		[12]

Q4.

(a)	Carbon and hydrogen only	1
(b)	Methane has the lowest boiling point and decane has the highest melting point	1
	Octane is liquid over a larger temperature range than methane	1
(c)	heat / steam	1
	catalyst	1
(d)	Level 3 (5–6 marks): A detailed and coherent evaluation is provided that considers a range of relevant points, quotes relevant data from the table and comes to a conclusion consistent with the reasoning.	
	Level 2 (3–4 marks): An attempt to describe relevant points which comes to a conclusion. The logic and use of data may be inconsistent at times but builds towards a coherent argument.	
	Level 1 (1–2 marks): Discrete, relevant points made. The logic may be unclear and the conclusion, if present, may not be consistent with the reasoning.	
	0 marks: No relevant content.	
	Indicative content	
	• conclusion as to which bag is more environmentally friendly	

Points that may be used in argument

- Paper bags are made from a renewable resource (wood)
- Paper bags more sustainable
- Paper bags are biodegradable
- Plastic bags are made from a finite resource (oil or gas)
- Plastic bags not sustainable
- Paper bags require more energy to manufacture (1.7 MJ compared with 1.5 MJ)
- Paper bags produce more waste (50 g compared with 14 g)
- Paper bags create less CO₂ than plastic bags
- So manufacture of plastic bags has more effect on global warming / climate change / environmental effects
- Plastic bags can be recycled
- Recycling reduces use of energy sources in manufacture
- justified

6

[11]

Q5.

- (a) formulation 1
- (b) 1/10 1
- (c) make them palatable 1
- (d) neutralisation 1
- (e) carbon dioxide 1
- (f) water has a boiling point of 100 °C 1
- water has a melting point lower than room temperature 1
- (g) CaCl₂ 1
- (h) crushed 1
- melted
- must be in this order* 1

[10]

Q6.

- (a) 0.1% 1
- (b) bar correctly drawn to $\pm\frac{1}{2}$ square 1

(c)	argon	1
(d)	increased	1
	data values to justify	1
(e)	electricity and industry are equal	1
	electricity and industry are highest	1
	transport is lowest	1
	electricity or industry is double transport	1
(f)	use of renewable energy sources or specific example	1
(g)	limited investment in renewable technology or disagreement between countries <i>accept specific reason which relates to response to (f), eg insufficient sunlight</i>	1
		[11]

Q7.

(a)	to improve the appearance of the drink	1
	because they are permitted colours	1
(b)	(i) chromatography	1
	(ii) three / 3	1
	(iii) because one colour / spot / E102 <u>matched</u>	1
	because the other / two colours / spots / E104 and E110 did <u>not match</u> <i>if no other mark awarded allow because the drink did not contain E104 and E110 or because the drink contained E102 for 1 mark accept <u>only E102 matched</u> for 2 marks</i>	1
		[6]

Q8.

- (a) Flask 1
- (b) Fractional distillation 1
- (c) **A** – boiling
in this order 1
- B** – condensing 1
- (d) Pentane 1
- (e) Formulation 1
- (f) the fuel is a pure compound 1
- and crude oil is a mixture
- or**
- the fuel is made up of four hydrocarbons
*allow crude oil contains a large number of compounds and
the fuel contains four*
- and crude oil could have many more 1
- (g) $(35 + 37 + 37 / 3) = 36.33$ 1
- 36 1
- allow $(35 + 48 + 37 + 37 / 4 =) 39(.25)$ for 1 mark*

[10]