

**100 minutes on Chemistry C2 – Test on Wednesday 27<sup>th</sup> February – 12 days time**

**Q1.**

Water in Britain is taken from reservoirs to use as drinking water.



© KatieJonesPhotography/iStock/Thinkstock

(a) What are the **two** main steps used to treat water from reservoirs?

Give **one** reason for each step.

---

---

---

---

---

---

---

---

---

---

---

---

**(4)**

(b) Some people use water filters to treat water before drinking it.

(i) Water filters remove hardness from hard water.

What is in water filters that removes hardness from water?

---

---

**(1)**

(ii) Suggest why water filters used in the home contain particles of silver.

---

---

(1)

(c) Pure water can be produced by distillation.

Why is distillation **not** usually an economic method of treating water for drinking?

---

---

(1)

(d) Drinking hard water has health benefits.

State **one** health benefit of drinking hard water.

---

---

(1)

(Total 8 marks)

## Q2.

This question is about life, the Earth and its atmosphere.

(a) There are many theories about how life was formed on Earth.

Suggest **one** reason why there are many theories.

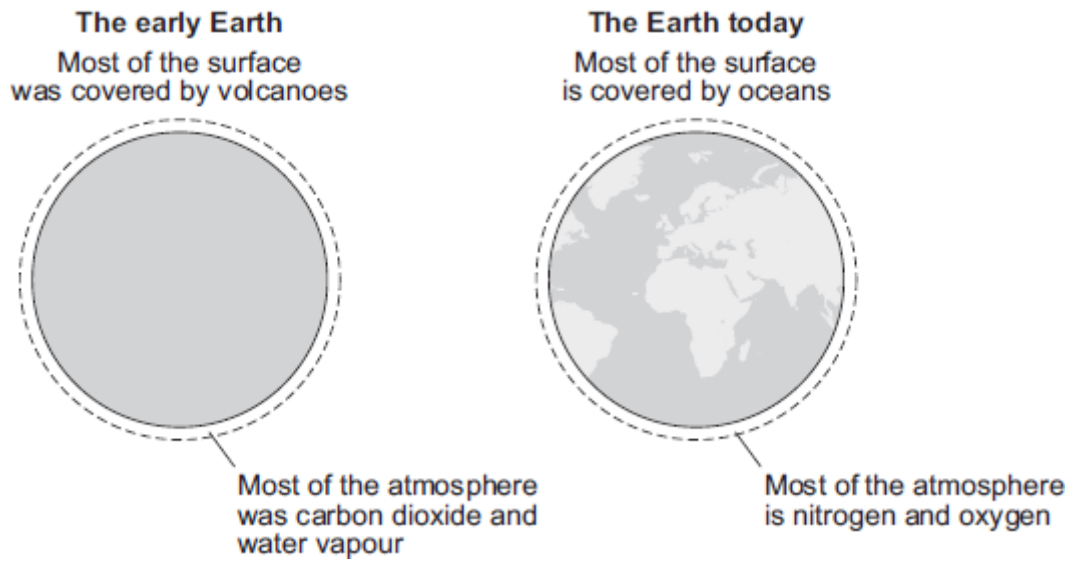
---

---

(1)

- (b) In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

This Earth and its atmosphere today are not like the early Earth and its atmosphere.



Describe and explain how the surface of the early Earth and its atmosphere have changed to form the surface of the Earth and its atmosphere today.

---

---

---

---

---

---

---

---

---

---

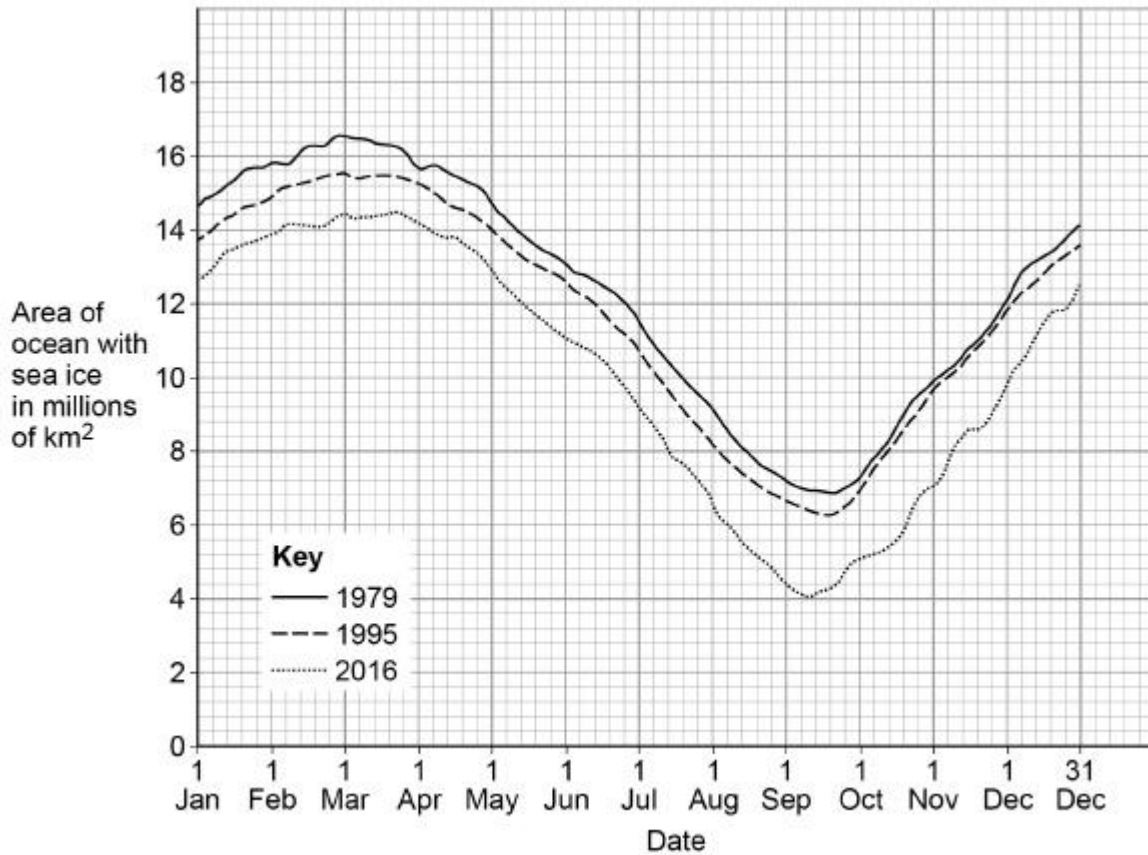
---

(6)  
(Total 7 marks)

**Q3.**

Human activities can affect our ecosystem.

The graph shows information about how the area of ocean with sea ice in the arctic has changed between 1979 and 2016.



(a) Give **two** conclusions you can make from the data shown in the graph.

- 1. \_\_\_\_\_
- \_\_\_\_\_
- 2. \_\_\_\_\_
- \_\_\_\_\_

(2)

(b) The area of ocean with sea ice in the arctic has changed.

Most scientists believe this is due to the activities of humans.

Explain the activities of humans that have led to the changes in sea ice from 1979 to 2016.

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_

---

---

---

---

---

---

---

---

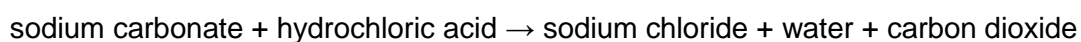
---

---

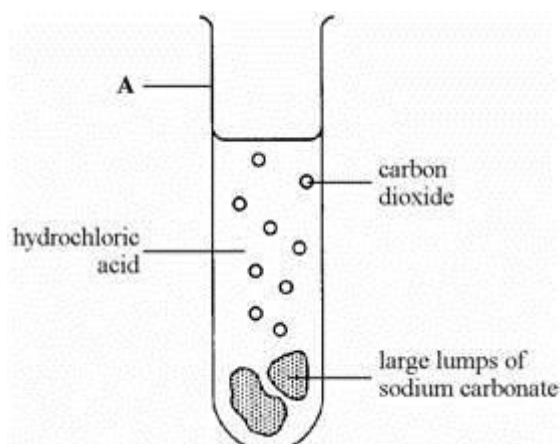
(6)  
(Total 8 marks)

**Q4.**

Dilute hydrochloric acid reacts with sodium carbonate. The word equation for this reaction is:



(a) The diagram shows apparatus used by student X to investigate this reaction.



(i) Name the piece of apparatus labelled **A**.

---

(1)

(ii) **NaCO<sub>3</sub>**      **NaCl**      **Na<sub>2</sub>CO<sub>3</sub>**      **Na<sub>2</sub>Cl**

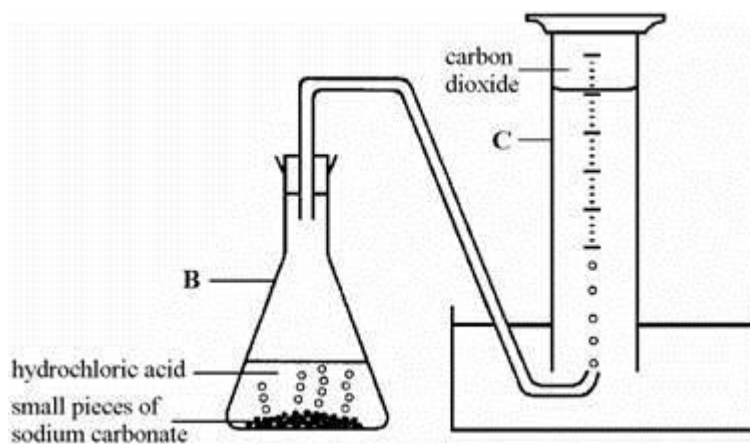
Use the Data Sheet to help you choose the correct formula from the list for:

sodium carbonate, \_\_\_\_\_

sodium chloride. \_\_\_\_\_

(2)

- (b) The diagram below shows a different apparatus used by student Y to investigate the same reaction.



- (i) Name the pieces of apparatus labelled **B** and **C**.

**B** \_\_\_\_\_

**C** \_\_\_\_\_

(2)

- (ii) Both students X and Y used the same

- volume of acid
- concentration of acid
- temperature
- mass of sodium carbonate

Use information from the diagrams to explain why the reaction that student Y carried out was faster.

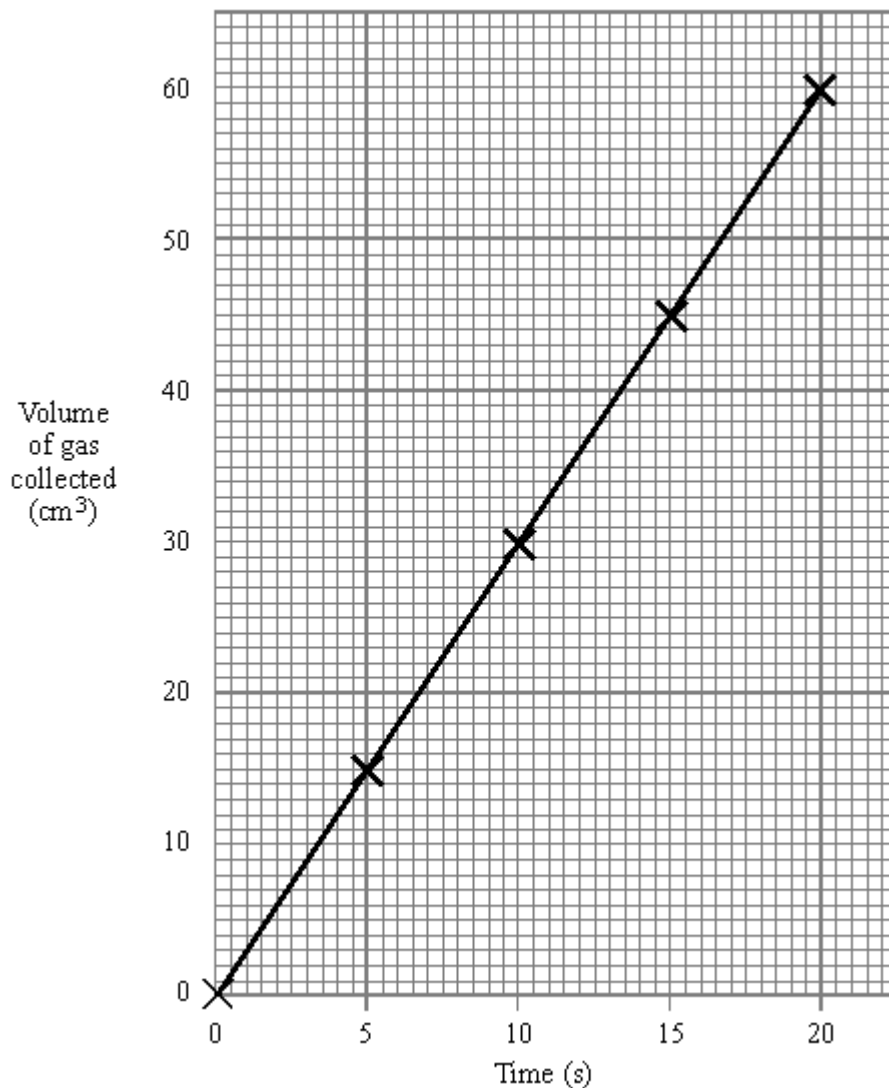
---

---

---

(2)

(c) The results obtained by student Y were plotted as shown below.



(i) Student Y repeated the experiment exactly as before but used warmer acid. This made the reaction faster. On the graph draw a line for this faster reaction.

(2)

(ii) Explain, in terms of particles, why the rate of the reaction is faster when warmer acid is used.

---

---

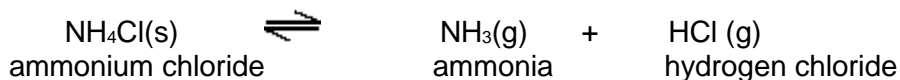
---

(3)

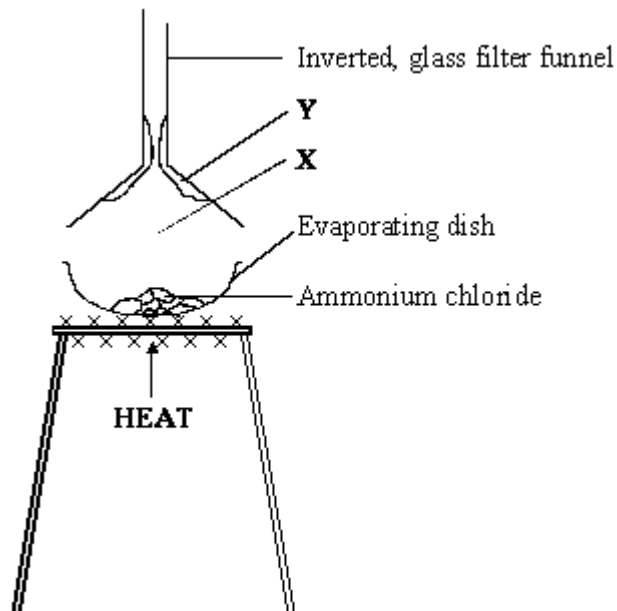
(Total 12 marks)

**Q5.**

- (a) The equation for the reaction that takes place when ammonium chloride is heated is:



The diagram shows how a teacher demonstrated this reaction. The demonstration was carried out in a fume cupboard.



- (i) Apart from the gases normally in the atmosphere, which two gases would be at **X**?

\_\_\_\_\_ and \_\_\_\_\_

(1)

- (ii) Name the white solid that has formed at **Y**.

\_\_\_\_\_

(1)

- (iii) Why was the demonstration carried out in a fume cupboard?

\_\_\_\_\_  
\_\_\_\_\_

(1)

- (iv) Complete the **four** spaces in the passage.

The chemical formula of ammonia is  $\text{NH}_3$ . This shows that there is one atom of \_\_\_\_\_ and three atoms of \_\_\_\_\_ in each \_\_\_\_\_ of ammonia. These atoms are joined by bonds that are formed by sharing pairs of electrons. This type of bond is called a \_\_\_\_\_ bond.



(b) Electrons, neutrons and protons are sub-atomic particles.

(i) Complete the **three** spaces in the table.

Name of sub-atomic particle	Relative mass	Relative charge
_____	1	+1
_____	1	0
_____	$\frac{1}{1840}$	-1

(2)

(ii) Which **two** sub-atomic particles are in the nucleus of an atom?

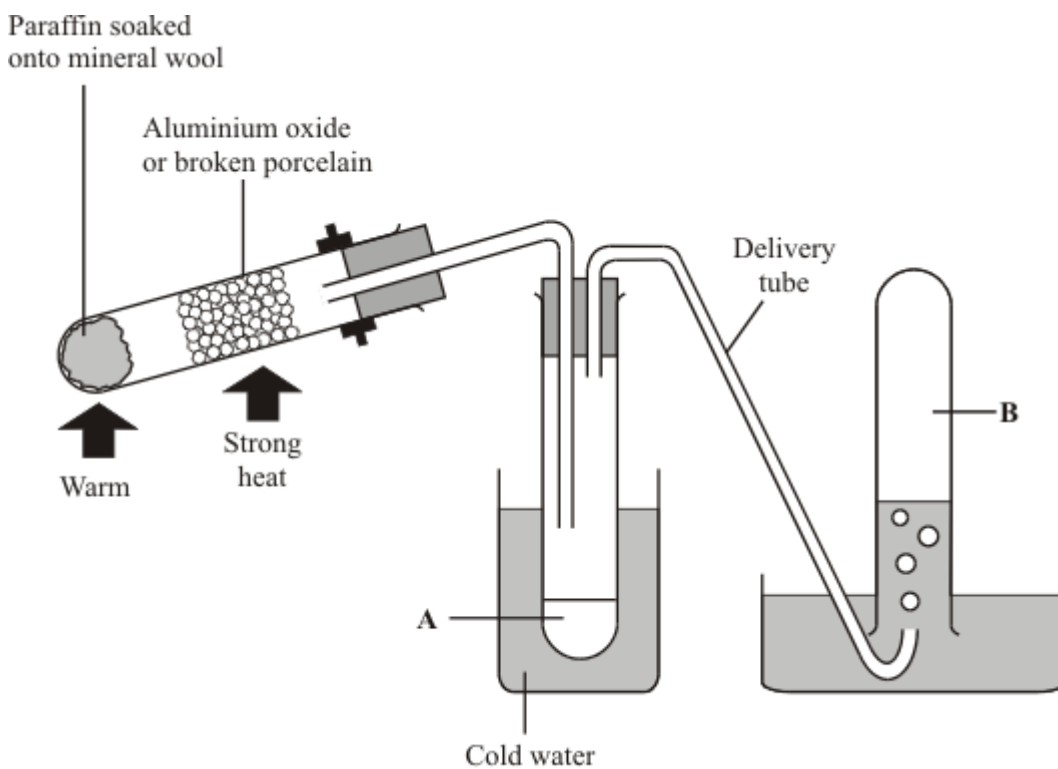
\_\_\_\_\_ and \_\_\_\_\_

(1)

(Total 10 marks)

**Q6.**

The diagram shows an apparatus that can be used to carry out cracking reactions in a laboratory.



(a) Why is aluminium oxide or broken porcelain used?

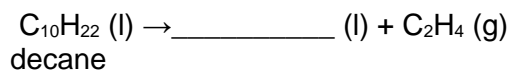
---

---

(1)

(b) Paraffin contains decane. The cracking of decane can be represented by the equation below. A decane molecule is split into two smaller molecules.

Complete the equation by adding the formula of the other product.



(1)

(c) Would you expect C<sub>2</sub>H<sub>4</sub> molecules to collect at position **A** or **B** shown on the diagram?

Position \_\_\_\_\_ .

Explain your answer.

---

---

(1)

(d) Cracking reactions involve *thermal decomposition*.

What is meant by thermal decomposition?

---

---

---

---

(2)

(e) Explain, as fully as you can, why cracking is used in the oil industry.

*To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.*

---

---

---

---

---

---

---

(3)

- (f) The cracking reaction produces a mixture of products. The mixture contains hydrocarbons with different boiling points.

Suggest a method of separating this mixture.

---

---

(1)

(Total 9 marks)

Q7.

## Why blue sweets are turning white

A recent study identified a possible harmful effect on children's nervous systems by some artificial colours. Two of these colours are Brilliant Blue (E133) and Quinoline Yellow (E104). Both are artificial colours because they are made from coal. The company is to stop producing the blue sweets because it is removing all artificial colours and there is no natural blue alternative.

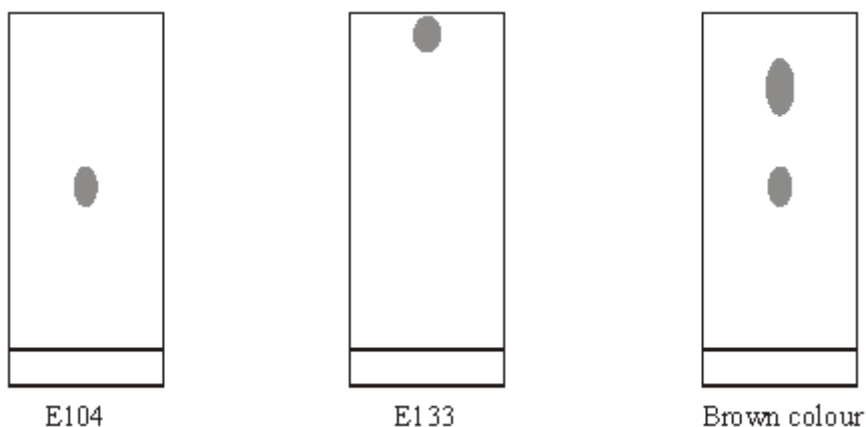
- (a) Suggest why it is important to be able to identify the colour additives in food.

---

---

(1)

- (b) A brown colour used in sweets was analysed using chromatography. The results were compared with those from E104 and E133.



What do the results tell you about the brown colour and its suitability for use in sweets?

---

---

---

---

---

---

---

(3)

- (c) Once all the unsuitable colours are removed, the company claims that its sweets are now 'free from artificial colours'.

Does this mean that the sweets contain no additives? Explain your answer.

---

---

---

---

---

(2)

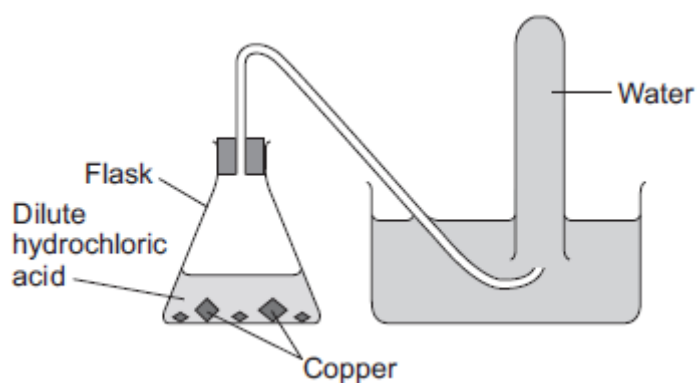
(Total 6 marks)

### Q8.

A student was trying to produce hydrogen gas.

Figure 1 shows the apparatus she used.

Figure 1



- (a) No gas was produced.

The student's teacher said that this was because the substances in the flask did **not** react.

(i) Suggest why the substances in the flask did **not** react.

---

---

---

(1)

(ii) Which two substances could the student have put in the flask to produce hydrogen safely?

Tick (✓) **one** box.

Gold and dilute hydrochloric acid

Potassium and dilute hydrochloric acid

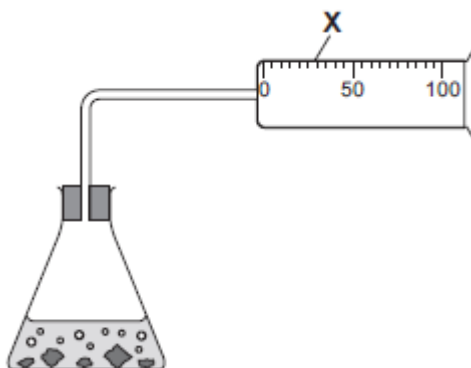
Zinc and dilute hydrochloric acid

(1)

(b) Another student did produce hydrogen from two substances.

**Figure 2** shows the apparatus the student used to collect and measure the volume of the hydrogen gas.

**Figure 2**



Give the name of the apparatus labelled X.

---

(1)

(c) The student did the experiment four times. Her results are shown in the table below.

Experiment	Volume of hydrogen collected in one minute in cm <sup>3</sup>
1	49
2	50
3	35
4	48

(i) One of the results is anomalous.

Which result is anomalous? Write your answer in the box.

Give a reason for your choice.

\_\_\_\_\_

(2)

(ii) Calculate the mean volume of hydrogen collected in one minute.

\_\_\_\_\_

\_\_\_\_\_

Mean volume = \_\_\_\_\_ cm<sup>3</sup>

(2)

(iii) Give a reason why the experiment should be repeated several times.

\_\_\_\_\_

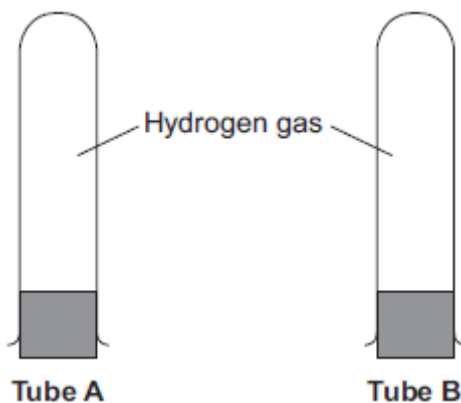
\_\_\_\_\_

\_\_\_\_\_

(1)

- (d) A teacher collected two tubes full of hydrogen gas, as shown in **Figure 3**.

**Figure 3**



She tested tube **A** with a lighted splint as soon as she took the bung out.

She tested tube **B** with a lighted splint a few seconds after taking the bung out.

- (i) Suggest why tube **B** gave a much louder pop than tube **A**.

---

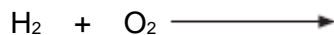
---

---

---

(1)

- (ii) Complete and balance the chemical equation for the reaction that takes place when the hydrogen reacts in this test.



(2)

(Total 11 marks)

### Q9.

The label shows the ingredients in a drink called Cola.

<p style="text-align: center;"><b>Cola</b></p> <p>Ingredients:</p> <p>Carbonated water Sugar Colouring Phosphoric acid Flavouring Caffeine</p>
--------------------------------------------------------------------------------------------------------------------------------------------------------------------

(a) (i) The pH of carbonated water is 4.5.

The pH of Cola is 2.9.

Name the ingredient on the label that lowers the pH of Cola to 2.9.

\_\_\_\_\_

(1)

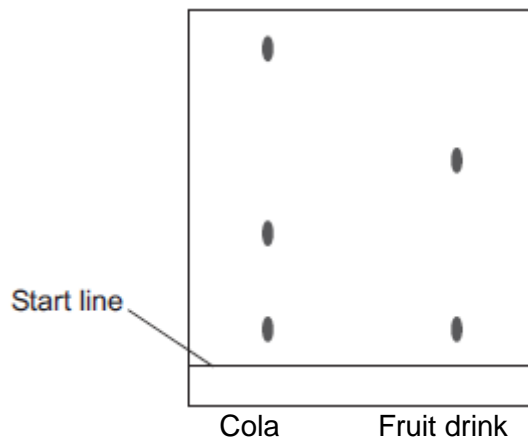
(ii) Which ion causes the pH to be 2.9?

\_\_\_\_\_

(1)

(b) A student investigated the food colouring in Cola and in a fruit drink using paper chromatography.

The chromatogram in the figure below shows the student's results.



(i) Complete the sentence.

The start line should be drawn with a ruler and \_\_\_\_\_ .

Give a reason for your answer.

\_\_\_\_\_

\_\_\_\_\_

(2)

(ii) Suggest **three** conclusions you can make from the student's results.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(3)



- (c) Caffeine can be separated from the other compounds in the drink by gas chromatography.

Why do different compounds separate in a gas chromatography column?

---

---

(1)

- (d) Caffeine is a stimulant.

Large amounts of caffeine can be harmful.

- (i) Only **one** of the questions in the table **can** be answered by science alone.

Tick (✓) **one** question.

Question	Tick (✓)
Should caffeine be an ingredient in drinks?	
Is there caffeine in a certain brand of drink?	
How much caffeine should people drink?	

(1)

- (ii) Give **two** reasons why the other questions **cannot** be answered by science alone.

Reason 1 \_\_\_\_\_

---

Reason 2 \_\_\_\_\_

---

(2)

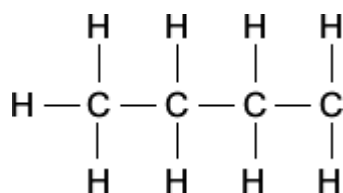
(Total 11 marks)

### Q10.

Crude oil is a mixture of hydrocarbons. Most of these hydrocarbons are alkanes.

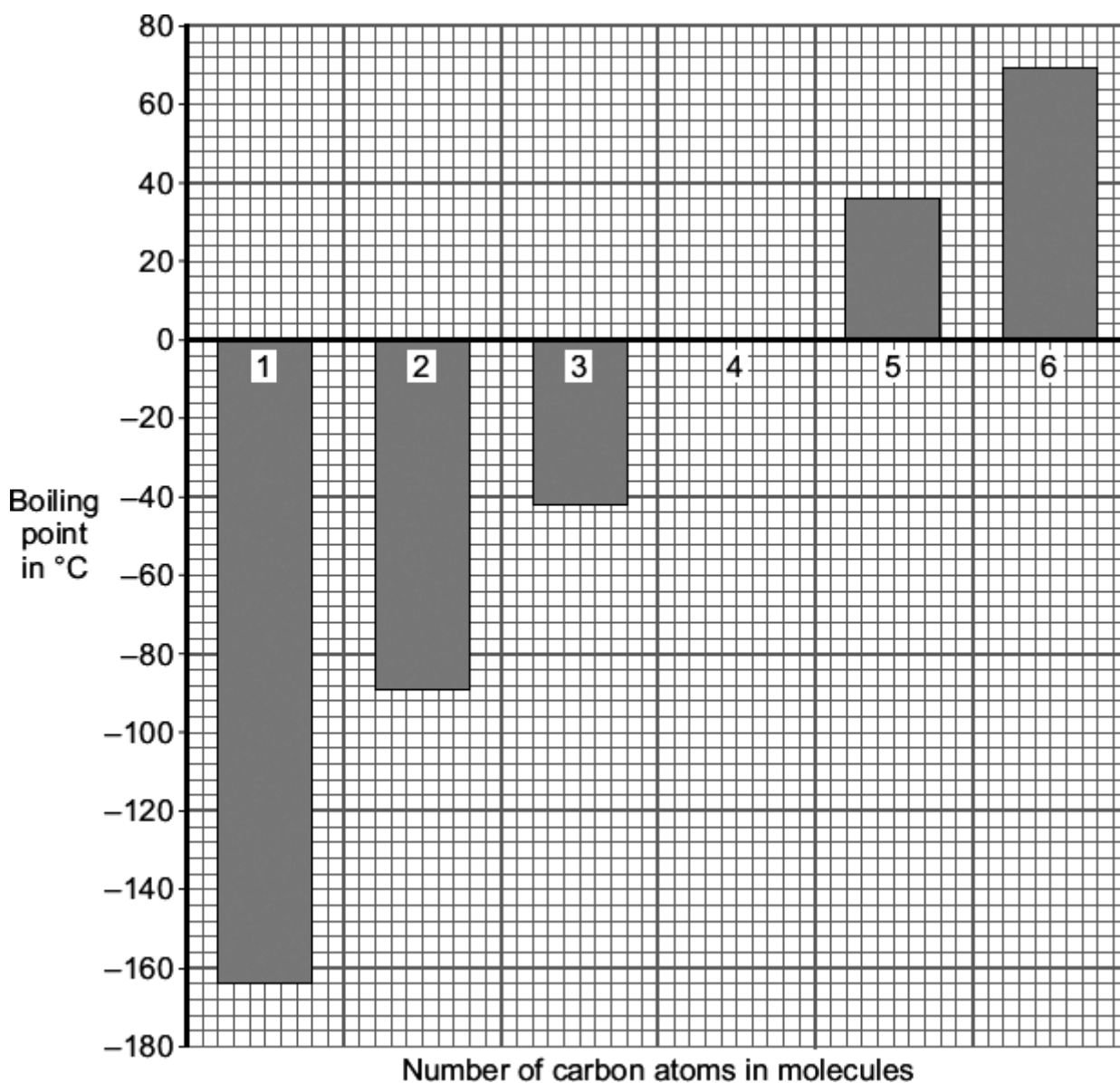
- (a) The general formula of an alkane is  $C_nH_{2n+2}$

Complete the structural formula for the alkane that has **six** carbon atoms in its molecules.



(1)

(b) The boiling points of alkanes are linked to the number of carbon atoms in their molecules.



(i) Describe the link between the number of carbon atoms in an alkane molecule and its boiling point.

---

---

(1)

(ii) Suggest **two** reasons why all of the alkanes in the bar chart are better fuels than the alkane with the formula  $C_{30}H_{62}$

1. \_\_\_\_\_

\_\_\_\_\_

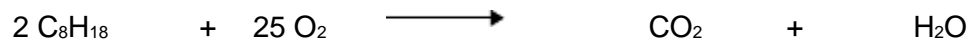
2. \_\_\_\_\_

\_\_\_\_\_

(2)

- (c) During the last 200 million years the carbon cycle has maintained the percentage of carbon dioxide in the atmosphere at about 0.03 %.  
Over the last 100 years the percentage of carbon dioxide in the atmosphere has increased to about 0.04 %.  
Most of this increase is caused by burning fossil fuels to heat buildings, to generate electricity and to power our transport.  
Fossil fuels contain carbon that has been locked up for millions of years.

- (i) Burning fossil fuels, such as petrol, releases this locked up carbon. Balance the chemical equation for the combustion of one of the alkanes in petrol.



(1)

- (ii) Where did the carbon that is locked up in fossil fuels come from?

---



---

(1)

- (iii) The burning of fossil fuels has caused the percentage of carbon dioxide in the atmosphere to increase to above 0.03 %.  
Explain why.

---



---



---



---



---



---

(2)

(Total 8 marks)

### Q11.

Hydrogen peroxide,  $\text{H}_2\text{O}_2$ , is often used as a bleach. It decomposes forming water and oxygen.

- (a) (i) Write the balanced chemical equation for the decomposition of hydrogen peroxide.

---

(3)

- (ii) Give a test for oxygen.

Test \_\_\_\_\_

Result of test \_\_\_\_\_

---

(2)

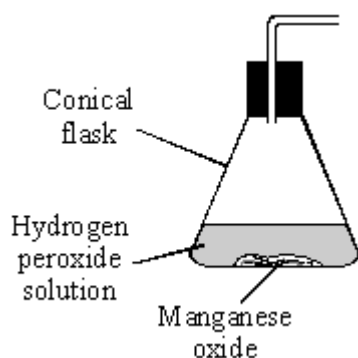
- (b) The rate of decomposition of hydrogen peroxide at room temperature is very slow. Manganese oxide is a catalyst which can be used to speed up the decomposition. Complete the sentence.

A catalyst is a substance which speeds up a chemical reaction. At the end of the reaction, the catalyst is \_\_\_\_\_

(1)

- (c) Two experiments were carried out to test if the amount of manganese oxide,  $\text{MnO}_2$  affected the rate at which the hydrogen peroxide decomposed.

- (i) Complete the diagram to show how you could measure the volume of oxygen formed during the decomposition.

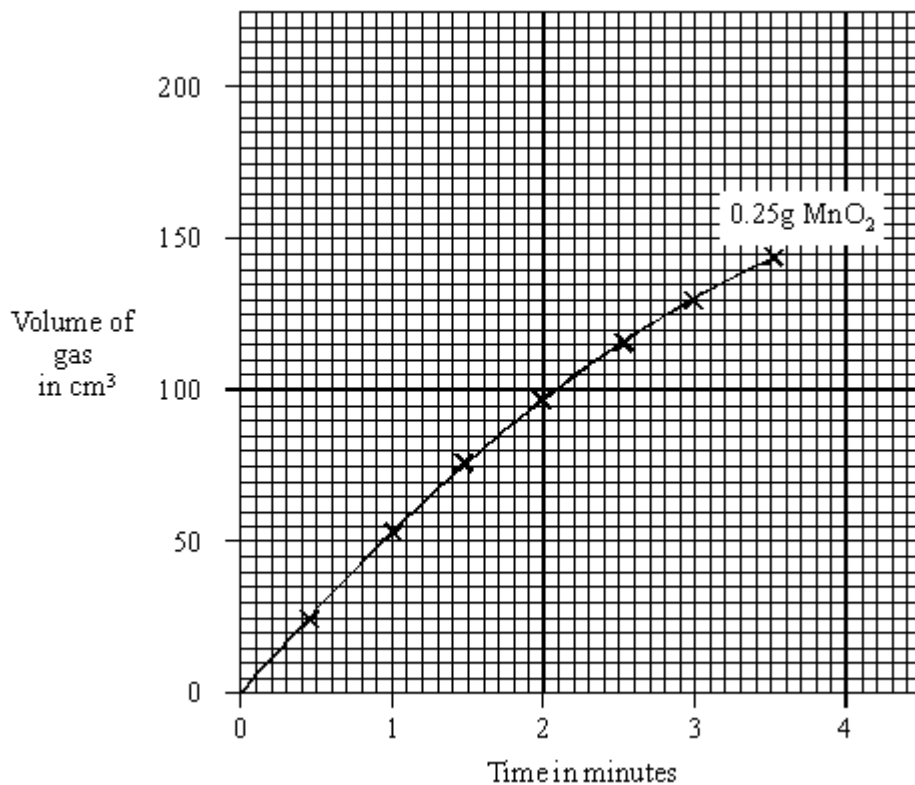


(2)

- (ii) The results are shown in the table.

<b>Time in minutes</b>	0	0.5	1	1.5	2	2.5	3	3.5
<b>Volume of gas in <math>\text{cm}^3</math> using 0.25 g <math>\text{MnO}_2</math></b>	0	29	55	77	98	116	132	144
<b>Volume of gas in <math>\text{cm}^3</math> using 2.5 g <math>\text{MnO}_2</math></b>	0	45	84	118	145	162	174	182

Draw a graph of these results. The graph for 0.25 g  $\text{MnO}_2$  has been drawn for you.



(3)

(iii) Explain why the slopes of the graphs become less steep during the reaction.

---



---



---

(2)

(iv) The same volume and concentration of hydrogen peroxide solution was used for both experiments. What **two** other factors must be kept the same to make it a fair test?

1. \_\_\_\_\_

---

2. \_\_\_\_\_

---

(2)

(Total 15 marks)

## Mark schemes

### Q1.

- (a) filter 1
- to remove solids **or** *insoluble particles*
- OR**
- add coagulant (1)*
- flocculation / settling / remove solids (1) 1
- (add) chlorine
- accept ozone / UV* 1
- to reduce the number of microbes
- accept to kill microbes / bacteria / germs*
- accept sterilise*
- allow disinfect*
- ignore remove microbes* 1
- (b) (i) ion exchange resin
- allow ion exchange column*
- allow sodium ions / Na<sup>+</sup>*
- allow hydrogen ions / H<sup>+</sup>* 1
- (ii) prevent growth of microbes
- accept sterilise*
- accept to kill microbes / bacteria / germs*
- accept to reduce the number of microbes*
- ignore remove microbes* 1
- (c) high cost of energy / *heating*
- allow uses a lot of energy* 1
- (d) any **one** from:
- helps to develop / maintain bones  
*allow any suitable positive effect on bones*
  - helps to develop / maintain teeth  
*allow any suitable positive effect on teeth*
  - reduces heart disease
- 1

[8]

## Q2.

- (a) any **one** from:
- not enough evidence or proof  
*allow no evidence or no proof*
  - (life and the Earth were created) billions of years ago  
*allow a long time ago*  
*ignore different beliefs or no one was there.*
- (b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking Guidance and apply a 'best-fit' approach to the marking.

1

### 0 marks

No relevant content

### Level 1 (1–2 marks)

Statements based on diagrams

### Level 2 (3–4 marks)

Description of how one change occurred

### Level 3 (5–6 marks)

Descriptions of how at least two changes occurred

### Examples of chemistry points made in the response could include:

#### Main changes

- oxygen increased because plants / algae developed and used carbon dioxide for photosynthesis / growth producing oxygen; carbon dioxide decreased because of this
- carbon dioxide decreased because oceans formed and dissolved / absorbed carbon dioxide; carbon dioxide became locked up in sedimentary / carbonate rocks and / or fossil fuels
- oceans formed because the Earth / water vapour cooled and water vapour in the atmosphere condensed
- continents formed because the Earth cooled forming a supercontinent / Pangaea which formed the separate continents
- volcanoes reduced because the Earth cooled forming a crust.

#### Other changes

- nitrogen has formed because ammonia in the Earth's early atmosphere reacted with oxygen / denitrifying bacteria.

6

[7]

## Q3.

- (a) any **two** from:
- the area of ocean with sea ice has reduced since 1979
  - the amount of ice follows the same pattern during a year  
*allow ice reduces in the summer and increases in the winter*
  - most ocean with sea ice in February / March
  - least ocean with sea ice in September / October

- area of ocean with sea ice decreases from March to September each year
  - area of ocean with sea ice increases from September to February / March each year
  - decrease is greater between 1995 and 2016 compared with 1979 to 1995
- allow other correct conclusions derived from the graph*

2

(b)

<b>Level 3:</b> Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.	5-6
<b>Level 2:</b> Relevant points (reasons/causes) are identified, and there are attempts at logically linking. The resulting account is not fully clear.	3-4
<b>Level 1:</b> Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1-2
No relevant content	0
<b>Indicative content</b> <ul style="list-style-type: none"> <li>• deforestation has reduced the number of trees on the planet</li> <li>• which has reduced the amount of carbon dioxide that can be removed from the atmosphere</li> <li>• increased combustion releases more carbon dioxide into the atmosphere</li> <li>• therefore there is a build-up of carbon dioxide in the atmosphere</li> <li>• (build up) allows short-wavelength radiation to pass into the Earth's atmosphere</li> <li>• and absorbs long-wavelength</li> <li>• causing an increase in global temperature</li> <li>• the increase in temperature causes ice to melt</li> </ul>	

6

[8]

**Q4.**

- (a) (i) test tube / boiling tube  
*for 1 mark*

1

- (ii)  $\text{Na}_2\text{CO}_3$



- NaCl  
each for 1 mark 2
- (b) (i) flask  
measuring cylinder  
each for 1 mark 2
- (ii) used smaller pieces  
gains 1 mark  
**but** larger surface area for reaction  
gains 2 marks 2
- (c) (i) steeper line  
straight line  
each for 1 mark 2
- (ii) reaction occurs when particles collide  
higher temperature, higher speed of particles  
so harder collisions  
more frequent collisions  
any three for 1 mark each 3

[12]

**Q5.**

- (a) (i) ammonia and hydrogen chloride  
both required either order  
accept formulae if correct in every detail 1
- (ii) ammonium chloride /  $\text{NH}_4\text{Cl}$   
do not credit ammonia chloride 1
- (iii) the fumes / gases / are poisonous / toxic  
**or** ammonia and hydrogen chloride are  
poisonous / toxic / lethal  
accept just ammonia is poisonous / toxic  
accept just hydrogen chloride is  
poisonous / toxic  
accept vapour is poisonous / toxic  
do not credit just fumes are dangerous  
**or** harmful 1
- (iv) nitrogen  
do not credit  $\text{N}/\text{N}_2$  1
- hydrogen

- do not credit H/H<sub>2</sub>* 1
- molecule  
*do not credit compound or mole* 1
- covalent  
*accept single / molecular* 1
- (b) (i) proton  
neutron  
electron  
***either all three correct  
or one or two correct  
however do not credit a response  
which is repeated*** 2
- (ii) protons and neutrons  
*both required in either order* 1

[10]

**Q6.**

- (a) catalyst **or** speeds up the reaction (owtte)  
*accept lowers activation energy **not** just helps reaction to  
take place  
ignore increased surface area* 1
- (b) C<sub>8</sub>H<sub>18</sub>  
*allow H<sub>18</sub>C<sub>8</sub>  
must be upper case  
do **not** accept powers* 1
- (c) B  
because it is a gas **or** because it has small molecules **or** because they are small  
*position **and** reason for mark  
allow it has a lower / very low boiling point than **A**  
ignore references to solubility  
accept does not condense  
do **not** accept light molecules **or** bubbles into B  
do **not** accept it is small* 1
- (d) breakdown of a substance (owtte)  
*do **not** accept decompose unqualified* 1
- by the action of heat (owtte) 1

(e) **Quality of written communication**

*if the written communication makes sense and it is in context  
then award Q mark*

Q ✓ Q ✗

1

large to small molecules **or** scientific word that implies smaller,  
e.g. alkene / ethane / petrol

*any name or formula of alkane / alkene smaller than decane*

1

either advantages of smaller molecules **or** disadvantages of larger molecules  
e.g. hydrocarbons with large molecules are limited in their usefulness

***or** converse for smaller molecules*

1

large hydrocarbon molecules do not ignite easily / do not flow easily /  
are not very volatile

***or** converse for smaller molecules*

more large hydrocarbon molecules are produced than are needed

***or** converse for smaller molecules*

smaller molecules are useful as fuels

alkenes / products can be used to make polymers

(f) (fractional) distillation

*accept fractionation*

*accept good description*

*do **not** accept just diagram*

1

[9]

**Q7.**

(a) check if safe to eat / healthy

**or**

permitted

*accept references to allergies / medical problems*

1

(b) any **three** from:

*accept dye for colour*

- made up of two colours / dots
- contains an unknown colour / dot
- contains a harmful colour
- contains E104 / quinoline yellow  
**or** does not contain E133 / brilliant blue

- further analysis needed 3
- (c) ignore No or Yes but No must be implied
- there could be other additives (in the sweets)
- accept any other type of additives but **not** colourings* 1
- could still contain / use / add natural colours
- accept non-artificial for natural*
- or**
- named natural colours* 1

[6]

**Q8.**

- (a) (i) copper is less reactive than hydrogen **or** copper is unreactive 1
- (ii) Zinc and dilute hydrochloric acid 1
- (b) (gas) syringe 1
- (c) (i) 35
- allow 3* 1
- because not close to others
- accept it is much lower than the others*
- ignore references to trends or patterns*
- dependent on the first mark* 1
- (ii)  $(49 + 50 + 48) / 3$
- = 49
- correct answer with or without working gains 2 marks* 1
- allow ecf from anomaly identified in (i) for 2 marks:*
- *Exp 1 anomalous gives 43.3*
- *Exp. 2 anomalous gives 44*
- *Exp. 4 anomalous gives 44.7*
- answer of 45.5 or 46 (anomaly not excluded) gains 1 mark*
- correct working **excluding anomaly** but with wrong answer gains 1 mark* 1
- (iii) so that a mean can be calculated
- accept improves accuracy of the mean **or** so anomalies can be identified / discarded **or** to reduce effect of random errors*
- ignore makes it a fair test*

*ignore reliability, validity, repeatability, reproducibility*

1

- (d) (i) idea of mixing with oxygen / air, letting air / oxygen in  
*accept converse*

1

- (ii) H<sub>2</sub>O  
*do not accept incorrect additional products*

1

balancing 2 ... (1) ... 2  
*allow fractions or multiples*  
*dependent on first mark*

1

[11]

**Q9.**

- (a) (i) (phosphoric) acid  
*allow phosphoric*

1

- (ii) H<sup>+</sup> / hydrogen (ion)  
*if ion symbol given, charge must be correct*

1

- (b) (i) pencil

1

so it will not run / smudge / dissolve  
*ignore pencil will not interfere with / affect the results*

**or**

because ink would run / smudge / dissolve  
*ignore ink will interfere with / affect the results*

1

- (ii) any **three** from:  
*reference to spots / dots = max 2*  
*allow colouring for colour*
- 3 colours in Cola  
*allow more colours in cola or fewer colours in fruit drink*
  - 2 colours in Fruit drink
  - one of the colours is the same
  - two of the colours in Cola are different
  - one of the colours in Fruit drink is different  
*allow some of the colours in the drinks are different*
  - one of the colours in Cola is the most soluble  
*accept one of the colours in Cola has the highest R<sub>f</sub> value*

3

- (c) different substances travel at different speeds **or** have different retention times  
*accept different attraction to solid*

*ignore properties of compounds*

1

(d) (i) Is there caffeine in a certain brand of drink?

1

(ii) any **two** from:

- cannot be done by experiment
  - based on opinion / *lifestyle choice*
  - ethical, *social* or economic issue
- accept caffeine has different effects on different people*

2

[11]

### Q10.

(a) complete diagram with 2 carbon atoms and 5 hydrogen atoms each C–C and each C–H linked by a single line (bond)

1

(b) (i) the greater the number of (carbon) atoms (in an alkane molecule) the greater its boiling point **or** vice versa

*allow as the (carbon) chain gets longer the boiling point increases*

*ignore melting points*

*do **not** accept reference to greater number of molecules*

1

(ii) *they = hydrocarbons from the graph*

*it = C<sub>30</sub>H<sub>62</sub>*

any **two** from:

- low boiling point / volatile  
*accept they are gases or liquids*
- low viscosity
- high flammability  
*accept easier to burn / ignite*
- small molecules  
*accept short chains*  
*ignore number of carbon atoms*
- burn completely  
*ignore speed of burning*

2

(c) (i) 16 (CO<sub>2</sub>) + 18 (H<sub>2</sub>O)

1

(ii) (carbon dioxide in the Earth's early) atmosphere

*accept from volcanoes (millions of years ago)*

*or from dead plants / animals*

*allow dead sea creatures  
ignore shells*

1

(iii) increase in burning / use of fossil fuels

1

locked up carbon (carbon dioxide) is released

*allow carbon / carbon dioxide from millions of years ago is released*

*accept extra carbon dioxide is not 'absorbed' (by the carbon cycle)*

1

[8]

**Q11.**

(a) (i)  $\text{H}_2\text{O}_2$  reactant correct  
*ignore any state symbols*

1

$\text{H}_2\text{O} + \text{O}_2$  products correct

1

$2\text{H}_2\text{O}_2 \rightarrow 2\text{H}_2\text{O} + \text{O}_2$  balanced  
*accept correct multiple*

1

(ii) glowing splint

1

relights

*accept 'bursts into flame'*

*do **not** accept a lighted splint burns brighter **or** faster*

1

(b) unchanged

*accept **not** used up **or** left (behind)*

1

(c) (i) gas syringe **or** measuring cylinder **either** with scale drawn **or** labelled

1

the apparatus as drawn would work

1

(ii) correct plotting of points

***one** mark to be deducted for each error*

2

best fit graph line drawn (single line drawn)

1

(iii) concentration of hydrogen peroxide decreases

*accept less particles of hydrogen peroxide to collide*

*do **not** accept hydrogen peroxide gets used up*

1

rate of reaction decreases  
*accept reaction gets slower*

1

(iv) any two from:

- temperature
- pressure
- division of catalyst **or** manganese oxide  
*do **not** accept any other factors*

2

[15]