

**GENERAL CERTIFICATE OF SECONDARY EDUCATION**

**TWENTY FIRST CENTURY SCIENCE**

**A171/02**

**CHEMISTRY A**

Unit A171: Modules C1, C2, C3 (Higher Tier)

Candidates answer on the question paper  
A calculator may be used for this paper

**OCR Supplied Materials:**

None

**Duration: 1 hour**

**Other Materials Required:**

- Pencil
- Ruler (cm/mm)

Candidate Forename		Candidate Surname	
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Centre Number						Candidate Number				
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**INSTRUCTIONS TO CANDIDATES**

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

**INFORMATION FOR CANDIDATES**

- Your quality of written communication is assessed in questions marked with a pencil (✎).
- The number of marks for each question is given in brackets [ ] at the end of the question or part question.
- The total number of marks for this paper is **60**.
- This document consists of **20** pages. Any blank pages are indicated.

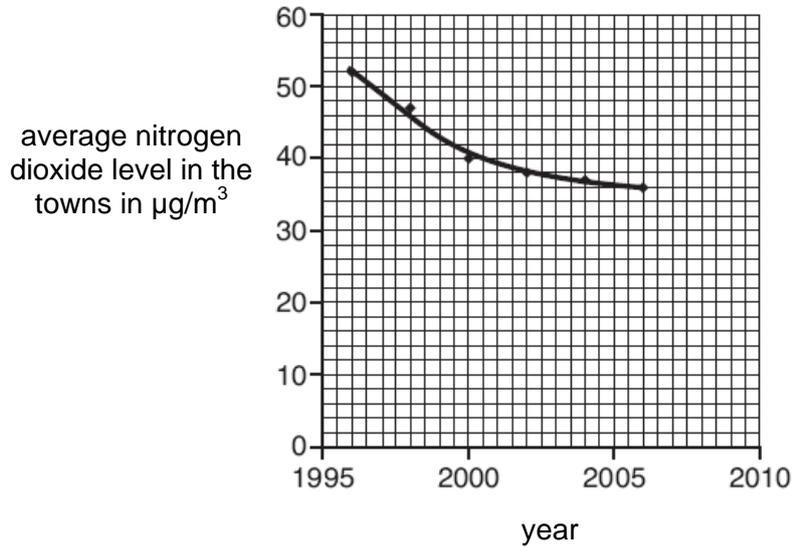
For Examiner's Use		
	Max	Mark
1	10	
2	6	
3	4	
4	9	
5	6	
6	4	
7	9	
8	4	
9	8	
TOTAL	60	

Answer **all** the questions.

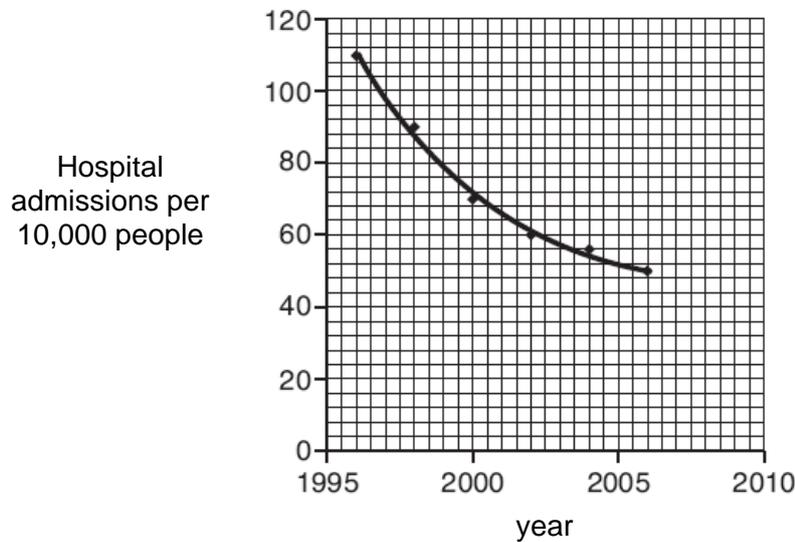
1 This question is about air pollution.

- (a) The graphs show nitrogen dioxide pollution in the air and the number of hospital admissions for asthma between 1996 and 2006.

**average nitrogen dioxide levels  
in UK towns**



**hospital admissions for asthma**



- (i) What was the number of hospital admissions per 10 000 people when the average nitrogen dioxide level in towns reached  $40 \mu\text{g} / \text{m}^3$ ?

answer = ..... [1]

- (ii) Between 1997 and 2006 the number of hospital admissions for asthma halved.

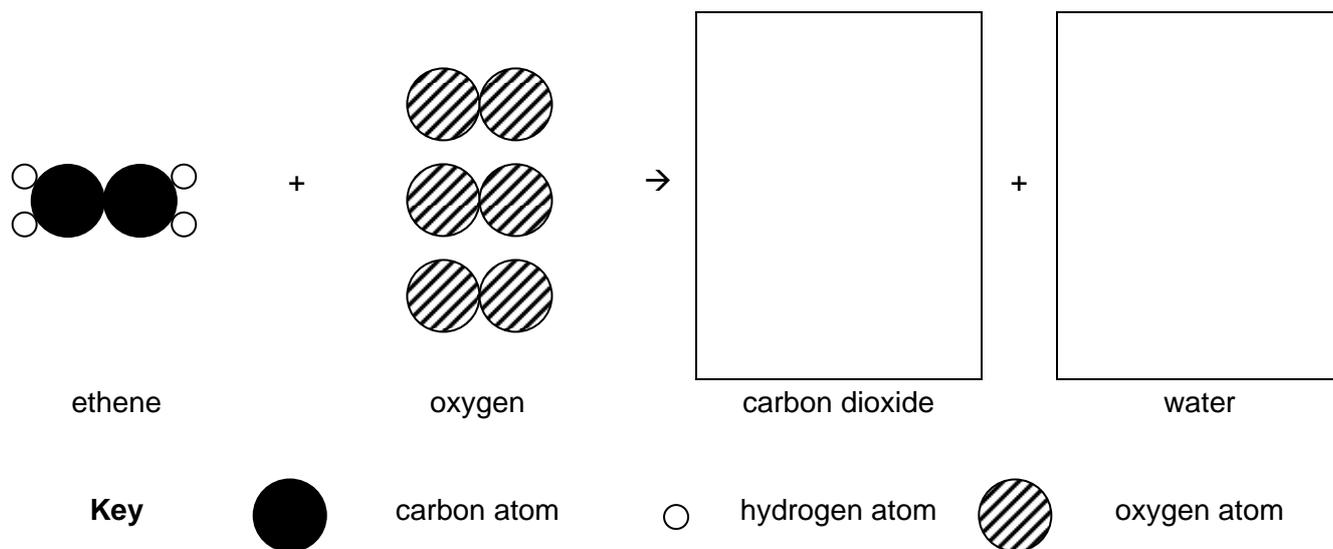
What was the change in average nitrogen dioxide levels in that time?

answer = .....  $\mu\text{g} / \text{m}^3$  [1]



2 (a) Ethene is a hydrocarbon. Ethene burns to make carbon dioxide and water.

Complete the diagram to show this reaction.



[3]

(b) A scientist analyses the products of combustion of ethene.

He collects all the products of the reaction.

His results are shown in the table.

product	mass in g
carbon dioxide	82.0
water vapour	70.2
carbon monoxide	52.0
carbon	2.0
<b>total</b>	<b>206.2</b>

(i) What is the percentage by mass of carbon monoxide?

percentage by mass = ..... % [1]

(ii) What can be concluded from these results about the conditions in which combustion occurred?

Explain your answer.

.....

.....

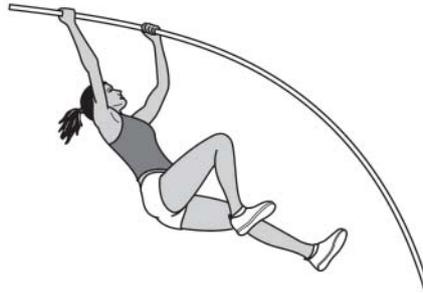
..... [2]

[Total: 6]



- 4 The table shows how the Olympic record height for the pole vault event has increased over the last 60 years.

It also shows the material used to make the pole.



year that record was broken	Olympic record in metres	material used to make the pole
1948	4.45	bamboo
1952	4.55	bamboo
1960	4.70	bamboo
1964	5.10	polymer and glass fibre
1968	5.40	polymer and glass fibre
1972	5.50	polymer and glass fibre
1980	5.80	polymer and glass fibre
1988	5.90	polymer and glass fibre
2004	5.95	polymer and glass fibre
2008	5.96	polymer and glass fibre

- (a) Here are four statements about the pole vault Olympic record height.

Use the evidence in the table to evaluate each statement.

Put a tick (✓) in the correct box next to each statement to show whether it is **true** or **false**.

	true	false
The Olympic record increased at least 0.5 m every 20 years.	<input type="checkbox"/>	<input type="checkbox"/>
The biggest increase in the Olympic record was when the material used to make the poles changed.	<input type="checkbox"/>	<input type="checkbox"/>
The Olympic record increased more between 1988 and 2008 than between 1948 and 1960.	<input type="checkbox"/>	<input type="checkbox"/>
The average increase in the Olympic record over the period of the table is about 0.1 m every 4 years.	<input type="checkbox"/>	<input type="checkbox"/>

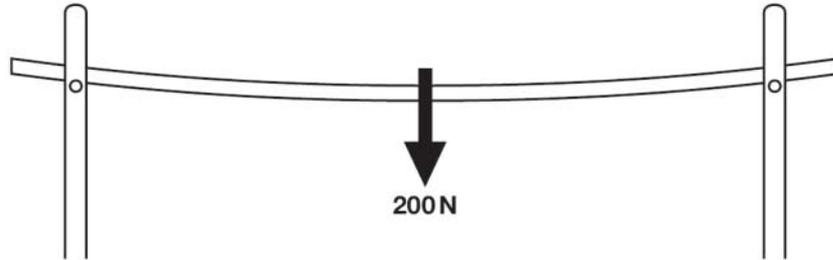
[2]

(b) Anna and Nick are investigating the properties of vaulting poles.

They know that flexibility (how far the pole bends) is an important property.

They support a pole at both ends as shown in the diagram.

They hang a 200 N weight from the centre of the pole and measure how far the pole bends.



(i) They repeat this measurement five times.

Suggest reasons why.

.....

..... [2]

Here are their results.

test number	1	2	3	4	5
how far the pole bends in cm	11.4	10.9	11.5	11.0	11.2

(ii) Suggest why the results of the five tests are different.

.....

.....

.....

..... [2]

(c) Anna and Nick use the same test on a different vaulting pole.

Here are the results for the second pole.

test number	1	2	3	4	5
how far the pole bends in cm	12.4	12.9	11.9	11.8	12.5

(i) Work out the best estimate of how far each pole bends.

first pole = ..... cm

second pole = ..... cm

[1]

(ii) Anna looks at the best estimates for both poles and concludes that the two poles have different flexibility.

Comment on whether Anna is correct to come to this conclusion? Justify your answer.

.....

.....

.....

..... [2]

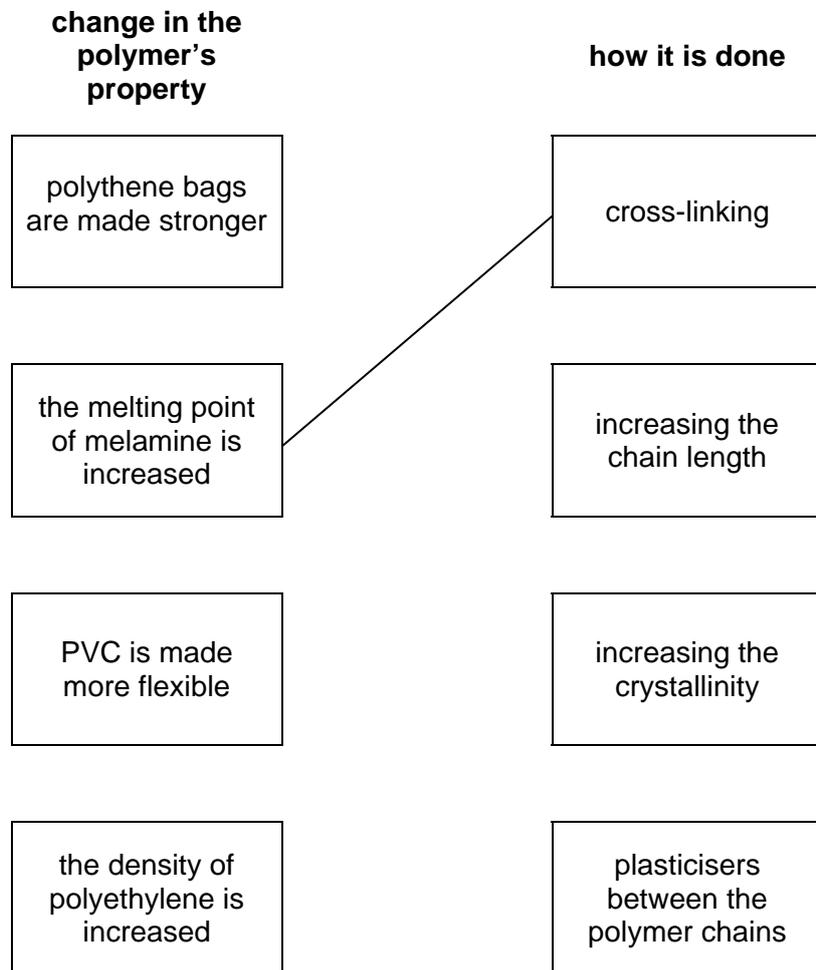
[Total: 9]



6 This question is about changing the properties of a polymer by changing its molecules.

(a) Draw straight lines to link each **change in the polymer's property** to **how it is done**.

One has been done for you.



[2]

(b) 'Vulcanised' rubber is made by heating natural rubber with sulfur.

The sulfur atoms form cross-links between the polymer chains.

The more cross-links between the polymer chains, the higher the melting point of the 'vulcanised' rubber, and the harder it becomes.

Why does the **amount of cross-linking** have these effects?

Put a tick (✓) in the correct box next to each possible reason, to show whether the reason is **true** or **false**.

	<b>true</b>	<b>false</b>
There are larger forces between the polymer chains.	<input type="checkbox"/>	<input type="checkbox"/>
There are smaller forces within the polymer chains.	<input type="checkbox"/>	<input type="checkbox"/>
The polymer chains are increased in length.	<input type="checkbox"/>	<input type="checkbox"/>
The polymer chains are forced further apart.	<input type="checkbox"/>	<input type="checkbox"/>
It becomes more difficult for the polymer chains to break away from one another.	<input type="checkbox"/>	<input type="checkbox"/>
The polymer chains become tangled.	<input type="checkbox"/>	<input type="checkbox"/>
The polymer chains can slide past one another more easily.	<input type="checkbox"/>	<input type="checkbox"/>

[2]

[Total: 4]

7 A website gives information about salt in the diet.

The maximum amount of salt a person should eat in a day is:

1 to 3 years old	–	2 g salt per day
4 to 6 years old	–	3 g salt per day
7 to 10 years old	–	5 g salt per day
11 years old and over	–	6 g salt per day

(a) (i) Describe carefully the relationship between age and the daily maximum amount of salt.

.....  
 ..... [1]

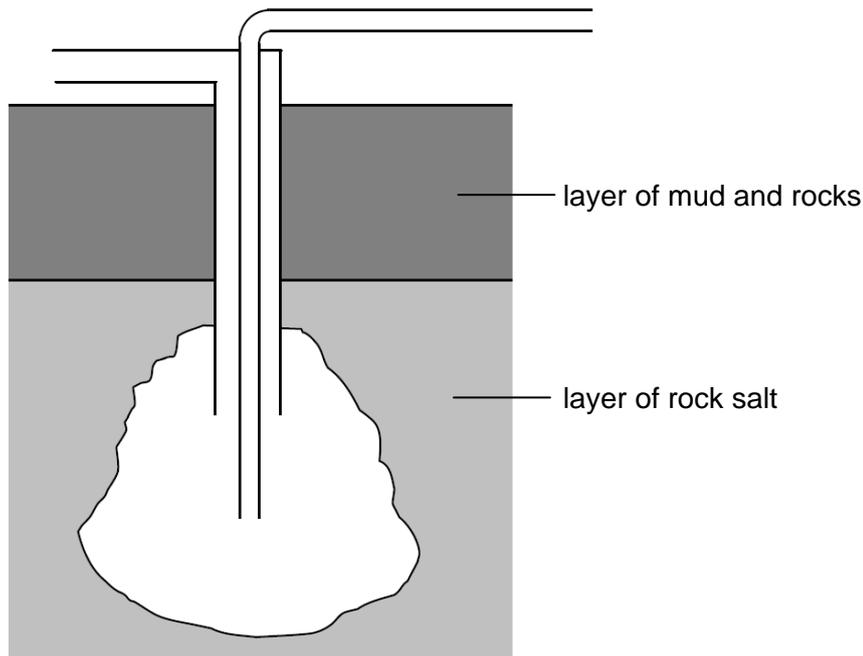
(ii) Tom thinks that the daily maximum intake of salt should be linked to a person's body mass rather than to their age.

Explain why a person's body mass may be more important than their age when deciding how much salt they can safely eat in a day.

.....  
 .....  
 ..... [2]



- 8 Salt is found underneath the ground in some parts of the UK.  
It can be obtained by solution mining.



- (a) The diagram shows part of the process for solution mining of salt.  
Here are some statements about solution mining of salt.  
Not all of the statements are correct, and they are in the wrong order.

- A Water dissolves the salt.
- B Water is pumped down the inner and outer pipes.
- C Water is pumped down the outer pipe.
- D Salt solution is pumped to the chemical plant when required.
- E Salt solution is stored above the ground.
- F Rock salt is dug out of the cavern.
- G Pressure pushes salt solution up to the surface.

Choose the correct steps and then fill in the boxes to show the right order.  
One has been done for you.

				<b>D</b>
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[2]

(b) Describe ways that solution mining can affect the environment near the mine.

.....

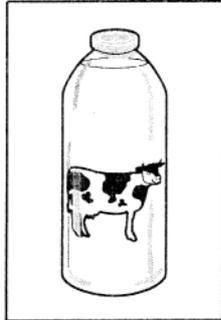
.....

.....

..... [2]

[Total: 4]

- 9 Some people have milk delivered to their houses. The milk is contained in glass bottles. When the glass bottles are empty they are collected, cleaned and re-used. Other people buy milk in plastic bottles from the supermarkets. When the milk has been used the plastic bottles are thrown away.



glass bottle



plastic bottle

The table gives information about the energy used to make glass bottles and plastic bottles. It also gives information about the energy used in washing, filling and delivering the bottles.

	energy used in MJ	
	re-usable glass bottle	non-reusable plastic bottle
<b>manufacturing the bottle</b>	7.2	4.7
<b>washing, filling and delivering the bottle</b>	2.5	2.2

- (a) How many times must a glass bottle be re-used for there to be an energy saving compared to using non-returnable plastic bottles?

You must show your working.

number of times = ..... [2]

(b) Some students are talking about the disposal of plastic bottles by incineration.

**Anwar**  
Incineration releases toxic gases.

**Frankie**  
The need for burning other fuels is reduced.

**Barry**  
High temperature incineration heats the atmosphere.

**Ella**  
Building incinerators uses energy.

**Carly**  
The energy released when the bottles burn can be used.

**David**  
Waste bottles have to be collected and transported.

Which two students, **when taken together**, are arguing that incineration might have less environmental impact than landfill?

..... and ..... [2]

- (c) The method of disposal of the bottle is one feature considered in its Life Cycle Assessment (LCA).

Write down **two** other features that should be considered in a Life Cycle Assessment, and for each feature suggest how it may be different for the two types of bottle.

.....

.....

.....

.....

.....

.....

.....

.....

[4]

[Total: 8]

[Paper Total: 60]

**END OF QUESTION PAPER**

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**CHEMISTRY A**

**A171/02**

Unit A171: Modules C1, C2, C3 (Higher Tier)

**MARK SCHEME**

**MAXIMUM MARK 60**

## Guidance for Examiners

Additional guidance within any mark scheme takes precedence over the following guidance.

1. Mark strictly to the mark scheme.
2. Make no deductions for wrong work after an acceptable answer unless the mark scheme says otherwise.
3. Accept any clear, unambiguous response which is correct, e.g. mis-spellings if phonetically correct (but check additional guidance).
4. Abbreviations, annotations and conventions used in the detailed mark scheme:

/	= alternative and acceptable answers for the same marking point
(1)	= separates marking points
<b>not/reject</b>	= answers which are not worthy of credit
<b>ignore</b>	= statements which are irrelevant - applies to neutral answers
<b>allow/accept</b>	= answers that can be accepted
(words)	= words which are not essential to gain credit
<u>words</u>	= underlined words must be present in answer to score a mark
ecf	= error carried forward
AW/owtte	= alternative wording
ORA	= or reverse argument

Eg mark scheme shows 'work done in lifting / (change in) gravitational potential energy' (1)  
work done = 0 marks  
work done lifting = 1 mark  
change in potential energy = 0 marks  
gravitational potential energy = 1 mark

5. Annotations:  
The following annotations are available on SCORIS.

✓	= correct response
✗	= incorrect response
bod	= benefit of the doubt
nbod	= benefit of the doubt <b>not</b> given
ECF	= error carried forward
^	= information omitted
I	= ignore
R	= reject

6. If a candidate alters his/her response, examiners should accept the alteration.

7. Crossed out answers should be considered only if no other response has been made. When marking crossed out responses, accept correct answers which are clear and unambiguous.

Eg

For a one mark question, where ticks in boxes 3 and 4 are required for the mark:

Put ticks (✓) in the two correct boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth 0 marks.

Put ticks (✓) in the two correct boxes.

<input type="checkbox"/>
<input type="checkbox"/>
<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth one mark.

Put ticks (✓) in the two correct boxes.

<input checked="" type="checkbox"/>
<input type="checkbox"/>

This would be worth one mark.

8. The list principle:  
If a list of responses greater than the number requested is given, work through the list from the beginning. Award one mark for each correct response, ignore any neutral response, and deduct one mark for any incorrect response, eg one which has an error of science. If the number of incorrect responses is equal to or greater than the number of correct responses, no marks are awarded. A neutral response is correct but irrelevant to the question.
9. Marking method for tick boxes:  
Always check the additional guidance.

If there is a set of boxes, some of which should be ticked and others left empty, then judge the entire set of boxes.

If there is at least one tick, ignore crosses. If there are no ticks, accept clear, unambiguous indications, eg shading or crosses.

Credit should be given for each box correctly ticked. If more boxes are ticked than there are correct answers, then deduct one mark for each additional tick. Candidates cannot score less than zero marks.

Eg If a question requires candidates to identify a city in England, then in the boxes

Edinburgh	
Manchester	
Paris	
Southampton	

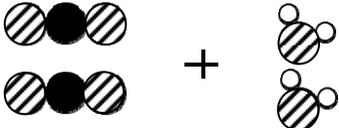
the second and fourth boxes should have ticks (or other clear indication of choice) and the first and third should be blank (or have indication of choice crossed out).

Edinburgh			✓			✓	✓	✓	✓	
Manchester	✓	x	✓	✓	✓				✓	
Paris				✓	✓		✓	✓	✓	
Southampton	✓	x		✓		✓	✓		✓	
Score:	2	2	1	1	1	1	0	0	0	NR

10. Three questions in this paper are marked using a Level of Response (LoR) mark scheme with embedded assessment of the Quality of Written Communication (QWC). When marking with a Level of Response mark scheme:
- Read the question in the question paper, and then the list of relevant points in the 'Additional guidance' column of the mark scheme, to familiarise yourself with the expected science. The relevant points are not to be taken as marking points, but as a summary of the relevant science from the specification.
  - Read the level descriptors in the 'Expected answers' column of the mark scheme, starting with Level 3 and working down, to familiarise yourself with the expected levels of response.
  - *For a general correlation between quality of science and QWC:* determine the level based upon which level descriptor best describes the answer; you may award either the higher or lower mark within the level depending on the quality of the science and/or the QWC.
  - *For high-level science but very poor QWC:* the candidate will be limited to Level 2 by the bad QWC no matter how good the science is; if the QWC is so bad that it prevents communication of the science the candidate cannot score above Level 1.
  - *For very poor or totally irrelevant science but perfect QWC:* credit cannot be awarded for QWC alone, no matter how perfect it is; if the science is very poor the candidate will be limited to Level 1; if there is insufficient or no relevant science the answer will be Level 0.

Question			Expected answers	Mark	Additional guidance
1	(a)	(i)	70	[1]	allow any answer between 68 and 72
		(ii)	(decrease) of $13 \mu\text{g}/\text{m}^3$	[1]	allow any answer between 11 and 15
		(iii)	<p> <b>[Level 3]</b>            Answer explains the difference between correlation and cause, and correctly identifies the correlation shown by the graphs. Explains clearly that nitrogen dioxide could be a cause of asthma or asthma could be caused by other factors and that more information is needed to be sure. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling.            (5-6 marks)</p> <p><b>[Level 2]</b>            Answer does not clearly explain the difference between correlation and cause, but correctly identifies the correlation shown by the graphs. Explains that nitrogen dioxide could or could not be a cause of asthma. Understands that more information is needed to be sure. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling.            (3-4 marks)</p> <p><b>[Level 1]</b>            Answer identifies a link shown by the graphs. Explains that nitrogen dioxide may not be a cause of asthma. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science.            (1-2 marks)</p> <p><b>[Level 0]</b>            Insufficient or irrelevant science. Answer not worthy of credit.            (0 marks)</p>	[6]	<p><b>relevant points include:</b></p> <ul style="list-style-type: none"> <li>• a correlation is present when an outcome changes, as an input (factor) changes / OWTTE</li> <li>• graphs show a (positive) correlation between levels of nitrogen dioxide in the air and hospital admissions for asthma.</li> <li>• as nitrogen dioxide decreases hospital admissions for asthma decrease</li> <li>• a correlation does not necessarily indicate a causal link</li> <li>• a causal link needs a known mechanism linking the input factor and the outcome OWTTE</li> <li>• nitrogen dioxide in the air is a plausible cause of asthma, but need to know how it causes asthma to be sure</li> <li>• asthma could be caused by other factors that need to be investigated.</li> </ul>

Question		Expected answers	Mark	Additional guidance
1	(b)	1 3	[2]	either order
<b>Total</b>			<b>[10]</b>	

Question		Expected answers	Mark	Additional guidance
2	(a)		[3]	1 mark for correct drawing of CO <sub>2</sub> molecule 1 mark for correct drawing of water molecule 1 mark for 2 CO <sub>2</sub> and 2 water molecules
	(b)	(i) 25.2	[1]	
		(ii) there was a lack of oxygen since carbon monoxide and carbon were produced due to incomplete combustion	[2]	for full marks the explanation must be linked to the conclusion
<b>Total</b>			<b>[6]</b>	

Question		Expected answers	Mark	Additional guidance
3		water decreased because Earth cooled and water condensed into oceans CO <sub>2</sub> decreased by photosynthesis and CO <sub>2</sub> also decreased by dissolving in oceans/formation of fossil fuels oxygen increased through photosynthesis	[4]	
<b>Total</b>			<b>[4]</b>	

Question		Expected answers	Marks	Additional guidance															
4	(a)	<table border="0"> <thead> <tr> <th></th> <th>true</th> <th>false</th> </tr> </thead> <tbody> <tr> <td>... 0.5 m every 20 years.</td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>... poles changed</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>...more between 1996 and 2008 ...</td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td>... 0.1 m every 4 years.</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </tbody> </table>		true	false	... 0.5 m every 20 years.	<input type="checkbox"/>	<input checked="" type="checkbox"/>	... poles changed	<input checked="" type="checkbox"/>	<input type="checkbox"/>	...more between 1996 and 2008 ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>	... 0.1 m every 4 years.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	[2]	all four correct = 2 marks 3 or 2 correct = 1 mark
	true	false																	
... 0.5 m every 20 years.	<input type="checkbox"/>	<input checked="" type="checkbox"/>																	
... poles changed	<input checked="" type="checkbox"/>	<input type="checkbox"/>																	
...more between 1996 and 2008 ...	<input type="checkbox"/>	<input checked="" type="checkbox"/>																	
... 0.1 m every 4 years.	<input checked="" type="checkbox"/>	<input type="checkbox"/>																	
	(b)	(i)	<b>any two from:</b> find the best estimate of the true value identify outliers discard outliers ensure results are reliable	[2]															
		(ii)	<b>any two from:</b> human error in measuring weight not placed in middle / weight hung from a different place supports move apart or together / pole in a different position on supports pole does not straighten after weight hung on it	[2]															
	(c)	(i)	11.2 12.3	[1]	both correct for 1 mark														

Question			Expected answers	Marks	Additional guidance
4	(c)	(ii)	<p>the ranges of the two data sets do not overlap / the mean of each data set is outside the range of the other data set indicating that the true values/best estimates/means/variabilities are likely to be different / Anna's conclusion is likely to be correct</p> <p><b>OR</b></p> <p>the sample size is too small <u>and</u> the ranges too close together to be sure that the true values/best estimates/means/variabilities are different / to be sure that Anna's conclusion is correct</p>	[2]	maximum of 1 mark if answer implies that Anna's conclusion is definitely correct or incorrect
			<b>Total</b>	<b>[9]</b>	

Question	Expected answers	Marks	Additional guidance
5	 <p><b>[Level 3]</b> Detailed and clear explanation of why experts have concerns about nanoparticles and suggestions of how consumers may be protected. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5-6 marks)</p> <p><b>[Level 2]</b> An explanation of why experts have concerns about nanoparticles and at least one suggestion of how consumers may be protected. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There are occasional errors in grammar, punctuation and spelling. (3-4 marks)</p> <p><b>[Level 1]</b> Answer only refers to either why experts are worried or how consumers can be protected. Little detail is provided. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling prevent communication of the science. (1-2 marks)</p> <p><b>[Level 0]</b> Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	<b>[6]</b>	<p><b>relevant points include:</b></p> <ul style="list-style-type: none"> <li>• nanoparticles show different properties to larger particles of the same material</li> <li>• one of the reasons is that their surface area to volume ratio is very large</li> <li>• may be harmful</li> <li>• may have long-term effects</li> <li>• difficulty of establishing long-term effects since new technology</li> <li>• harmful effects have not been fully investigated</li> <li>• more research needed</li> <li>• to establish safe levels</li> <li>• specific to each application / type of nanoparticle</li> <li>• labelling to show when nanoparticles used</li> </ul>
	<b>Total</b>	<b>[6]</b>	

Question		Expected answers	Marks	Additional guidance																																
6	(a)		[2]	3 lines correct = 2 marks 2 or 1 line correct = 1 mark																																
	(b)	<table border="0"> <tr> <td></td> <td>larger forces between ...</td> <td>true</td> <td>false</td> </tr> <tr> <td></td> <td></td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td></td> <td></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td>becomes more difficult for ...</td> <td><input checked="" type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td></td> <td></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> <tr> <td></td> <td></td> <td><input type="checkbox"/></td> <td><input checked="" type="checkbox"/></td> </tr> </table>		larger forces between ...	true	false			<input checked="" type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input checked="" type="checkbox"/>			<input type="checkbox"/>	<input checked="" type="checkbox"/>			<input type="checkbox"/>	<input checked="" type="checkbox"/>		becomes more difficult for ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>			<input type="checkbox"/>	<input checked="" type="checkbox"/>			<input type="checkbox"/>	<input checked="" type="checkbox"/>	[2]	evaluate every row all 7 rows correct = 2 marks 6 rows correct = 1 mark
	larger forces between ...	true	false																																	
		<input checked="" type="checkbox"/>	<input type="checkbox"/>																																	
		<input type="checkbox"/>	<input checked="" type="checkbox"/>																																	
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		<input type="checkbox"/>	<input checked="" type="checkbox"/>																																	
	becomes more difficult for ...	<input checked="" type="checkbox"/>	<input type="checkbox"/>																																	
		<input type="checkbox"/>	<input checked="" type="checkbox"/>																																	
		<input type="checkbox"/>	<input checked="" type="checkbox"/>																																	
		<b>Total</b>	<b>[4]</b>																																	

Question			Expected answers	Marks	Additional guidance
7	(a)	(i)	as age increases the daily maximum amount of salt increases up to the age of 11, then the daily maximum is fixed / does not increase (any further) with age	[1]	
		(ii)	(for a particular amount of salt) a person with a low mass will get much more salt per kg of body mass than a person with a high body mass therefore the daily maximum should be linked to mass because people of different ages may have the same body mass / people who are the same age may have (very) different body masses	[2]	<b>credit</b> the idea that the same amount of salt gives a higher <u>concentration</u> in a person with low body mass than in a person with high body mass

Question			Expected answers	Marks	Additional guidance
7	(b)		<p><b>[Level 3]</b> Answer clearly considers (perceived) risks versus (perceived) benefits in the argument <i>against</i> lowering salt, and in the argument <i>for</i> lowering salt. All information in answer is relevant, clear, organised and presented in a structured and coherent format. Specialist terms are used appropriately. Few, if any, errors in grammar, punctuation and spelling. (5-6 marks)</p> <p><b>[Level 2]</b> Answer for the most part considers (perceived) risks and (perceived) benefits on both sides of the argument. For the most part the information is relevant and presented in a structured and coherent format. Specialist terms are used for the most part appropriately. There may be occasional errors in grammar, punctuation and spelling. (3-4 marks)</p> <p><b>[Level 1]</b> Answer shows a limited consideration of (perceived) risks and (perceived) benefits, but may not address both sides of the argument. Answer may be simplistic. There may be limited use of specialist terms. Errors of grammar, punctuation and spelling may be intrusive. (1-2 mark)</p> <p><b>[Level 0]</b> Insufficient or irrelevant science. Answer not worthy of credit. (0 marks)</p>	[6]	<p><b>relevant points include:</b></p> <p>food companies may not want to lower the amount of salt in their food because:</p> <ul style="list-style-type: none"> <li>• (the companies think) the , cost of reformulating recipes / cost of removing salt / risk of decreased sales (due to , poorer taste / shorter shelf life) , outweighs benefits to health</li> <li>• (the companies think) the benefits of taste and preservative outweigh (perceived) risk(s) to health</li> </ul> <p>food companies should be made to lower the amount of salt in their foods because:</p> <ul style="list-style-type: none"> <li>• too much salt in a diet increases the risk of high blood pressure, heart disease and strokes</li> <li>• risk / cost , of ill health outweighs benefits of adding salt</li> <li>• benefit to population outweighs , risk / cost , to food companies</li> </ul>
<b>Total</b>				<b>[9]</b>	

Question		Expected answers	Marks	Additional guidance
8	(a)	<b>C A G E</b>	[2]	<b>C A</b> in correct place = 1 mark <b>G E</b> in correct place = 1 mark
	(b)	land above the mine is unsupported/less stable so it could collapse into the mine / subside subsidence affects buildings/structures/roads/habitats / risk of falling through cracks to humans/wildlife/livestock	[2]	
		<b>Total</b>	<b>[4]</b>	

Question		Expected answers	Marks	Additional guidance
9	(a)	first use: glass = $7.2 + 2.5 = 9.7$ (MJ) plastic = $4.7 + 2.2 = 6.9$ (MJ)  second use: glass = 2.5 (MJ) plastic = $4.7 + 2.2 = 6.9$ (MJ)  number of times = 2	[2]	first mark is for correctly calculating the energy used each time for both types of bottle; second mark is for correctly concluding that a glass bottle must be used twice to save energy compared to two plastic bottles   correct answer with no working shown = 1 mark
	(b)	Carly Frankie	[2]	
	(c)	<b>any two pairs from:</b>  environmental impact of obtaining raw materials suggestion of how this will be different for glass and plastic bottles  making and using the product suggestion of how this will be different for glass and plastic bottles  using resources (including water) suggestion of how this will be different for glass and plastic bottles	[4]	<b>credit</b> any reasonable suggestion   <b>credit</b> any reasonable suggestion   <b>credit</b> any reasonable suggestion
<b>Total</b>			<b>[8]</b>	

## Assessment Objectives (AO) Grid

(includes quality of written communication )

Question	AO1	AO2	AO3	Total
1(a)(i)		1		1
1(a)(ii)		1		1
1(a)(iii) 		3	3	6
1(b)	1	1		2
2(a)	2	1		3
2(b)(i)		1		1
2(b)(ii)	1		1	2
3	4			4
4(a)		1	1	2
4(b)(i)	1	1		2
4(b)(ii)	1	1		2
4(c)(i)		1		1
4(c)(ii)			2	2
5 	4	2		6
6(a)	1	1		2
6(b)	2			2
7(a)(i)		1		1
7(a)(ii)		2		2
7(b) 	2	2	2	6
8(a)	2			2
8(b)	2			2
9(a)		2		2
9(b)		2		2
9(c)	2	2		4
<b>Totals</b>	<b>25</b>	<b>26</b>	<b>9</b>	<b>60</b>

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