

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
SCIENCE A

UNIT 1: Modules B1 C1 P1 (Foundation Tier)

SPECIMEN ASSESSMENT MATERIAL

(from 2010 onwards)

Time: 40 minutes

Candidates answer on the question paper

Additional materials (enclosed):

None

Calculators may be used.

Additional materials: Pencil
 Ruler (cm/mm)

Candidate
 Forename

Candidate
 Surname

Centre
 Number

--	--	--	--	--

Candidate
 Number

--	--	--	--

INSTRUCTIONS TO CANDIDATES

- Write your name 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 you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Do **not** write outside the box bordering each page.
- Write your answer to each question in the space provided.

INFORMATION FOR CANDIDATES

- The number of marks for each question is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **42**.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	6	
2	8	
3	5	
4	8	
5	9	
6	6	
TOTAL	42	

This document consists of **16** printed pages

Answer **all** the questions.

- 1 Sam has been watching a TV programme about the Earth.

He is trying to explain it to his friend Jo, but he has forgotten some of the information in the programme.



Sam

The Earth is made of several layers.
 The very middle of the Earth is called the mantle.
 The outside layer of the Earth is called the crust.
 The outside layer of the Earth is made of tectonic plates.
 These tectonic plates move about.

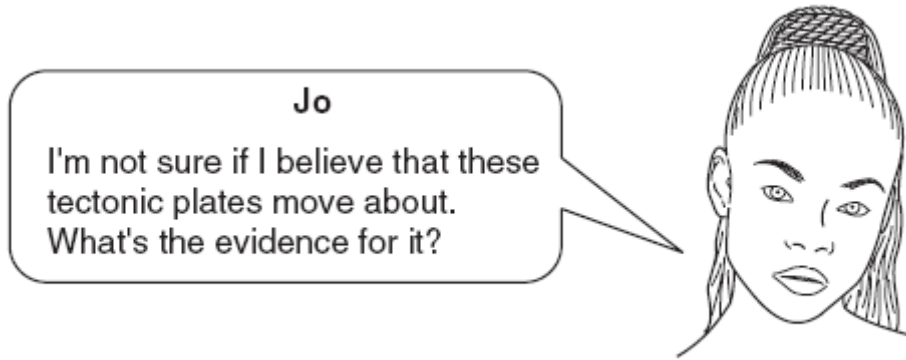
- (a) Sam makes a number of statements of fact. Some of them are mistakes.

Write **T** in the box next to each **true** statement and **F** in the box next to each **false** one.

	T (true) or F (false)
The Earth is made of several layers.	<input type="checkbox"/>
The very middle of the Earth is called the mantle.	<input type="checkbox"/>
The outside layer of the Earth is called the crust.	<input type="checkbox"/>
The outside layer of the Earth is made of tectonic plates.	<input type="checkbox"/>

[4]

(b) Jo needs to be convinced of these ideas.



Here are some scientific statements about the Earth.

Put ticks (✓) in the boxes next to the **three** statements which give Jo evidence that the tectonic plates move about.

Coal and oil are fossil fuels.

The centre of the Earth is mostly iron.

Mountains often occur where tectonic plates meet.

Seafloor spreading happens in the middle of many oceans.

Volcanoes and earthquakes happen near the edges of tectonic plates.

[2]

[Total: 6]

- 2 When astronomers look at the night sky through telescopes, they see many stars and spiral nebulae.



© R. Jay GaBany

In 1920, astronomers did not know what 'spiral nebulae' were, nor how far away they were. There was a great debate between two astronomers.



Harlow Shapley

Our Milky Way is the only galaxy there is: it's the whole Universe. It is huge: 300 000 light years across.

Spiral nebulae are clouds of gas and dust inside the Milky Way.

Our Sun is far from the centre of the Milky Way.

Heber Curtis

You're wrong about the size of the Milky Way - it's ten times smaller than that.

Our Sun is very near the centre of the Milky Way.

These spiral nebulae are galaxies just like our Milky Way. They are much further away from us than the edge of the Milky Way galaxy.



(a) Explain why Shapley and Curtis had different explanations, even though they used the same experimental data.

Your answer should include

- differences between their explanations
- suggested reasons for their disagreement.

.....

.....

.....

.....

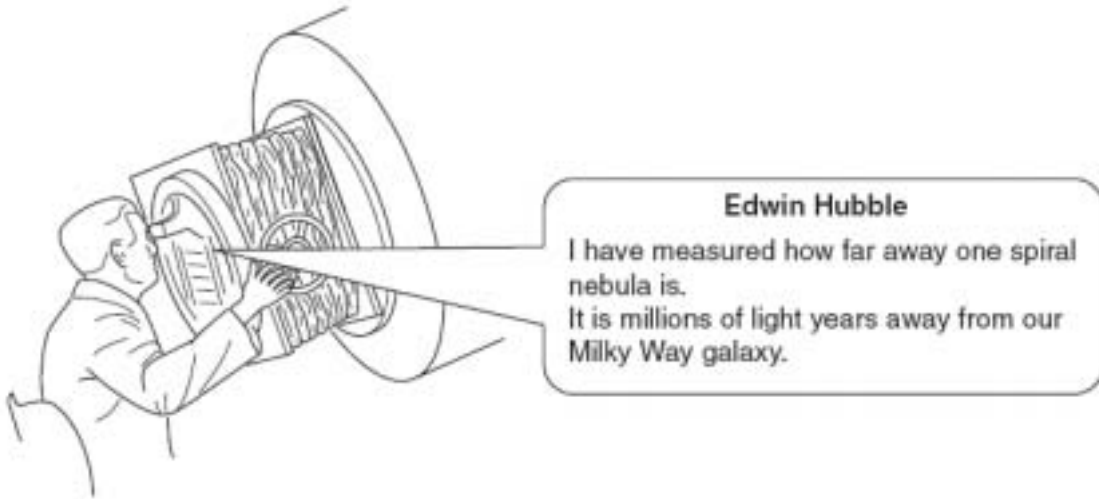
.....

.....

.....

[4]

(b) Another astronomer made more accurate measurements on stars and spiral nebulae.



Who could use this new evidence to support his argument?

Put a tick (✓) in the one correct box to show which theory about spiral nebulae is supported by Hubble's measurement.

Shapley	
Curtis	
both Shapley and Curtis	

[1]

(c) Edwin Hubble also measured the **movement** of objects in the night sky.

Use the words from this list to complete the sentence below.

away from us

galaxies

moons

planets

together

towards us

Edwin Hubble showed that distant

are moving [2]

(d) Using Edwin Hubble's methods, astronomers have been able to show that the Universe began with a 'big bang'.

Put a **ring** around the number of years ago that the Universe began.

4000 million

5000 million

10 000 million

14 000 million

[1]

[Total: 8]

BLANK PAGE

**Question 3 starts on page 8
PLEASE DO NOT WRITE ON THIS PAGE**

3 (a) It is possible to do genetic tests on fetuses.

These tests can give information about the alleles the fetus has inherited.

The fetus may have alleles that cause diseases such as Cystic Fibrosis.

After the test the parents may decide to terminate the pregnancy.

Suggest **two** reasons why parents may choose **not** to have a genetic test.

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

(b) This article appeared on a website.

Watchdog backs more embryo checks

There are new guidelines for tests on embryos.

Couples with family histories of breast cancer can now have their embryos tested. Breast cancer does not usually affect people until they are over thirty.

Individuals with the genes linked to breast cancer have about an 80% chance of developing breast cancer.

Testing will not be allowed for conditions like asthma which can be treated with medicine.

Testing will not be allowed for schizophrenia which is not caused by a single gene.

(i) There are **two major changes** to the tests on embryos which should be allowed.

Put ticks (✓) in the boxes next to the **two** tests which will be allowed by the new guidelines.

- tests for genes causing asthma
- tests for genes that increase the chance of cancer
- tests for conditions caused by many genes, e.g. schizophrenia
- tests for genes which do not usually affect individuals until they reach the age of thirty

[1]

(ii) The article says:

'Individuals with the genes linked to breast cancer have about an 80% chance of developing breast cancer.'

Read the explanations of this statement.

Put a tick (✓) in the box next to the **best** explanation.

20% of women with breast cancer genes will get breast cancer.

80% of women with breast cancer genes will get breast cancer.

Every woman with breast cancer genes will get breast cancer.

[1]

(iii) Schizophrenia is probably caused by a combination of several inherited genes and environmental factors.

Who is **most** likely to suffer from schizophrenia?

Choose from the following people.

individual	genes present	environmental factors present
Andy	yes	yes
Briony	no	yes
Chloe	yes	no
David	no	no

answer [1]

[Total: 5]

4 Read the newspaper article below.

Three sisters unite for surrogate birth

Laura, who is infertile, has a baby boy thanks to her two sisters.

Her sister Rebecca had an operation to remove an egg.

This was fertilised using sperm from Laura's husband, Simon.

The embryo was implanted into another of Laura's sisters, Hannah.

Hannah became pregnant and gave birth to a healthy boy, Jake.

(a) Complete the sentences using words from this list.

calcium

DNA

many copies

one copy

two copies

The egg cell from Rebecca and the sperm cell from Simon each contained

..... of each chromosome.

The fertilised egg cell contains of each chromosome.

Each chromosome is made of a chemical called [3]

(b) Jake is a boy. His sex is determined by his sex chromosomes.

Write down the sex chromosomes Jake must have inherited.

answer [1]

(c) Which statement best explains who Jake is most like?

Put a tick (✓) in the correct box.

Rebecca, because she donated the egg.

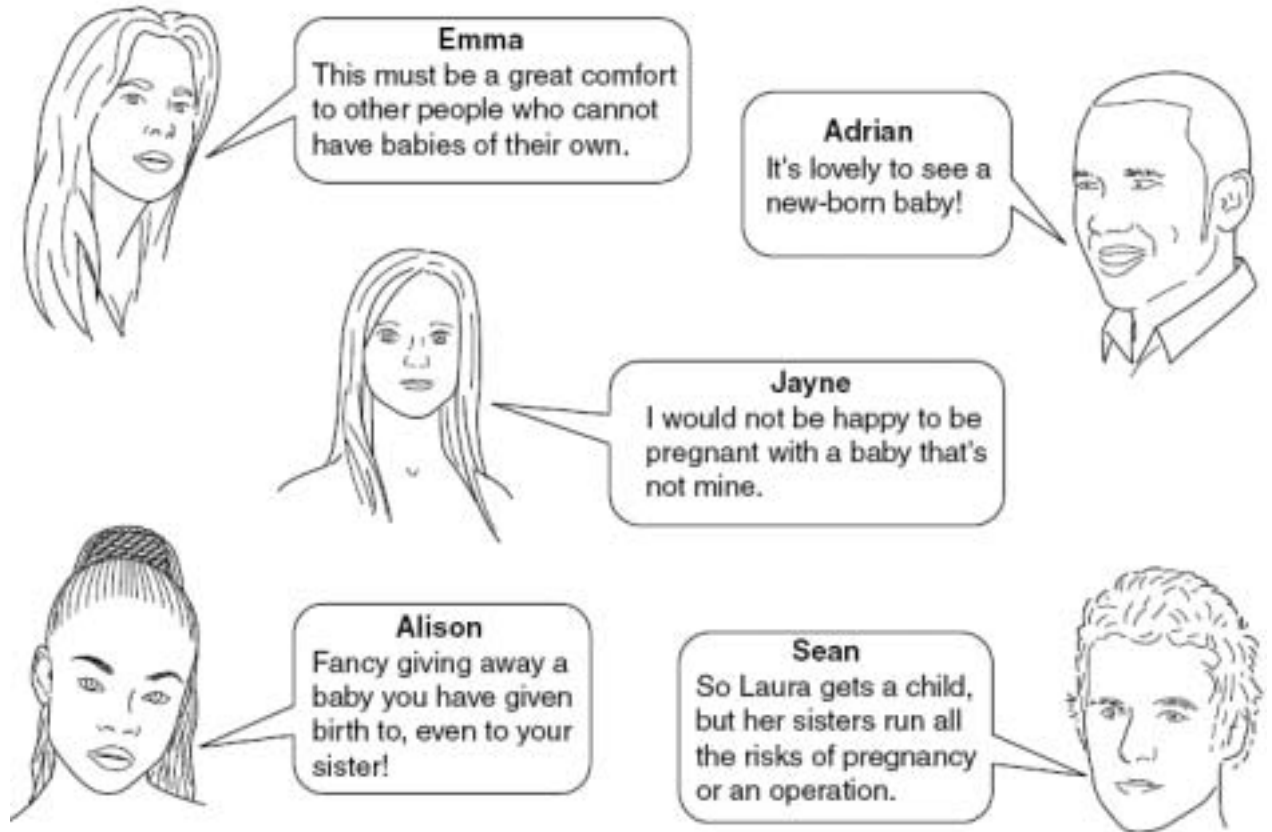
Hannah, because she was pregnant with Jake for 9 months.

Rebecca, because all of Jake's genes came from her.

Hannah, because half of Jake's genes came from her.

[1]

(d) Five people have different views about this story.



(i) Write down the names of the **two** people who think the treatment described is a good idea.

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

(ii) Suggest **one** reason why people rarely agree to take part in the type of surrogate treatment described.

.....
 [1]

[Total: 8]

- 5 In the UK, older cars must have an MOT test every year to check that they are working properly. One part of the test is to check that the amount of each pollutant gas in the exhaust emissions is within legal limits.

Liz tests a car exhaust. These are the results from the test.

	Limits	Actual value
engine speed	2500-3000 rpm	2829 rpm
carbon monoxide	less than 0.3%	0.03%
hydrocarbons	less than 200 ppm	28 ppm

- (a) Explain in detail whether this car should pass this part of the MOT test.

.....

 [3]

- (b) The hydrocarbons in the exhaust gases come from unburnt petrol.

Complete the sentences to show what happens to petrol when it burns normally in the car engine.

Use words from this list.

Each word may be used once, more than once or not at all.

carbon dioxide carbon monoxide oxygen water

When petrol burns, **carbon** atoms in the petrol react with oxygen to form

..... and.....

Hydrogen atoms in the petrol react with to

form

[2]

- (c) Liz uses an electronic sensor to take five measurements of the percentage of carbon monoxide in the car exhaust.

These are her results.

test	percentage of carbon monoxide (%)
1	0.12
2	0.03
3	0.04
4	0.03
5	0.02

- (i) Liz treats test 1 as an **outlier**.

Why does she do this?

Put a tick (✓) in the box next to the **best** answer.

The first test is just a rough trial.

This result is higher than the mean of the other results.

This result lies well outside the range of the other results.

This result is not a best estimate.

[1]

- (ii) Complete the sentence about the true value of the percentage of carbon monoxide.

The true value lies in the range [1]

- (iii) Why does Liz repeat the test five times?

Put ticks (✓) in the **two** boxes next to **best** reasons for repeating the test.

She is looking for a correlation.

The electronic sensor may not work reliably.

The data is more accurate.

It is important to control other factors when measuring.

The percentage of carbon monoxide in the exhaust may vary.

[2]

[Total: 9]

6 Air in cities contains pollutants that affect the air quality.

(a) The pie chart shows the amounts of the three main gases in **clean air**.

Label the pie chart.

Choose words from this list.

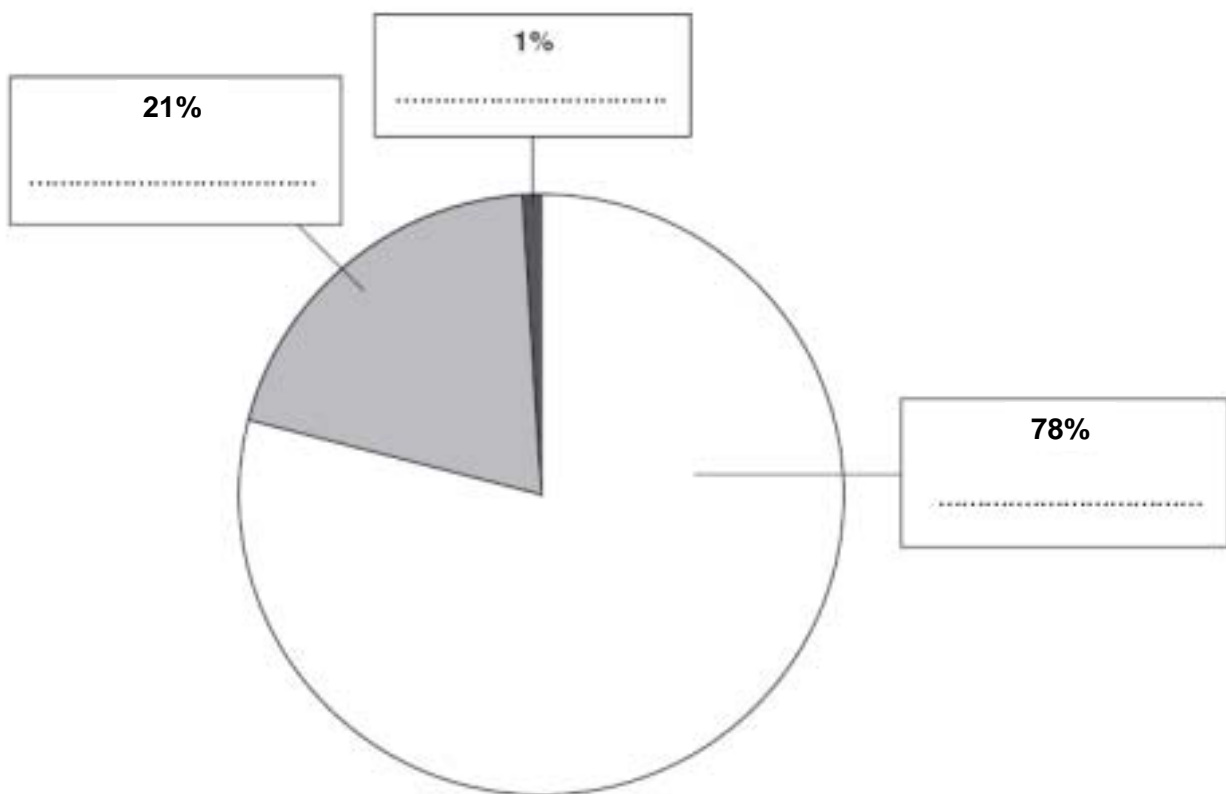
argon

carbon dioxide

nitrogen

oxygen

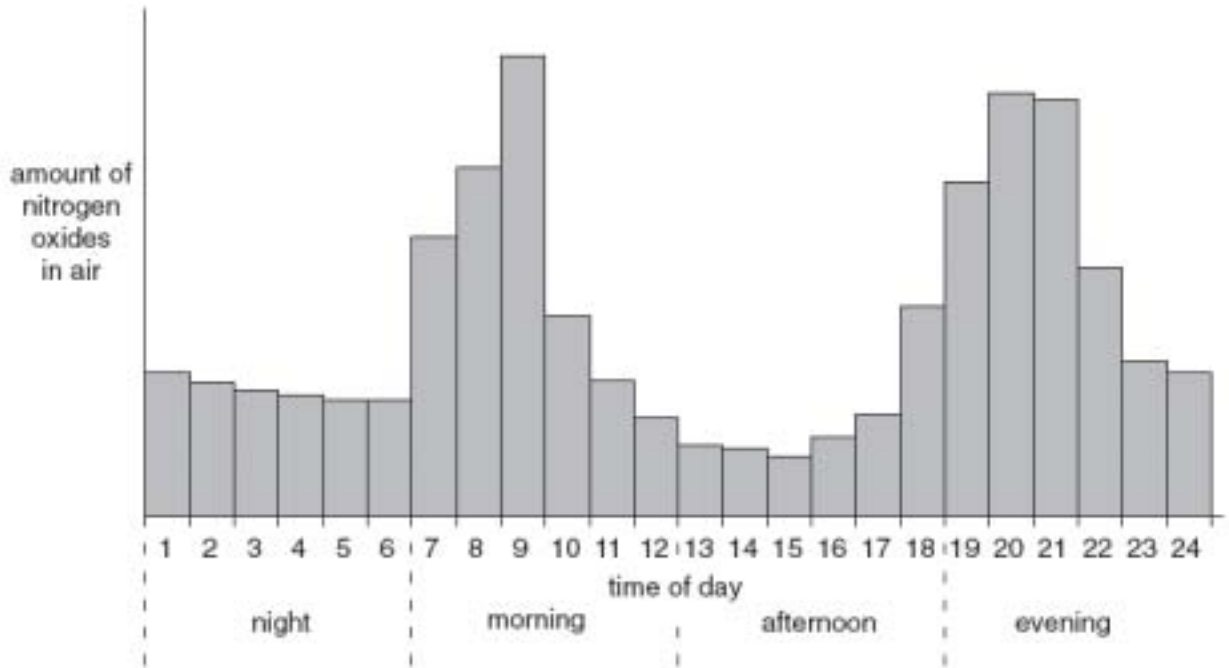
sulfur



[2]

(b) Some of the gases that affect air quality are nitrogen oxides.

This graph shows how the amount of nitrogen oxides in air changes over a typical day in a city.



Scientists use data like this to make conclusions.

Describe the pattern shown by this graph.

.....

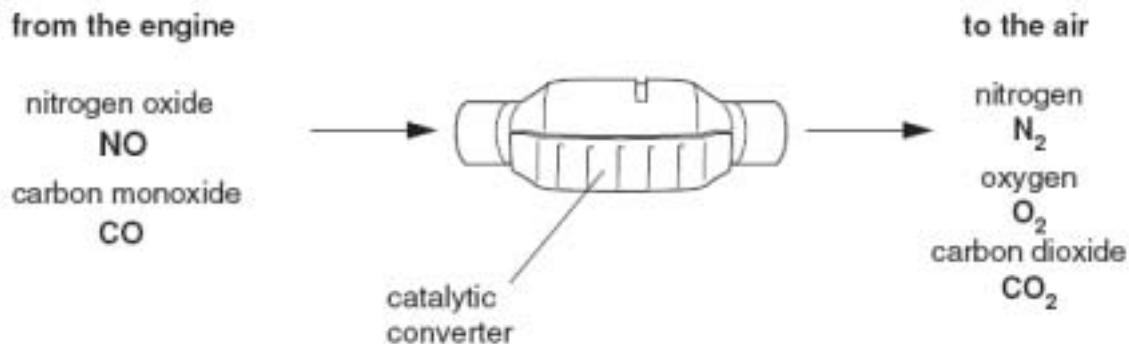
.....

.....

..... [2]

- (c) One way of reducing the amount of nitrogen oxides in the air is by using catalytic converters in cars.

This diagram shows what gases go in and out of a catalytic converter.



The boxes below show the formulae and molecules of some of the gases that go in or out of the converter.

Draw a straight line from each **formula** to the correct **molecule**.

One has been done for you.

formula		molecule
CO	—	
NO		
N ₂		
CO ₂		

[2]

[Total: 6]

END OF QUESTION PAPER

Acknowledgements:

Q.2 photo
Q.3b

© R. Jay GaBany, www.cosmotography.com. Reproduced by kind permission of R. Jay GaBany.
Article adapted from *Watchdog backs more embryo checks*, 10 May 2006, © BBC News, <http://news.bbc.co.uk>

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (OCR) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

OCR is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

CONFIDENTIAL

GCSE Unit

MARK SCHEME

SAMPLE ASSESSMENT MATERIAL
(from 2010 onwards)

Science A (J630)
Modules B1, C1 and P1
Foundation Tier

A211/01

Maximum Mark: 42

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
not/reject	= answers which are not worthy of credit
ignore	= statements which are irrelevant - applies to neutral answers
allow/accept	= 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

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

8. 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, e.g. 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.

E.g. 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

Question		Expected Answers	Marks	Rationale								
1	a	<p>made of several layers</p> <p>middle is called the mantle</p> <p>outside layer is called the crust</p> <p>made of tectonic plates</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td>T</td><td>(1)</td></tr> <tr><td>F</td><td>(1)</td></tr> <tr><td>T</td><td>(1)</td></tr> <tr><td>T</td><td>(1)</td></tr> </table>	T	(1)	F	(1)	T	(1)	T	(1)	4	Accept ✓ for T and x for F. Second box blank does not count as F.
T	(1)											
F	(1)											
T	(1)											
T	(1)											
	b	<p>mountains occur where plates meet</p> <p>seafloor spreading</p> <p>volcanoes and earthquakes</p> <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td>✓</td></tr> <tr><td>✓</td></tr> </table>			✓	✓	✓	2	<p>If all 5 boxes are ticked, award no marks.</p> <p>If 4 boxes are ticked, deduct 1 mark from the score</p> <p>All three correct: 2 marks</p> <p>Two correct: 1 mark</p> <p>One correct does not get a mark.</p> <p>Allow T for ✓, F for blank.</p> <p>NB Two correct ticks = 1 mark, not two!</p>			
✓												
✓												
✓												
		Total	6									

Question		Expected Answers	Marks	Rationale			
2	a	<p><i>Differences</i> – number of galaxies; size of the Milky Way; position of the Sun within Milky Way; position of Super Nova; what Super Nova are; <i>Suggested reasons</i> – explanations require imagination/cannot just be deduced from evidence; scientists judgements can be affected by personality/experience/background/interests; evidence too poor to decide between the two explanations; any other sensible suggestion</p>	4	<p>maximum 3 marks for differences</p> <p>Maximum 3 marks for suggested reasons</p>			
	b	<p>supports Curtis <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td> </td></tr><tr><td>✓</td></tr><tr><td> </td></tr></table> (1)</p>		✓		1	No extra ticks allowed.
✓							
	c	<p>galaxies (1) away (from us) (1)</p>	2	Accept any clear indication of choice.			
	d	14 000 million (1)	1	Accept any clear indication of choice.			
Total			8				

Question		Expected Answers	Marks	Rationale	
3	a	unnatural owtte; because of their religious beliefs; because they consider termination wrong; because the tests carry a risk; any other sensible suggestion	2	maximum 2 marks	
	b	i			
		increase chance of cancer	<input checked="" type="checkbox"/>	1	Both correct (plus two blanks) for the one mark
		reach the age of thirty	<input checked="" type="checkbox"/>		
		ii			
		80% with breast cancer genes	<input checked="" type="checkbox"/>	1	No extra ticks allowed.
		iii	Andy (1)	1	Accept any clear indication of choice. Cannot have two (or more) names.
		Total		5	

Question		Expected Answers	Marks	Rationale				
4	a	one copy (1) two copies (1) DNA (1)	3	Allow '1 copy', 'one' or other clear indication of correct choice. Allow '2 copies', 'two' or other clear indication of correct choice				
	b	XY / X and Y (1)	1	Either order. Not 'X or Y'				
	c	because she donated the egg <table border="1" style="display: inline-table; vertical-align: middle;"><tr><td style="text-align: center;">✓</td></tr><tr><td> </td></tr><tr><td> </td></tr><tr><td> </td></tr></table> (1)	✓				1	No extra ticks allowed.
✓								
	d	i	Emma (1) Adrian (1)	2	ignore order			
		ii	difficult to give up a child you have given birth to; there are risks associated with pregnancy/giving birth; any other sensible suggestion;	1				
		Total		8				

Question		Expected Answers	Marks	Rationale									
5	a	Yes, because no failure (1) Any two reasons from - carbon monoxide level is less than the limit; hydrocarbon level is less than the limit; test was carried out at correct rpm range;	3										
	b	carbon dioxide and carbon monoxide (1) oxygen water (1)	2	CO ₂ and CO - either order Accept O or O ₂ for oxygen, H ₂ O for water. Order important. Both chemicals needed for each mark.									
	c	i	lies well outside the range	<table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> </table> (1)			✓		1	No extra ticks allowed.			
✓													
		ii	0.02 to 0.04 / 0.02 – 0.04 / 0.02, 0.04 / 0.04 to 0.02 / 0.04 – 0.02/ 0.04, 0.02 (1)	1	Both correct for one mark. Check decimal point: 0.2 to 0.4 is wrong.								
		iii	sensor may not work reliably <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> <tr><td> </td></tr> </table> (1) carbon monoxide may vary <table border="1" style="display: inline-table; vertical-align: middle;"> <tr><td> </td></tr> <tr><td> </td></tr> <tr><td>✓</td></tr> <tr><td> </td></tr> </table> (1)		✓					✓		2	If 4 or 5 boxes are ticked, award no marks. If 3 boxes are ticked, deduct 1 mark from the score One mark for each correct choice
✓													
✓													
Total			9										

Question		Expected Answers	Marks	Rationale
6	a	1% argon (smallest segment) 20% oxygen (medium segment) 79% nitrogen (largest segment)	2	Argon correct (1) Oxygen and nitrogen correct (1)
	b	low at night (1); high in the morning (1); low in afternoon (1); high in evening (1)	2	Any two points
	c		2	Ignore any link going to or coming from a box with more than one link. 3 links correct (2) 1 or 2 links correct (1)
Total			6	
Paper Total			42	