OCR
RECOGNISING ACHIEVEMENT

H

A212/02

GENERAL CERTIFICATE OF SECONDARY EDUCATION
TWENTY FIRST CENTURY SCIENCE
SCIENCE A
Unit 2 Modules B2 C2 P2 (Higher Tier)
SAMPLE 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	**9**	
2	**6**	
3	**7**	
4	**7**	
5	**7**	
6	**6**	
TOTAL	**42**	

This document consists of **20** printed pages

Answer **all** the questions.

1 Poly(ethene) is a plastic material.

There are **two** types of poly(ethene), Low Density Poly(ethene) (**LDPE**) and High Density Poly(ethene) (**HDPE**).

The table shows some information about the properties of the two types.

property		LDPE	HDPE
1	stiffness	flexible	stiff
2	density in g/cm^3	0.92	0.96
3	strength when pulled in MN/m^2	15	29
4	stretch before breaking	6 times normal length	3 times normal length
5	effect of heat	softens at 90 °C	softens at 200 °C
6	comparative price	cheaper	more expensive

(a) Which of the statements about the properties of the two types of poly(ethene) is **true**?

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

LDPE is more easily bent, stronger and stretches more than HDPE. ☐

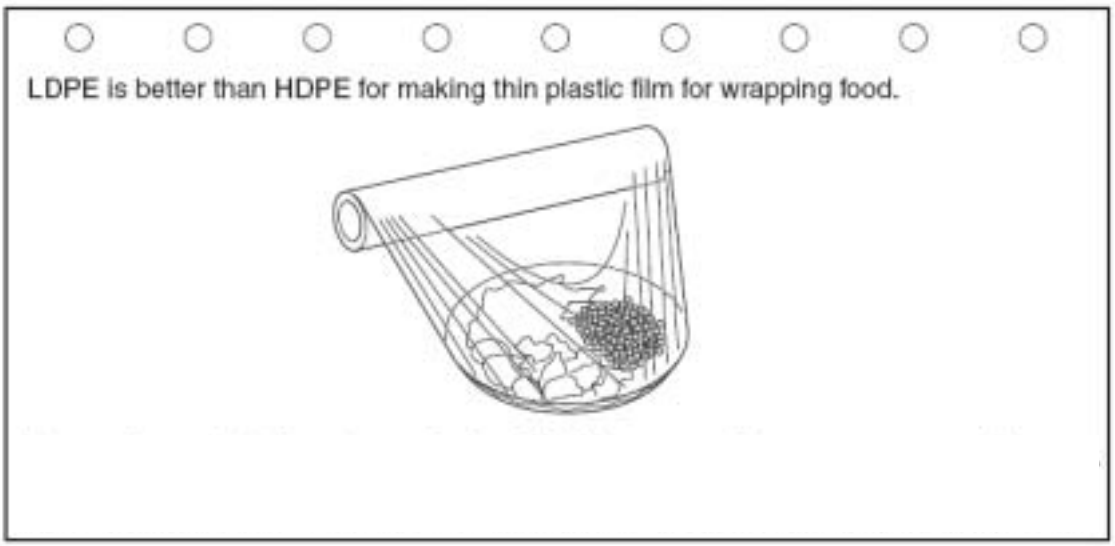
HDPE is less easily bent, withstands high temperature better than LDPE but costs more. ☐

LDPE is several times denser than HDPE and stretches twice as much. ☐

HDPE stretches less than LDPE but is stronger. ☐

[1]

(b) This information card shows one use of **LDPE**.



What are the advantages and disadvantages of using LDPE for wrapping food?

.....

.....

.....

.....

..... **[4]**

(c) Joe works in a factory that makes carrier bags from LDPE.

His job is to check the strength of the bags.

He cuts strips from the bags and finds out the force needed to break them.

Here are Joe's results for **two** bags, **A** and **B**.

bag A		bag B	
strip number	**force needed to break the sample in Newtons**	**strip number**	**force needed to break the sample in Newtons**
1A	690	1B	720
2A	700	2B	715
3A	695	3B	705
4A	569	4B	720
5A	695	5B	690
best estimate of force needed		**best estimate of force needed**	**710**

(i) Complete the table by calculating the best estimate for **bag A**. **[2]**

(ii) Which of the following statements about Joe's results are **true** and which are **false**?

Put a tick (✓) in the correct box for each statement.

	true	**false**
There is a real difference in breaking strength between the two bags.	☐	☐
The range for the true value of the result for Bag B is between 690 and 720.	☐	☐
There is a positive correlation between the breaking strengths of the two bags.	☐	☐

[1]

(iii) Why does Joe repeat his test several times?

Put a tick (✓) in the box next to **each** correct reason.

Repeating the test makes it a fair test.	☐
The more often he repeats the test, the closer the results will get.	☐
The more results Joe collects, the better estimate he can make.	☐
Repeating the test makes sure the right range is being tested.	☐
Repeating the test helps Joe to check for reliability.	☐

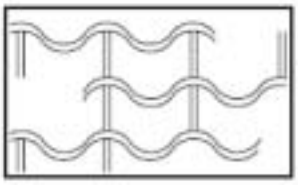
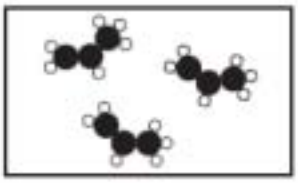
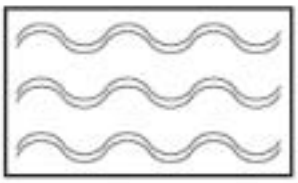
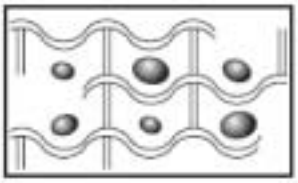
[1]

[Total: 9]

2 Rubber for making car tyres is made from small molecules from crude oil.

(a) The boxes below describe the process for making rubber for car tyres.

Draw a straight line from each **description** to its correct **diagram**.

description	diagram
Small molecules from crude oil are needed to make rubber.	
The small molecules polymerise.	
Sulfur is used to form cross links.	
Oils and resins are used to make the rubber more flexible.	

[2]

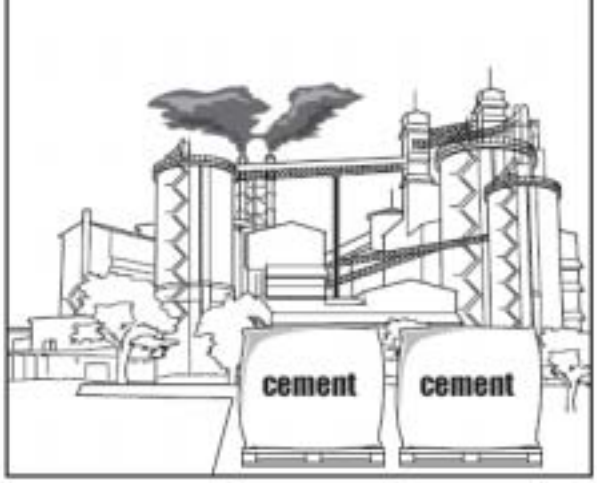
(b) Until recently, old car tyres were usually buried in landfill sites.

This is now against the law, and new uses for old tyres must be found.

Old tyres are now reused or recycled.

The rubber from old tyres can be shredded and used as a surface for children's playgrounds.

The rubber from old tyres can be burnt and used as a fuel for making cement.



(i) Explain why reusing and recycling old tyres improves the life cycle assessment of a car tyre.

Put a tick (✓) in each correct box.

When tyres are burnt, the energy they contain is put to good use.	☐
Children's playgrounds improve the quality of life for children.	☐
Shredded car tyre surfacing lasts for many years.	☐
Putting tyres in landfill used up energy and space.	☐
Cement making usually uses fossil fuels for energy.	☐

[2]

(ii) What else do you need to know to make a full life cycle assessment of the car tyre?

Put a tick (✓) in the box next to each correct answer.

what raw materials are used to make the tyre.	☐
whether there is another material that is biodegradable that could be used to make car tyres	☐
what methods of disposal are used for the metal parts of the tyre that cannot be used for playgrounds or fuel	☐
the average time that the car tyres are used on the car	☐
the average cost per tyre when the tyres are fitted	☐

[2]

[Total: 6]

3 (a) Here are four statements about electromagnetic radiation.

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)
Electromagnetic radiation is weaker when you are further from the source because photons lose energy as they travel further.	
Ionising radiation can make molecules take part in chemical reactions.	
Non-ionising radiation can break up molecules.	
X-rays are the electromagnetic radiation with the most energetic photons.	

[4]

(b) The hot, dry summer in 2006 meant that crops like peas and beans did not grow well in Britain.

Four people in one farming village were talking about this.

(i) Who talks about a possible **consequence** of global warming?

Put ticks (✓) in the boxes next to the **two** correct names.

Melanie ☐

Sunil ☐

Peter ☐

Mary ☐

[2]

(ii) Who talks about a possible **cause** of global warming?

Put a tick (✓) in the box next to the correct name.

Melanie ☐

Sunil ☐

Peter ☐

Mary ☐

[1]

[Total: 7]

4 **(a)** The list shows different regions of the electromagnetic spectrum.

gamma rays

infrared

microwaves

radio waves

ultraviolet

visible light

X-rays

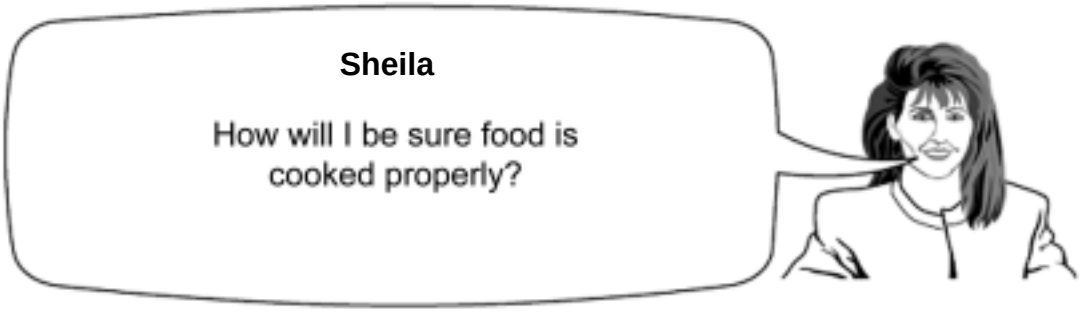
(i) Which region has the most energetic photons?

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

(ii) Which regions are types of ionising radiation?

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

(b) Sheila is thinking about buying a microwave oven, but she is afraid they may be dangerous.

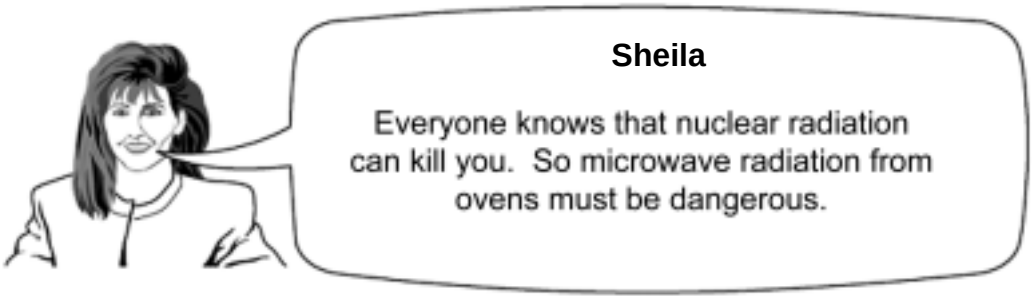


(i) What are the factors that control the amount of heating in a microwave oven?

.....

.....

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



(ii) Explain why the actual risk of microwave radiation is different from Sheila's perceived risk.

You should include in your answer

- the nature of the different radiations,
- the ways in which radiation can damage living cells.

.....

.....

.....

.....

.....

..... **[3]**

[Total: 7]

5 Read this leaflet on Tuberculosis.

> Tuberculosis (TB) is an infectious disease; it usually affects the lungs, although it can affect any part of the body.
>
> TB is not easily caught – you have to be in close and lengthy contact with someone with TB, for example living in the same house.
>
> A person who has breathed in TB microorganisms may not catch TB, because TB microorganisms collect in mucus at the back of the throat where it is swallowed.
>
> About 70% of people who are infected with TB microorganisms will not develop TB. Worldwide, many of the new cases of TB are in people who are also infected with HIV.

(a) Use the article, together with your knowledge of the way that the body protects itself against infection , to explain

- why breathing in TB microorganisms may not result in the person developing TB,
- why people with HIV are more likely to develop TB.

.....

.....

.....

.....

.....

..... **[3]**

(b) The leaflet continues with some information about how death rates from TB have changed.

> 100 years ago, TB caused about 150 deaths in every thousand deaths in the UK.
>
> Nowadays, TB can be prevented using vaccinations, and is curable by using antibiotics. The death rate is now much lower.

(i) 100 years ago, what percentage of deaths in the UK were due to TB?

Put a (ring) around the correct answer.

150% **15%** **1.5%** **0.15%**

[1]

(ii) When you take antibiotics against TB, you must continue to take the antibiotics for at least six months, otherwise a resistant strain of TB microorganisms may develop.

Here are some statements about antibiotic resistance.

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)
Using antibiotics slows the spread of resistance.	
Using antibiotics causes every TB microorganism to become resistant.	
Resistance to antibiotics occurs as a result of mutations.	
Using antibiotics can increase the spread of resistance.	

[1]

(c) In 1953, a vaccination programme against TB was introduced.

All school children were vaccinated.

Recently, it was decided to **stop** vaccinating school children against TB.

Read the statements below.

Which statements help explain why vaccination was stopped?

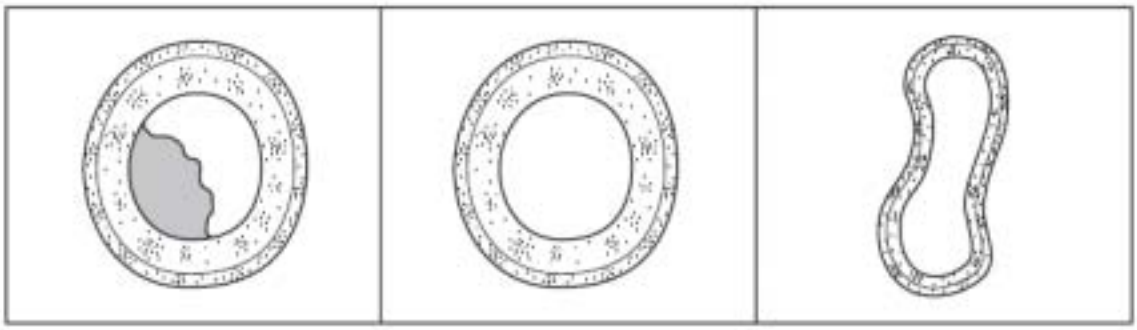
Put ticks (✓) in the **two** correct boxes.

The vaccine prevents the most serious forms of TB.	☐
The vaccine has no serious side effects.	☐
In the UK, TB in children is rare and does not spread easily.	☐
Across the world, TB kills around 2 million people a year.	☐
Most people living in the UK will never encounter a case of TB.	☐

[2]

[Total: 7]

6 **(a)** The diagrams **A**, **B** and **C** below show three blood vessels.



(i) Which diagram, **A**, **B** or **C**, shows a blood vessel which carries blood at low pressure towards the heart?

answer ..... **[1]**

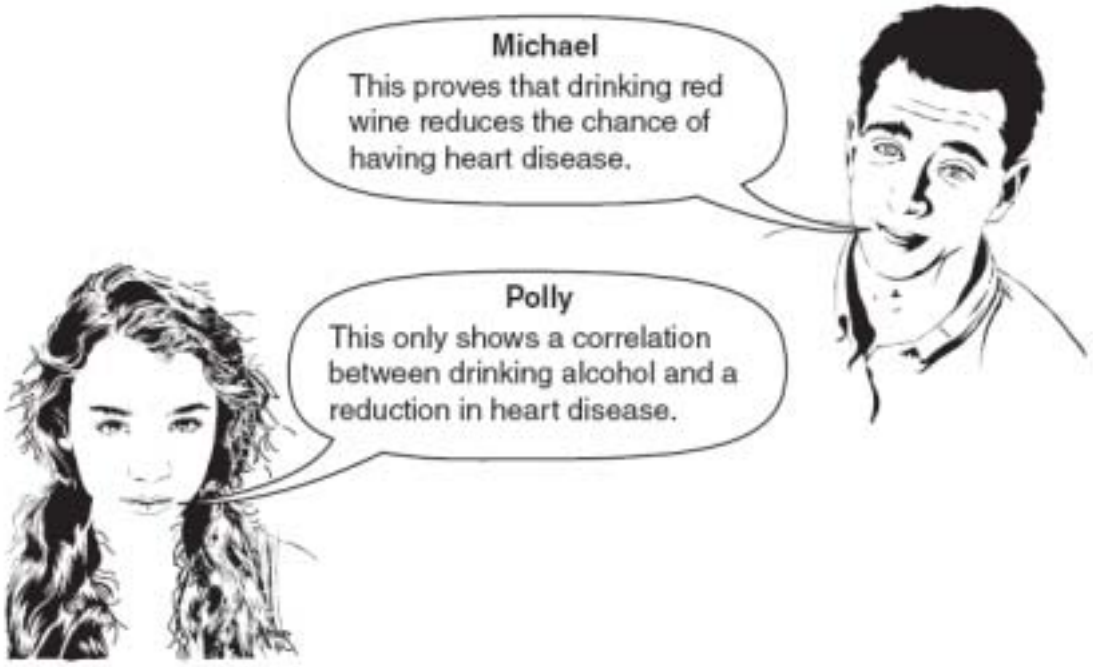
(ii) One of the blood vessels shows an abnormality. Put an X on the diagram to show the abnormality. **[1]**

(b) A heart attack happens when the heart is starved of a gas.

What is the name of this gas?

answer ..... **[1]**

(c) Two friends have been reading an article about the 'French Paradox'. The article explains that the French eat as much fatty food as other nations but they have a lower death rate from heart disease. The French drink red wine. Over the last ten years, many large scale studies have shown that drinking a small amount of alcohol each day reduces the risk of heart disease.



(i) Put a tick (✓) in the box next to **each** statement which **supports** Polly's idea.

These are large scale studies, so there is enough data to prove the link between the risk of heart disease and drinking alcohol. ☐

There is still a need to collect more data before we can be sure. Ten years is not a long time in scientific research. ☐

The studies are about drinking alcohol, not just red wine, so we would need to know more about the type of alcohol drunk. ☐

The individuals who drink a small amount of alcohol every day may have other factors in common. ☐

No mechanism has been suggested to give a causal link between alcohol consumption and reduced risk of heart disease. ☐

[2]

(ii) Polly and Michael find an article about a compound similar to compounds found in red wine.

The article has been peer reviewed.

Which of the following statements, **A**, **B**, **C** or **D**, best describes the process of peer review?

A Methods and results are written-up in a standard way so that other scientists can repeat the experiments and check the data.

B Results and methods are discussed by other scientists to confirm that the work is original and valid.

C After the work is published, reports are printed in other scientific journals and in newspapers

D A panel of experts mark the work and recommend what studies should be done next.

answer ..... **[1]**

[Total: 6]

END OF QUESTION PAPER

PLEASE DO NOT WRITE ON THIS PAGE

RECOGNISING ACHIEVEMENT

CONFIDENTIAL

GCSE Unit

SAMPLE ASSESSMENT MATERIAL
(from 2010 onwards)

MARK SCHEME

Science A (J630)
Modules B2, C2 and P2
Higher Tier

A212/02

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 <u>should be blank</u> (or have indication of choice crossed out).

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

Question			Expected Answers	Marks	Rationale
1	a		more easily bent, stronger, stretches: less easily bent, high temp, costs more: ✓ denser and stretches: stretches less, stronger:	1	
	b		*advantages* – more flexible/less stiff (1) stretches more (1) cheaper (1) *disadvantage* – not as strong (1) softens more easily (1)	4	IF only advantages (or disadvantages) given, max 2 marks.
	c	i	695 (2) **or** 670 / 669.8 (1)	2	
		ii	True: False: ✓ True: ✓ False: True: False: ✓	1	
		iii	more results, better estimate: ✓ repeating to check for reliability: ✓	1	
			Total	**9**	

Question			Expected Answers	Marks	Rationale
2	a		small molecules from crude oil small molecules polymerise sulfur is used oils and resins are used	2	If any box has more than one link drawn to it, ignore all those links 4 correct links (2) 2 or 3 correct links (1)
	b	i	energy is put to good use ✓ shredded car tyre surface ✓ putting tyres in landfill ✓	2	3 correct ticks and two blanks : 2 marks 3 correct ticks, one extra tick and one blank: 1 mark 2 correct ticks and at least 2 blanks: 1 mark No other combination gets any marks
		ii	raw materials used ✓ methods of disposal ✓ average time tyres used ✓	2	3 correct ticks and two blanks : 2 marks 3 correct ticks, one extra tick and one blank: 1 mark 2 correct ticks and at least 2 blanks: 1 mark No other combination gets any marks
			Total	**6**	

Question			Expected Answers	Marks	Rationale
3	a		weaker further from source F (1) ionising radiation T (1) non-ionising radiation F (1) X-rays F (1)	4	one mark for each correct letter allow the full 'true' or ✓ for T and 'false' or x for F blank boxes are wrong.
	b	i	Melanie ✓ (1) Mary ✓ (1)	2	one mark for each correct tick deduct one mark for each incorrect tick if more than two ticks used
		ii	Sunil ✓ (1)	1	no extra ticks allowed
			Total	**7**	

Question			Expected Answers	Marks	Rationale
4	a	i	gamma (rays) / γ (1)	1	ignore spelling errors. If more than one term written, list principle applies. Treat any subsequent variety of the correct answer as neutral.
		ii	gamma (rays) / γ, ultraviolet / UV, X-rays / X	1	all three needed for the mark. Order and spelling are not important. If more than three terms written, list principle applies. Treat any subsequent variety of a correct answer as neutral.
	b	i	intensity of radiation/ energy that arrives every second/ power setting of the oven (1) duration / exposure time / cooking time (1)	2	

Question			Expected Answers	Marks	Rationale
4	b	ii	[3 marks] Candidate demonstrates a high level of understanding of the different damage mechanisms of ionising and non-ionising radiations, the difference between nuclear and electromagnetic radiations and the biological effects of radiation exposure to human cells. Damage due to ionising radiation is explained in terms of damage at the molecular level, giving rise to mutation which may be cancerous. Heating effects of (all/non-ionising) radiation will be noted and related to much lower damage. The answer is expressed clearly and logically. [2 marks] Candidate demonstrates an understanding of the different damage mechanisms between nuclear (ionising) and microwave (non-ionising) radiations. Risk of mutation and possibly cancer from ionising radiation is identified, although without a clear molecular mechanism. Damage risk due to heating effect of microwaves is also identified. The answer is expressed clearly and logically. [1 mark] Candidate shows basic knowledge that microwave radiation is non ionising, and causes damage by heating, whereas nuclear radiation is ionising and may cause cancer, without a clear mechanism. The answer is expressed logically but may lack clarity in expression.	3	
			Total	**7**	

Question			Expected Answers	Marks	Rationale
5	a		[3 marks] Candidate demonstrates a high level of understanding of the body's defence mechanisms against infection, and how HIV weakens the immune system, resulting in higher TB infection rates. They identify the role of stomach acid in destroying microorganisms present in swallowed mucus, preventing initial infection. They explain the effect of HIV on the immune system referring to white blood cells, and relate this to increased infection rates in people exposed to TB pathogens. The answer is expressed clearly and logically. [2 marks] Candidate demonstrates an understanding of the body's defence mechanisms against infection, and how HIV weakens the immune system. They identify the role of stomach as a barrier to infection / destroying microorganisms present in swallowed mucus, preventing initial infection. They explain the general effect of HIV on the immune system and relate this to a general increased susceptibility to (all / TB) infections. The answer is expressed clearly and logically. [1 mark] Candidate shows basic knowledge of the body's barrier defence mechanisms against infection, and how HIV weakens the immune system. They indicate that swallowing mucus prevents infection reaching the lungs / entering the bloodstream. They relate HIV to a weakened immune system. These points may not be expressed in a logical sequence.	3	

Question			Expected Answers	Marks	Rationale
5	b	i	15% (1)	1	Allow any indication of choice
		ii	Slows spread of disease F TB microorganisms become resistant F Result of mutations T Increase spread of disease T	1	all correct for one mark blank boxes are wrong allow the full 'true' or ✓ for T and 'false' or × for F
	c		in UK, TB in children is rare ✓ (1) most never encounter a case ✓ (1)	2	one mark for each correct tick. deduct one mark for each incorrect tick if more than two ticks used. All 5 boxes ticked gets no marks.
			Total	**7**	

Question			Expected Answers	Marks	Rationale
6	**a**	**i**	C (1)	1	Look at the letter on the dotted line, NOT the diagram, for this part.
		ii	X on the bulge in diagram A (1)	1	Centre of X must be on the actual bulge in diagram A (The bulge is what diagram A has extra to diagram B)
	b		oxygen / O_2 / O(1)	1	
	c	**i**	may have other factors in common ✓ (1) no mechanism has been suggested ✓ (1)	2	one mark for each correct tick. deduct one mark for each incorrect tick if more than two ticks used. All 5 boxes ticked gets no marks.
		ii	B (1)	1	
			Total	**6**	

			Section Total	**42**	