GCSE
COMBINED SCIENCE: SYNERGY
8465/1F

Foundation Tier Paper 1 Life and Environmental Sciences

Mark scheme

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Version: 1.0 Final

2 4 6 G 8 4 6 5 / 1 F / M S

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

No student should be disadvantaged on the basis of their gender identity and/or how they refer to the gender identity of others in their exam responses.

A consistent use of 'they/them' as a singular and pronouns beyond 'she/her' or 'he/him' will be credited in exam responses in line with existing mark scheme criteria.

Further copies of this mark scheme are available from aqa.org.uk

Information to Examiners

1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the examiner make their judgement
- the Assessment Objectives and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent (for example, a scientifically correct answer that could not reasonably be expected from a student's knowledge of the specification).

2. Emboldening and underlining

2.1 In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

2.2 A bold **and** is used to indicate that both parts of the answer are required to award the mark.

2.3 Alternative answers acceptable for a mark are indicated by the use of **or**.
Alternative words in the mark scheme are shown by a solidus eg allow smooth / free movement.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of errors / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution?

[1 mark]

Student	Response	Marks awarded
1	green, 5	0
2	red*, 5	1
3	red*, 8	0

Example 2: Name **two** magnetic materials.

[2 marks]

Student	Response	Marks awarded
1	iron, steel, tin	1
2	cobalt, nickel, nail*	2

3.2 Use of symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, or uses symbols to denote quantities in a physics equation, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

3.3 Marking procedure for calculations

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. At any point in a calculation students may omit steps from their working. If a subsequent step is given correctly, the relevant marks may be awarded.

Full marks are **not** awarded for a correct final answer from incorrect working.

3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

3.5 Errors carried forward

An error can be carried forward from one question part to the next and is shown by the abbreviation 'ecf'.

Within an individual question part, an incorrect value in one step of a calculation does not prevent all of the subsequent marks being awarded.

3.6 Phonetic spelling

Marks should be awarded if spelling is not correct but the intention is clear, **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

3.9 Ignore

Ignore is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

3.10 Do <u>not</u> accept

Do **not** accept means that this is a wrong answer which, even if the correct answer is given as well, will still mean that the mark is not awarded.

3.11 Numbered answer lines

Numbered lines on the question paper are intended to support the student to give the correct number of responses. The answer should still be marked as a whole.

4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- Level of response mark schemes are broken down into levels, each of which has a descriptor.
- The descriptor for the level shows the average performance for the level.
- There are two marks in each level.

Before you apply the mark scheme to a student's answer, read through the answer and, if necessary, annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1: Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level.

The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer. With practice and familiarity you will find that for better answers you will be able to quickly skip through the lower levels of the mark scheme.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

Step 2: Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this. The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do not have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

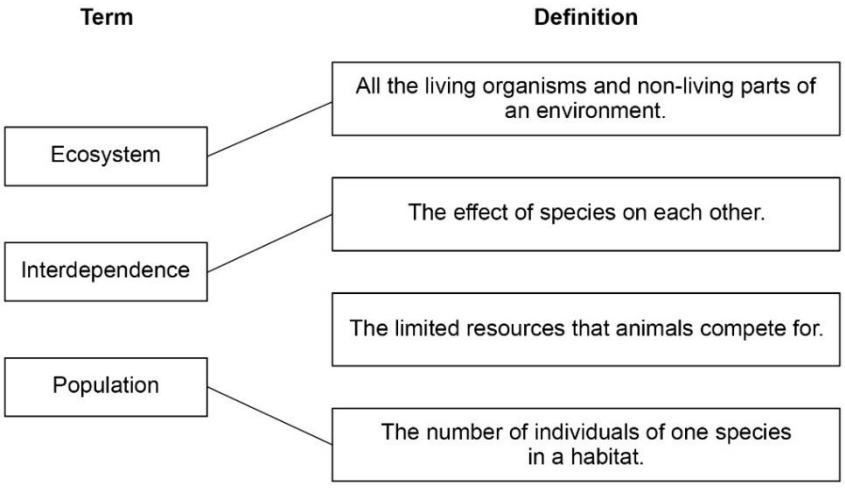
You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	krill		1	AO2 4.4.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	seal		1	AO2 4.4.2.1

Question	Answers	Mark	AO / Spec. Ref.
01.3	 do **not** accept more than one line from a box on the left	1 1 1	AO1 4.4.2.1 4.4.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	increase		1	AO2 4.4.2.1 4.4.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	most animals eat more than one type of prey		1	AO2 4.4.2.1 4.4.2.2 4.4.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	$68 \times \frac{8}{100}$		1	AO2 4.4.2.1
	5.44 (arbitrary units)	allow 5.4 (arbitrary units)	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	chlorophyll		1	AO1 4.2.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.8	light intensity		1	AO1 4.4.2.3
	temperature		1	

Total Question 1	**12**

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	specific latent heat = $\frac{31\ 500}{0.15}$		1	AO2
	specific latent heat = 210 000		1	AO2
	J/kg		1	AO1 4.1.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	the energy was transferred to the surroundings		1	AO3 4.1.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	insulating the sides of the beaker that the wax was in		1	AO3 4.1.1.4
	stirring the wax as it was melting		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	12 °C		1	AO2 4.1.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	specific heat capacity = $\frac{3600}{0.15 \times 12}$	allow a substitution consistent with their answer to question **02.4**	1	AO2 4.1.1.4
	specific heat capacity = 2000 (J/kg°C)	allow an answer consistent with their answer to question **02.4**	1	

Total Question 2	**9**

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	(**X** =) 100 – (20.9 + 78.1)	allow 100 – 20.9 – 78.1	1	AO2 4.4.1.1
	= 1.0 (%)	allow 1 (%)	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	(the Earth's atmosphere today has)	allow converse if clearly referring to the atmosphere of Mars		
	more nitrogen (as a percentage)		1	AO2 4.4.1.1
	more oxygen (as a percentage)		1	
	less carbon dioxide (as a percentage)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	volcanic activity		1	AO1 4.4.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	carbon dioxide dissolved in the oceans		1	AO1 4.4.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	neutrons		1	AO1 4.1.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	any **one** from: • to avoid contamination • to reduce / avoid evaporation		1	AO3 4.4.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7		this order only		
	carbon dioxide	allow CO_2	1	AO1 4.2.2.5
	glucose	allow $C_6H_{12}O_6$ ignore sugar	1	

Total Question 3	**11**

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	antibiotics do not kill viruses		1	AO2 4.3.3.6 4.3.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2		allow virus / bacteria / microorganisms / microbes / measles for pathogen throughout		
	(mucus) traps pathogen		1	AO1 4.3.3.1 4.3.3.3
	(cilia) move (mucus containing) the pathogen (out)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	kills pathogen	allow kills / destroys virus / bacteria / microorganisms / microbes / measles	1	AO1 4.3.3.1 4.3.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	weakened pathogen		1	AO1 4.3.3.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	white blood cells		1	AO1 4.3.3.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	line goes higher than first peak line is steeper than before first peak	 ignore any decrease	1 1	AO2 4.3.3.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	5 : 1		1	AO2 4.3.3.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.8	to reduce / stop the spread of measles	allow descriptions such as less chance of an outbreak or fewer people get measles allow for herd immunity ignore so a person does not get measles	1	AO1 4.3.3.5

Total Question 4	**10**

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	(the) skin (a) neurone (a) muscle		1 1 1	AO2 AO1 AO2 4.2.1.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	a synapse		1	AO1 4.2.1.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	any **two** from: • sex • tiredness • diet • caffeine intake • the same method (each time) • (room) temperature • distractions	allow gender allow hours of sleep allow other drugs ignore variables for specific methods allow size of each group ignore height / weight of students	2	AO1 4.2.1.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	650 (milliseconds)	allow an answer in the range 640 to 660 (milliseconds)	1	AO2 4.2.1.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	12 years old		1	AO3 4.2.1.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	add the (reaction) times (of all the adults)	add the results (of all the adults)	1	AO2 4.2.1.6
	divide (the total) by 35	allow divide (the total) by the number of adults	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.7	0.45 (seconds)	allow 0.450 (seconds)	1	AO2 4.2.1.6

Total Question 5	**11**

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	Quercus		1	AO2 4.4.4.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	the two species are closely related to each other		1	AO2 4.4.4.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	meristem		1	AO1 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	fertilisation		1	AO2 4.1.3.5 4.4.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	mitosis		1	AO2 4.1.3.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	evolution		1	AO1 4.4.4.2

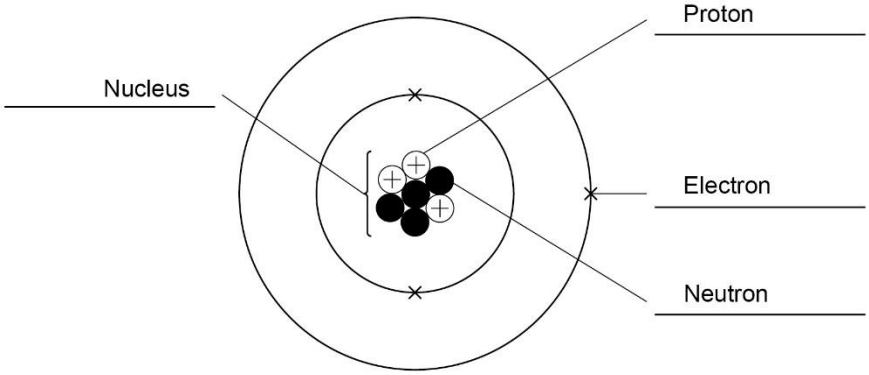
Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.7	xylem		1	AO1 4.2.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.8	phloem		1	AO1 4.2.2.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.9	transpiration	allow evaporation (from the leaves)	1	AO1 4.2.2.3

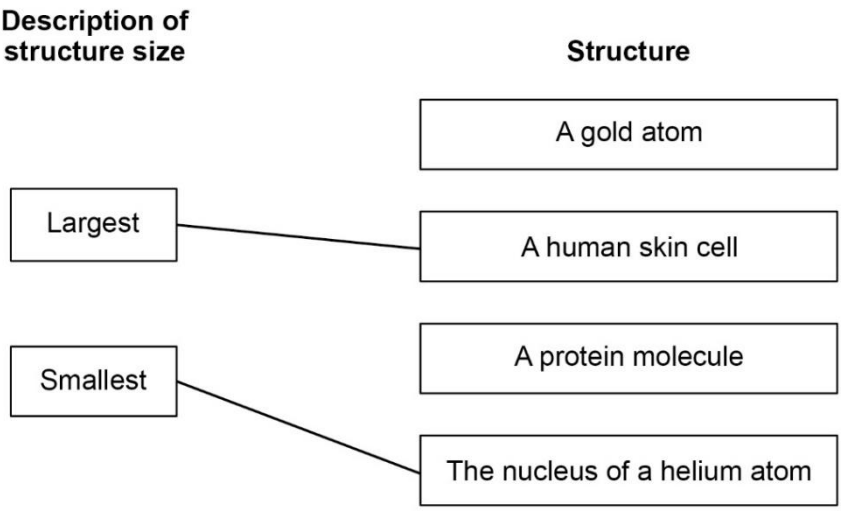
Total Question 6	**9**

Question 7

Question	Answers	Mark	AO / Spec. Ref.
07.1		1 1 1 1	AO1 4.1.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	lithium	allow Li	1	AO2 4.1.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	the number of electrons is equal to the number of protons **or** equal number of negatively and positively charged particles		1	AO1 4.1.2.3

Question	Answers	Mark	AO / Spec. Ref.
07.4	 do **not** accept more than one line from a box on the left	1 1	AO2 4.1.2.3 4.2.1.5 4.1.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	3.48×10^{-7} mm		1	AO2 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	plum pudding (model)		1	AO1 4.1.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.7	any **one** from: (more) recent model • contains electrons • is a sphere / ball of positive charge	allow plum pudding model for more recent model allow converse for Dalton model / atom allow (more) recent model contains charged / sub-atomic particles	1	AO2 4.1.2.1

Total Question 7	11

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	prokaryotic		1	AO1 4.1.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	any **one** from: (bacterial cells) • have a cell wall • have single loop of DNA • (may) have plasmid(s) • do not have mitochondria	allow converse if clearly referring to animal cells ignore ribosomes, vacuole, flagella ignore size	1	AO1 4.1.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	any **one** from: • boil(ing) • chlorine / iodine tablets • using UV light • using ozone		1	AO1 4.4.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	78 **and** 8 $\frac{78}{8}$ 9.7(5)	allow readings in the range of 77 to 79 and 7 to 9 allow use of their incorrect readings allow 9.8 allow 10 allow correct calculation using their incorrect readings	1 1 1	AO2 4.4.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	any **one** from: • (each) increase in cases occurs (about) 5 days after an increase in rainfall • the pattern of cases follows the pattern of rainfall but 5 days later	allow highest rainfall is on day 12 and the highest infections on day 17, (which is 5 days later)	1	AO3 4.4.1.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.6	climate change is causing more extreme rainfall		1	AO2 4.4.1.8 4.4.1.5 4.4.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.7	water vapour	ignore water	1	AO1 4.4.1.3
	methane	allow nitrous oxide allow ozone	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.8	any **one** from: • burn less fossil fuel • use renewable sources of energy (in place of fossil fuels) • plant more trees • capture and store carbon dioxide	allow burn less coal / oil / gas allow use electric cars allow less deforestation	1	AO1 4.4.1.5

Total Question 8	**11**

Question 9

Question	Answers	Mark	AO / Spec. Ref.
09	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5–6	AO1 4.2.2.6
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content **Independent variable** • independent variable is the light intensity • measure distance between lamp and pondweed • increase the distance to decrease the light intensity • use at least 5 light intensities **Dependent variable** • dependent variable is rate of photosynthesis or number of bubbles or volume of gas • count number of bubbles in set time • collect gas for set time and measure volume • repeats and calculate a mean **Control variables** • method of controlling temperature (e.g. use LED bulb or heat shield or beaker for pondweed tube) • method of controlling (dissolved) carbon dioxide concentration • method of controlling other light sources in room • allow pondweed to adjust to new light intensity before taking readings • size of pondweed • species of pondweed For **Level 3,** answers must give detail of independent variable, dependent variable and control variable		

Total Question 9	**6**

Question 10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	perpendicular		1	AO1 4.1.4.1

Question	Answers	Mark	AO / Spec. Ref.
10.2	**Level 2:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	3–4	AO1 4.1.4.1
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content: **method to measure time** • measure a time • measure a suitable time e.g. 10 seconds • use suitable equipment e.g. stopclock, mobile phone, timestamp on video **method to count waves** • count the number of waves • count the number of waves passing the mark on the tank • use a camera / phone to record video • replay video using slow motion **calculation of frequency** • frequency is the number of waves passing the mark on the tank each second • divide the number of waves passing the point by the time elapsed an alternative method using a strobe can gain full credit an alternative method measuring wavelength and wave speed to determine frequency can gain full credit		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.3	$v = f \lambda$		1	AO1 4.1.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.4	λ = 1.6 cm or λ = 16 mm	allow 1.5 cm to 1.7 cm or 15 mm to 17 mm	1	AO2 4.1.4.2
	λ = 0.016 (m)	allow a correct conversion of their value into metres	1	
	v = 2.5 × 0.016	allow a correct substitution using an incorrectly / not converted value of λ allow a correct substitution using their value of λ	1	
	v = 0.040 (m/s)	allow an answer in the range 0.0375 (m/s) to 0.0425 (m/s) allow a correct calculation using an incorrectly / not converted value of λ that is within the range for MP1	1	

Total Question 10	**10**