# GCSE
# BIOLOGY

## 8461/1F - PAPER 1 FOUNDATION TIER

Mark scheme

8461

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Version/Stage: 1.0 Final

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 Assessment Writer.

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.

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# 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 his or her 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.

## 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**. Different terms in the mark scheme are shown by a / ; 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 error / 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 planets in the solar system.

**[2 marks]**

| Student | Response | Marks awarded |
|---|---|---|
| 1 | Neptune, Mars, Moon | 1 |
| 2 | Neptune, Sun, Mars, Moon | 0 |

## 3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, 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. Full marks can, however, be given for a correct numerical answer, without any working shown.

## 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

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation ecf in the marking scheme.

### 3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **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.

## 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 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.

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.

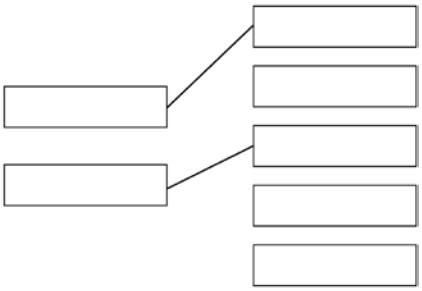
You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

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.

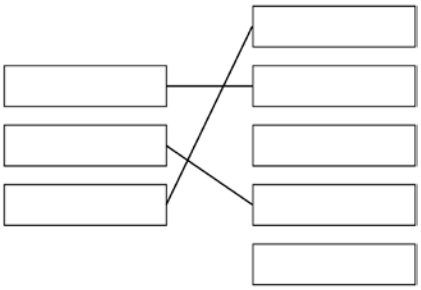
| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **01.1** | nucleus | | 1 | AO1<br>4.1.2.1 |
| **01.2** | gene(s) | allow allele(s) | 1 | AO1<br>4.6.1.4 |
| **01.3** | copying of chromosomes | | 1 | AO2<br>4.1.2.2 |
| **01.4** | mitochondria | | 1 | AO1<br>4.1.1.2 |
| **01.5** | <br><br>60 – 45<br>**or**<br>120 – 105<br><br>15 (minutes) | an answer of 15 (minutes) scores **2** marks | <br><br>1<br><br><br>1 | AO2<br>4.1.2.2 |
| **01.6** | C | | 1 | AO2<br>4.1.2.2 |
| **01.7** | 8 | | 1 | AO2<br>4.1.2.2 |
| **01.8** | to repair tissues | | 1 | AO1<br>4.1.2.2 |
| **Total** | | | **9** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.1** |  | additional line from a level of organisation negates the mark for that level of organisation | 2 | AO1<br>4.2.1<br>4.2.3.1 |
| **02.2** | palisade mesophyll | | 1 | AO2<br>4.2.3.1 |
| **02.3** | $\frac{50}{8}$<br><br>6 / 6.25 / 6.3 (micrometres) | an answer of 6 / 6.25 / 6.3 scores **2** marks | 1<br><br>1 | AO2<br>4.1.1.2 |
| **02.4** | they have no chloroplasts / chlorophyll | allow they are underground<br><br>allow they don't get (access to) light<br><br>allow (because) photosynthesis needs light<br><br>allow they can't absorb light<br>ignore 'sun'<br>ignore 'it is dark' | 1 | AO2<br>4.1.1.3<br>4.4.1.1 |
| **02.5** | differentiation | | 1 | AO1<br>4.1.1.4<br>4.1.2.3 |
| **02.6** | to protect endangered plants from extinction | | 1 | AO1<br>4.1.2.3 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.7** | plants can be produced quickly | | 1 | AO1<br>4.1.2.3 |
| **02.8** | any **one** from:<br>• glucose / sugars / starch<br>• amino acids / protein<br>• hormones<br>• ions / minerals<br>• vitamins<br>• water | allow named hormones eg auxin<br>allow magnesium / nitrate<br>allow named vitamins e.g. vitamin B<br>allow $H_2O$ / H2O<br>ignore oxygen / carbon dioxide / agar / nutrients / fertiliser | 1 | AO2<br>4.1.2.3 |
| **Total** | | | **10** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **03.1** | (A) stomach | | 1 | AO1 4.2.2.1 |
| | (B) small intestine | allow ileum<br>ignore intestine unqualified | 1 | |
| | (C) liver | | 1 | |
| **03.2** | soluble | this order only | 1 | AO1 4.2.2.1 |
| | catalyse | | 1 | |
| | denatured | | 1 | |
| **03.3** | amino acids | | 1 | AO1 4.2.2.1 |
| **03.4** | any **one** from:<br>• for growth<br>• for repair / replacement (of cells / tissues / organs) | allow for enzymes / hormones / antibodies<br>allow to strengthen bones<br>ignore for energy | 1 | AO1 4.2.2.1 |
| **03.5** | stomach | | 1 | AO1 4.2.2.1 |

| Question | Answers | Mark | AO / Spec. Ref. |
|---|---|---|---|
| **03.6** | **Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account. | 3–4 | AO1 4.2.2.1 |
| | **Level 1:** Facts, events or processes are identified and simply stated but their relevance is not clear. | 1–2 | |
| | **No relevant content** | 0 | |
| | **Indicative content**<br><br>• grinding up the food<br>• add Biuret reagent (allow $CuSO_4$ and NaOH) to food (sample)<br>• protein turns solution (from blue) to purple / lilac<br>• wear goggles to protect eyes<br>• clean up spills immediately<br>• Biuret / NaOH is an irritant / corrosive / poisonous<br><br>for **level 2** a reference to Biuret, a positive result and reason for a safety precaution is required | | |
| **03.7** | fat | 1 | AO1 4.2.2.1 |
| **03.8** | type 2 diabetes | 1 | AO1 4.2.2.6 |
| **Total** | | **15** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **04.1** |  | additional line from a blood component negates the mark for that component | 1<br>1<br>1 | AO1<br>4.2.2.3 |
| **04.2** | C | | 1 | AO3<br>4.2.2.2 |
| **04.3** | (vessel) B<br><br>thick walls **or** thick muscle / elastic tissue<br>**or**<br>lumen is small / narrow | <br><br>do **not** accept ref to 'cell walls'<br><br>allow description of 'lumen' | <br>1<br><br>1 | AO1<br>4.2.2.2 |
| **04.4** | 95 | | 1 | AO2<br>4.2.2.2 |
| **04.5** | (because coronary) arteries / they are narrower | allow (because the coronary) arteries are blocked / clogged (with fat) | 1 | AO2<br>4.2.2.4 |
| **04.6** | <br><br>250 × 60 (= 15 000)<br>**or**<br>15 000<br><br>15 | an answer of 15 scores **2** marks<br><br>allow 0.25 × 60<br><br>allow $\frac{\text{answer to marking point 1}}{1000}$<br><br>an incorrect conversion to $dm^3$ in calculation does not negate marking point 1 | <br><br>1<br><br>1 | AO2<br>4.2.2.2 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **04.7** | any **two** from:<br>• no need to stay as long in hospital (after procedure) **or** can go home sooner / same day<br>• not as / less invasive **or** no need for a major operation **or** no need for general anaesthetic<br>• shorter recovery time **or** can get back to normal lifestyle quicker **or** less time needed off work<br>• lower risk of a heart attack (during procedure) | allow only need to stay 2–3 hours in hospital (after procedure)<br>allow less scarring<br>allow less chance of infection<br>allow only a small cut needed<br>allow only 7 days recovery<br>ignore reference to cost<br>ignore idea that it takes less time overall | 2 | AO3<br>4.2.2.4 |
| **04.8** | lower chance of failure (within one year)<br><br>only need one operation to treat multiple blockages **or** can treat multiple blockages at one time | allow only a 5% chance of failure<br><br>ignore ref to anaesthetic or CABG being a long-term treatment | 1<br><br>1 | AO3<br>4.2.2.4 |
| **Total** | | | **14** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **05.1** | phloem | | 1 | AO2<br>4.2.3.2 |
| **05.2** | translocation | | 1 | AO1<br>4.2.3.2 |
| **05.3** | either:<br><br>less (sugars for) respiration<br><br>(so) less energy released<br><br>**or**<br><br>less amino acids made (1)<br><br>(so) less protein produced **or** less protein synthesis (1)<br><br>**or**<br><br>less cellulose made (1)<br><br>(so) weaker cell walls (1) | | <br><br>1<br><br>1 | AO2<br>4.4.1.3<br>4.4.2.1 |
| **05.4** | (aphids) can fly to another plant **or** part of the plant<br><br>to get (more) food | ignore to fly unqualified<br><br>allow to find a mate<br>allow idea of less competition for food<br>allow to escape predators<br><br>do **not** accept escape prey | 1<br><br>1 | AO2<br>4.3.3.1 |
| **05.5** | (oil) prevents aphids from attaching to leaf **or** causes aphids to slide off leaf<br>**or**<br>idea that oil may harm / kill the aphid | ignore 'the leaf is slippery'<br><br>allow oil may be unpleasant to the aphid | 1 | AO2<br>4.3.3.2 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **05.6** | (plant / stem has) thorns | allow spines / spikes / prickles<br>ignore stings<br><br>do **not** accept thorns protect (the plant) from predators | 1 | AO1<br>4.3.3.2 |
| **05.7** | C | if any other letter given then no marks for the question | 1 | AO3<br>4.3.1.4<br>4.3.3.1 |
| | (fungi / spores) blown by / in direction of the wind<br>**or**<br>it's the closest plant (to A) | allow black spot / disease is blown by / in direction of the wind<br><br>do **not** accept reference to bacteria / viruses / pollen being blown | 1 | AO2<br>4.3.1.4<br>4.3.3.1 |
| **05.8** | any **one** from:<br>• spread rose bushes out more<br><br>• remove any infected parts of the plant<br><br>• use a fungicide | allow isolate the infected plant<br>allow idea of barrier around infected plant<br><br>ignore separate unless qualified<br><br>allow remove infected plant / A<br><br>ignore pesticide<br><br>do **not** accept insecticides / herbicide | 1 | AO2<br>4.3.1.4<br>4.3.3.1 |
| **Total** | | | **11** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **06.1** | diffusion | | 1 | AO2<br>4.1.3.1 |
| **06.2** | A | | 1 | AO2<br>4.1.3.1 |
| **06.3** | B | | 1 | AO3<br>4.1.3.1 |
| **06.4** | (earthworm) can absorb more oxygen (in a given time)<br>**or**<br>increases / more gas exchange | allow get / obtain / take in more oxygen<br>ignore easier absorption of oxygen<br>ignore references to food | 1 | AO2<br>4.1.3.1 |
| **06.5** | lipase | | 1 | AO1<br>4.2.2.1 |
| **06.6** | | reference to more is only needed once for the first two marking points | | AO2<br>4.4.2.1<br>4.7.2.2 |
| | more oxygen (in soil with earthworms) | allow earthworms bring oxygen to soil | 1 | |
| | (for) more (aerobic) respiration | do **not** accept anaerobic respiration | 1 | |
| | (of) bacteria / fungi / microorganisms / microbes / decomposers | | 1 | |
| **06.7** | fertilisation | ignore sexual reproduction | 1 | AO1<br>4.6.1.1<br>4.6.1.2 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **06.8** | asexual (reproduction) | allow cloning | 1 | AO2<br>4.6.1.1 |
| **Total** | | | **10** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **07.1** | toxins / poisons (secreted by / from / in bacteria) | | 1 | AO1<br>4.3.1.3 |
| **07.2** | any **two** from:<br>• wash hands after using toilet / being sick<br>**or**<br>wash hands before preparing / handling food<br>**or**<br>do not prepare food (whilst infected)<br>• isolate yourself<br>• disinfect clothes / surfaces<br>• do not share utensils / cutlery / towels | ignore 'wash hands' unqualified<br>ignore reference to coughing / sneezing<br>allow examples of how isolation could be achieved | 2 | AO2<br>4.3.1.1 |
| **07.3** | antibiotics | allow named examples of antibiotics | 1 | AO1<br>4.3.1.8 |
| **07.4** | immune system is damaged / weakened **or** immune system doesn't function properly<br>white blood cells cannot kill bacteria / *Salmonella* (as effectively) | allow immunocompromised<br>allow lack of / no white blood cells<br>allow no / fewer antibodies so bacteria not killed **or** less phagocytosis so bacteria not killed **or** no / fewer antitoxins to counter toxins | 1<br>1 | AO2<br>4.3.1.2 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **07.5** | any **one** from:<br>• (give chickens) antibiotics<br>• don't sell infected chickens / eggs<br>• keep infected chickens isolated / indoors<br>• slaughter the infected chickens | allow (give chickens) monoclonal antibodies<br>allow don't sell the chickens / eggs<br>ignore don't sell chickens / eggs<br>allow keep the chickens indoors<br>ignore keep chickens indoors<br>ignore vaccination / chlorination / disinfection | 1 | AO1<br>4.3.1.3 |
| **07.6** | (cleaning liquid) B<br>**and**<br>greater reduction in number of bacteria (after cleaning) in both locations | ignore few bacteria in both locations<br>allow neither / both **and** idea of experimental error | 1 | AO3<br>4.1.1.6<br>4.3.1 |
| **07.7** | radius (of area with no bacteria growing) | allow diameter (of the area with no bacteria growing)<br>ignore $\pi r^2$ unqualified<br>allow idea of placing agar plate onto graph paper and counting the squares not covered with bacteria | 1 | AO2<br>4.1.1.6 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **07.8** | repeat **and** look to see if results are similar | ignore repeat unqualified<br><br>allow repeat **and** look to see if results are different<br><br>allow repeat and see if there are anomalies<br><br>ignore repeat and identify anomalies<br>ignore repeat and compare unqualified | 1 | AO3<br>4.1.1.6 |
| **07.9** | any **one** from:<br>• toxicity / side / health effects<br><br>• effect on other types of bacteria / pathogens<br><br>• interaction with other cleaners<br>• ease of use<br>• dilution factor of each cleaner (vs. cost)<br>• time cleaner is effective for | <br>ignore harmful / dangerous<br>allow reference to allergies<br><br>allow not tested on other types of bacteria<br>ignore germs<br><br><br><br>ignore concentration unqualified<br><br>ignore how long the cleaner lasts for<br><br>allow reference to odour of cleaning liquid<br><br>ignore reference to cost unqualified<br>ignore environmental effects / flammability | 1 | AO3<br>4.1.1.6 |
| **Total** | | | **11** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **08.1** | any **one** from:<br>• respiration<br>• formation of proteins<br>• formation / breakdown of glycogen<br>• breakdown of (excess) protein **or** formation of urea<br>• photosynthesis **or** formation of glucose / starch (in plants) | allow other correct reference to metabolic reactions in cells<br>ignore reference to digestion<br><br>ignore formation of carbohydrates | 1 | AO1<br>4.4.2.3 |
| **08.2** | males have a higher metabolic rate than females after five years of age<br><br>the mean metabolic rate of females decreases faster than males up to 25 years of age | each additional tick negates a mark | 1<br><br>1 | AO3<br>4.4.2.3 |
| **08.3** | $\frac{17}{53} \times 100$<br><br>32.075472…<br><br>32.1 | an answer of 32.1 scores **3** marks<br><br>allow correct rounding of this to at least 4 significant figures<br><br>allow a correct reduction to 3 significant figures from an incorrect calculation for marking point 2 | 1<br><br>1<br><br>1 | AO2<br>4.4.2.3 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **08.4** | any **two** from:<br>• (person) R heart rate rose / increased more slowly than (person) S<br>• (person) R heart rate levelled off whereas (person) S continued to increase<br>• (person) R heart rate rose less (overall / after 5 minutes of exercise) than S | allow converse<br><br>allow correct use of figures eg R increased (overall) by 39 bpm / 65% and S by 54 bpm / 69%<br>ignore lack of units | 2 | AO3<br>4.4.2.2 |
| **08.5** | correct scale and axis labelled<br><br>all points plotted correctly (to within ± ½ square)<br><br>line joined point to point or correct curved line of best fit | allow min(s)<br>do **not** accept 'm'<br>the zero is not required on the *x*-axis<br><br>allow 4 or 5 correct plots for **1** mark | 1<br><br>2<br><br>1 | AO2<br>4.4.2.2 |
| **08.6** | $\frac{132 - 78}{12}$<br><br>4.5 (minutes) / 4½ minutes / 4 minutes 30 seconds / 4:30 | an answer of 4.5 minutes scores **2** marks<br>allow $\frac{54}{12}$<br>allow sequential deductions of 12 four or five times<br>do **not** accept 4:50 **or** 4 minutes 50 seconds | 1<br><br>1 | AO2<br>4.4.2.2 |

| Question | Answers | Mark | AO / Spec. Ref. |
|---|---|---|---|
| **08.7** | **Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced. | 5–6 | AO3<br>4.4.2.2 |
| | **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**<br><br>• two groups of people - non-smokers and smokers<br>• have at least five people in each group or large groups<br>• get each person to do (named) exercise<br>• controlled variables:<br>- same number of people in each group or large groups<br>- same gender<br>- same level of activity / exercise<br>- same age<br>- no health issues / illnesses<br>- same type of exercise<br>- same time for exercise<br>• record heart rate for each person before and after exercise<br>• calculate increase in heart rate for each person after exercise<br>• compare results for each group<br><br>for **level 3**, students should refer to at least 5 smokers and 5 non-smokers, carrying out exercise with control variables and a means of determining an increase in heart rate<br><br>for **level 2**, students should refer to 'groups' of smokers and non-smokers exercising | | |
| **Total** | | | **20** |