# GCSE
# COMBINED SCIENCE: TRILOGY

## 8464/B/1F – BIOLOGY PAPER 1 FOUNDATION TIER

Mark scheme

8464

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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.

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 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** | cell membrane | extra ticks negates marks | 1 | AO1<br>4.1.1.2 |
| **01.2** | engulf pathogens<br>produce antibodies<br>produce antitoxins | extra ticks negates marks | 1<br>1<br>1 | AO1<br>4.2.2.3<br>4.3.1.6 |
| **01.3** | 2050 − 100<br>= 1950 | an answer of 1950 scores **2** marks<br>allow **1** mark for a correct subtraction of incorrect values | 1<br>1 | AO2<br>4.3.1.2 |
| **01.4** | any **one** from:<br>• (more) people vaccinated<br>• (more) people immune<br>• no new measles strain | ignore injections / treatments / medicines unqualified<br>allow vaccine produced<br>allow (more people given) MMR (vaccine)<br>do **not** allow antibiotics<br>ignore less people infected | 1 | AO2<br>4.3.1.1<br>4.3.1.2<br>4.3.1.7 |
| **01.5** | any **one** from:<br>• measles is (caused by) a virus<br>• viruses cannot be killed / destroyed by antibiotics | allow measles is not caused by a bacterium<br>allow antibiotics **only** kill / destroy bacteria<br>ignore harmed / treated | 1 | AO1<br>4.3.1.1<br>4.3.1.8<br>4.3.1.2 |
| **01.6** | any **one** from:<br>• use of a barrier method of contraception<br>• use of a condom<br>• vaccination / immunisation<br>• avoid sexual intercourse / contact | ignore use of diaphragm<br>ignore use protection / safe sex<br>do **not** accept less sexual intercourse / contact | 1 | AO1<br>4.3.1.3 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **01.7** | any **one** from:<br>• size / shape/ type of paper disc<br>• concentration of antibiotic<br>• volume / amount of antibiotic<br>• (incubation) time<br>• (incubation) temperature | ignore paper disc unqualified<br>allow strength / dosage of antibiotic<br>allow 3 days<br>ignore size of petri dish | 1 | AO2<br>4.3.1.8 |
| **01.8** | to check that the disc / water did not have an effect<br>**or**<br>to make sure it was the antibiotic that had an effect | allow for comparison with the antibiotics<br>allow as a (experimental) control<br>do **not** accept as a control variable | 1 | AO3<br>4.3.1.8 |
| **01.9** | (antibiotic) **A**<br>any **one** from:<br>• (antibiotic **A**) had the larg**est** clear area around it<br>• (antibiotic **A**) killed the **most** bacteria | no marks if wrong antibiotic given | 1<br>1 | AO3<br>4.3.1.8 |
| **Total** | | | **13** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.1** | glucose<br><br>oxygen | extra ticks negates marks | 1<br><br>1 | AO1<br>4.4.1.1 |
| **02.2** | count the number of bubbles produced in 1 minute<br><br>measure the volume of gas produced in 30 seconds | extra ticks negates marks | 1<br><br>1 | AO3<br>4.4.1.2 |
| **02.3** | any **one** from:<br>• to control the temperature<br><br>• temperature affects the rate of photosynthesis | ignore reference to 'it'<br><br>allow so pondweed / solution did not warm up<br><br>allow correct description of effect of temperature on rate<br>allow high temperatures denature enzymes<br><br>ignore references to limiting factors | 1 | AO3<br>4.4.1.2 |
| **02.4** | 52 | | 1 | AO2<br>4.4.1.2 |
| **02.5** | all points plotted correctly<br><br>smooth curve drawn through all points | (where a bar chart has been plotted)<br>allow **1** mark for all bars plotted correctly<br>if points are plotted as well as bars, ignore bars<br><br>allow ± ½ a square<br>allow **1** mark for three points correctly plotted<br><br>ignore extensions of line / curve unless inconsistent with line / curve drawn | 2<br><br>1 | AO2<br>4.4.1.2 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **02.6** | any **one** from:<br>• the nearer the light source to the pondweed the faster the rate of photosynthesis<br><br>• the greater the light intensity the faster the rate of photosynthesis | allow converse statements for all marking points<br><br>allow the nearer the light source to the pondweed the faster the bubbles produced<br><br>allow the greater the light intensity the faster the bubbles produced<br><br>allow the closer the light source the more the plant photosynthesises<br><br>ignore more bubbles are produced with no reference to rate<br><br>allow oxygen for bubbles<br><br>do **not** accept carbon dioxide | 1 | AO3<br>4.4.1.2 |
| **Total** | | | **10** | |

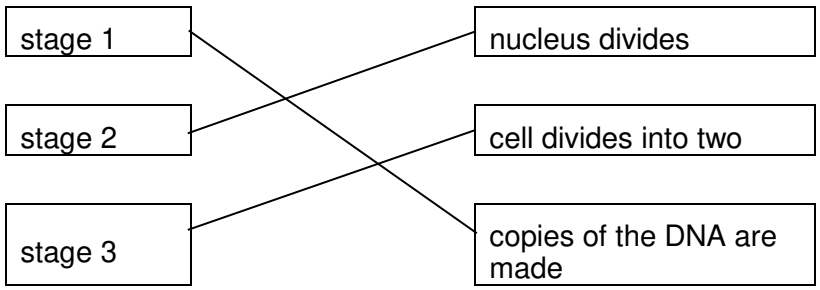
| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **03.1** | any **one** from:<br>• water on potato would increase mass<br>• to control amount of water on potato | allow so only the mass of the potato is measured<br>allow to remove water from outside of potato<br>allow liquid / solution / sugar solution for water<br>allow so you get the correct (starting) mass of the potato<br>do **not** accept so that all the pieces of potato weighed the same | 1 | AO3<br>4.1.3.2 |
| **03.2** | increase in mass<br>increase in length | extra ticks negate marks | 1<br>1 | AO2<br>4.1.3.2 |
| **03.3** | osmosis<br>into<br>lower | in this order only<br>allow diffusion<br>allow inside<br>do **not** accept through<br>allow low / more dilute / dilute | 1<br>1<br>1 | AO1<br>4.1.3.2<br>AO2<br>4.1.3.2<br>AO2<br>4.1.3.2 |
| **03.4** | any **one** from:<br>• the concentration (of sugar solution) in the cells is 0.4 ($mol/dm^3$)<br>• the concentration (of sugar solution) in the cells is the same as the solution (in the tube) | allow reference to potato instead of cells | 1 | AO3<br>4.1.3.2 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **03.5** | any **two** from:<br>• has (root) hairs<br>• large surface / area<br>• (root) hairs extend into soil<br>• (root) hairs have thin walls | ignore references to active transport and mineral uptake<br>allow root hair cells<br>allow wide surface area<br>allow (root) hairs are long / widespread | 2 | AO1<br>4.1.1.3<br>4.1.3.1<br>4.1.3.2 |
| **Total** | | | **9** | |

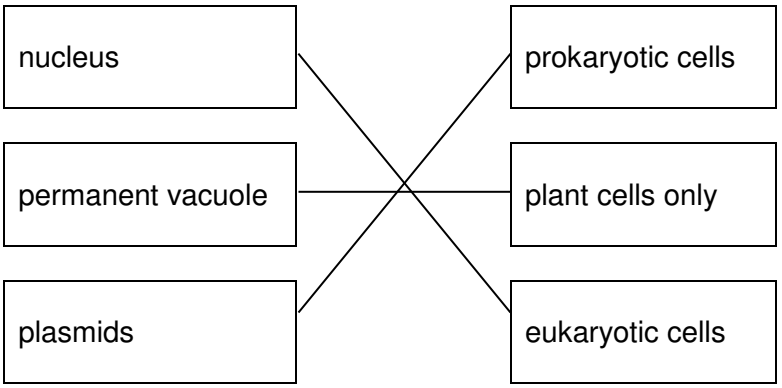
| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **04.1** | | **max 2** marks if written in terms of heart rate | | AO2 4.4.2.2 |
| | breathing rate when walking is twice that at rest | allow breathing rate when walking is 12 (breaths / minute) more than at rest | 1 | |
| | breathing rate when jogging is 5 times that at rest | allow breathing rate when jogging is 48 (breaths / minute) more than at rest | 1 | |
| | breathing rate when jogging is 2.5 times that when walking | allow breathing rate when jogging is 36 (breaths / minute) more than when walking | 1 | |
| | | allow for **1** mark if no other marks gained: breathing rate at rest is 12 (breaths per minute), breathing rate when walking is 24 (breaths per minute) and breathing rate when jogging is 60 (breaths per minute)<br>**or**<br>breathing rate increases with increasing activity | | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **04.2** | (breathing rate increases) | reference to more / faster required at least once for full marks | | AO1 4.4.2.2 |
| | to supply more oxygen / $O_2$<br>**or**<br>to supply oxygen / $O_2$ faster | allow to remove more carbon dioxide / $CO_2$<br>**or**<br>to remove carbon dioxide / $CO_2$ faster<br><br>do **not** accept incorrectly written formulae | 1 | |
| | for (aerobic) respiration<br>**or**<br>to reduce anaerobic respiration<br>**or**<br>to reduce lactic acid build up | | 1 | |
| | (so) that more energy is transferred / released<br>**or**<br>(because) more energy is required | do **not** accept used / produced / created or energy made | 1 | |
| **04.3** | right ventricle / side of the heart pumps (blood) to the lungs | | 1 | AO1 4.2.2.2 |
| | left ventricle / side of the heart pumps (blood) to the body | | 1 | |
| | | if no other marks scored allow **1** mark for one side pumps blood to the lungs and the other side pumps blood to the body | | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **04.4** | any **one** from:<br>• (the left ventricle) has to pump blood further (than the right ventricle)<br>• (the left ventricle) has to pump blood with a greater force (than the right ventricle)<br>• (the left ventricle) has to pump blood at a higher pressure (than the right ventricle) | there must be a comparative statement<br><br>allow (the left ventricle) has to pump blood all around the body<br><br>allow (left ventricle) has to pump blood harder | 1 | AO2<br>4.2.2.2 |
| **04.5** | any **one** from:<br>• strengthens heart (muscle)<br>• reduces chance of another heart attack<br>• reduces / controls weight<br>• improves circulation | ignore prevents / no heart attacks<br><br>allow decreases chance of fatty deposits<br>**or** fat building up (in arteries / blood vessels)<br><br>allow reduces resting heart rate | 1 | AO2<br>4.2.2.2<br>4.2.2.6 |
| **Total** | | | **10** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **05.1** |  <br>allow **1** mark for 1 or 2 correct<br><br>credit can be given where students have matched the boxes correctly, for example numbering the boxes | | 2 | AO1<br>4.1.2.2 |
| **05.2** | 6 picograms | | 1 | AO2<br>4.1.2.2 |
| **05.3** | meristem cells in plants can differentiate throughout the life of the plant | | 1 | AO1<br>4.1.2.3 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **05.4** | any **two** from:<br>• may cure / treat diseases **or** cure medical conditions **or** produce replacement cells / tissues / organs<br>• cells unlikely to be **rejected** by patient<br>• cells / tissues of any type can be produced<br>• many cells produced<br>• cells produced could be used for research<br>• would reduce waiting time for transplants | ignore references to cost<br>ignore all reference to producing babies / IVF<br><br>allow example eg diabetes / paralysis<br>allow cells can be stored for future use<br>ignore used in medical treatments<br>ignore patient makes / grows cells / tissues / organs<br><br>ignore same genetic information<br><br>ignore differentiated into most types of cells | 2 | AO3<br>4.1.2.3<br>4.1.1.4<br>4.6.2.4 |
| **05.5** | any **two** from:<br>• (potential) life is killed / destroyed<br>• shortage of donors / eggs<br>• egg donation / collection has risks<br>• do not yet know risks / side effects of the procedure on the patient<br>• may transfer (viral) infection<br>• poor success rate | ignore references to cost<br>ignore unethical unqualified<br>Ignore reference to religion / beliefs<br><br>allow embryo is killed<br>ignore embryo is destroyed<br>ignore embryo is a life / becomes a baby<br><br>ignore long term effects are not well understood<br>allow may cause tumours / cancer<br><br>allow in terms of viable egg / embryo / cell / tissue / organ production | 2 | AO3<br>4.1.2.3<br>4.1.1.4<br>4.6.2.4 |
| **Total** | | | **8** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **06.1** |  <br>allow **1** mark for one or two correct links | | 2 | AO1<br>4.1.1.1<br>4.1.1.2 |
| **06.2** | vacuole \| ribosome \| cell wall<br><br>tick box takes precedence<br>if no tick is given, look at both the figure and the circling of words in the table<br>if writing is seen on the figure and in the table both must be correct | | 1 | AO1<br>4.1.1.2 |
| **06.3** | turn the (fine focusing) knob until the cells are in focus | allow focus it<br><br>do **not** accept increase magnification<br><br>ignore decrease magnification<br>ignore clear<br>ignore references to resolution / illumination<br>ignore zoom in / out | 1 | AO2<br>4.1.1.2 |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **06.4** | (rotate the) nosepiece / objective lens | allow change the (objective / eyepiece) lens | 1 | AO2 4.1.1.2 |
| | to a higher power (lens) | allow (to) increase the magnification<br><br>a comparator is required<br><br>ignore change / adjust the magnification<br><br>allow stronger or more powerful lens<br><br>ignore references to resolution / illumination unqualified<br><br>ignore zoom in / out<br><br>ignore references to an electron microscope | 1 | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **06.5** | | an answer of 400 (×) scores **3** marks | | AO2<br>4.1.1.2 |
| | conversion of units:<br>(112 mm →) 112 000 (µm)<br>**or**<br>(280 µm →) 0.28 (mm) | | 1 | |
| | (magnification =) $\frac{112}{0.28}$<br>**or**<br>(magnification =) $\frac{112\,000}{280}$ | allow **1** mark for no conversion of units 112 / 280<br>**or**<br>incorrect value from step 1 correctly substituted | 1 | |
| | 400 (×) | do **not** accept if units are given | 1 | |
| | | if no other mark scored allow **1** mark for:<br>magnification = $\frac{\text{size of image}}{\text{size of real object}}$<br>a triangle with words or letters in is insufficient, as the correct rearrangement is needed | | |
| **Total** | | | **9** | |

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **07.1** | is not caused by a pathogen / infective organism | allow not caused by a microorganism / microbe<br>ignore not caused by infection<br><br>ignore named pathogen unless bacteria, virus and fungus all mentioned | 1 | AO1<br>4.2.2.4<br>4.2.2.5<br>4.3.1.1<br>4.3 |
| | (so ) is not passed / spread (from person to person) | allow cannot be spread / caught<br>allow is not infectious / contagious | 1 | AO2<br>4.2.2.4<br>4.2.2.5<br>4.3.1.1<br>4.3 |
| **07.2** | | allow 'it' for heart | | AO1<br>4.2.2.4 |
| | reduced / restricted / stopped blood flow | it does not matter where blood flow is restricted to – heart / body | 1 | |
| | (so) less oxygen reaches heart (muscle / cells) | must reference heart / it<br>allow no oxygen reaches the heart (muscle / cells) | 1 | |
| | (so heart muscle / cells) cannot respire (enough)<br>**or**<br>(so heart muscle / cells) do not release (enough) energy | do **not** accept do not make / produce / create energy<br><br>ignore references to breathing / suffocation<br><br>ignore blood clots / blockages | 1 | |

| Question | Answers | Mark | AO / Spec. Ref. |
|---|---|---|---|
| 02.3 | **Level 3:** Relevant points (factors / effects) are identified, given in detail and logically linked to form a clear account. | 5–6 | AO2 |
| | **Level 2:** Relevant points (factors / effects) are identified and there are attempts at logical linking. The resulting account is not fully clear. | 3–4 | AO2<br>AO1 |
| | **Level 1:** Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking. | 1–2 | AO1 |
| | **No relevant content** | 0 | |
| | **Indicative content**<br><br>**medical risk factors:**<br>• high blood pressure<br>• high cholesterol<br>• diabetes<br>• genetic factors<br>• medications<br><br>**lifestyle risk factors:**<br>• smoking<br>• obesity<br>• lack of exercise<br>• high fat / energy diet<br>• eating insufficient fruit / vegetables<br>• alcohol<br>• high salt intake<br>• exposure to air pollution<br>• certain drugs / correct named drug<br><br>**examples of links:**<br>• smoking – high bp / cholesterol / fatty deposition<br>• obesity – lack of exercise / high bp / cholesterol / fatty deposition / diabetes<br>• exercise – obesity / bp /diabetes<br>• diet – obesity / cholesterol / diabetes<br>• alcohol – bp / cholesterol<br>• high salt intake - high blood pressure<br>• genetic factors – bp / cholesterol / diabetes / obesity<br>• medication – can affect blood / blood vessels / metabolism<br><br>the main discriminator is the quality of linking<br>both lifestyle and medical factors are required for **level 3** | | 4.2.2.2<br>4.2.2.4<br>4.2.2.5<br>4.2.2.6 |
| **Total** | | **11** | |