



# Mark Scheme (Results)

January 2020

Pearson Edexcel International GCSE  
in Human Biology (4HB1)  
Paper 02

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### **General Marking Guidance**

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

| Question number | Answer                                                                                                                                                                                                                                                                                    | Notes                                    | Marks |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|-------|
| 1 (a) (i)       | (tooth X) incisor(1)<br>(tooth Y) canine(1)                                                                                                                                                                                                                                               |                                          | 2     |
| (ii)            | grind/crush/chew food (1)                                                                                                                                                                                                                                                                 |                                          | 1     |
| iii)            | Any two from: <ul style="list-style-type: none"> <li>Adult has premolars/wisdom teeth/3<sup>rd</sup> molar/more teeth/molars/(1)</li> <li>adult teeth are permanent (1)</li> <li>adult teeth are larger (1)</li> </ul>                                                                    | allow reverse argument for children      | 2     |
| (b) (i)         | London(1)<br>less people visiting the dentist(1)<br><br>OR<br><br>North of England (1)<br>More people visiting the dentist (as they have tooth decay) (1)                                                                                                                                 | Area must be stated to award second mark | 2     |
| (ii)            | Any two from: <ul style="list-style-type: none"> <li>(molars) have ridges/crevices/grooves(1)</li> <li>more likely that food can get trapped/larger surface area in contact with food/in contact with food for longer(1)</li> <li>more difficult to reach with a toothbrush(1)</li> </ul> | Ignore cusps                             | 2     |

**Total for Question 1 = 9 marks**

| Question number             | Answer                                                                                                                                                                                                                                                                                                                                                               | Notes                       | Marks                                |         |    |         |    |         |     |         |     |                                |   |
|-----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|--------------------------------------|---------|----|---------|----|---------|-----|---------|-----|--------------------------------|---|
| 2 (a) (i)                   | <div>column headings(1)<br/>units in column headings(1)<br/>values correctly written in columns(1)</div> <table><tr><th>Type of activity / exercise</th><th>Pulse/heart rate in beats per minute</th></tr><tr><td>at rest</td><td>78</td></tr><tr><td>walking</td><td>95</td></tr><tr><td>jogging</td><td>138</td></tr><tr><td>running</td><td>146</td></tr></table> | Type of activity / exercise | Pulse/heart rate in beats per minute | at rest | 78 | walking | 95 | jogging | 138 | running | 146 | Allow bpm for beats per minute | 3 |
| Type of activity / exercise | Pulse/heart rate in beats per minute                                                                                                                                                                                                                                                                                                                                 |                             |                                      |         |    |         |    |         |     |         |     |                                |   |
| at rest                     | 78                                                                                                                                                                                                                                                                                                                                                                   |                             |                                      |         |    |         |    |         |     |         |     |                                |   |
| walking                     | 95                                                                                                                                                                                                                                                                                                                                                                   |                             |                                      |         |    |         |    |         |     |         |     |                                |   |
| jogging                     | 138                                                                                                                                                                                                                                                                                                                                                                  |                             |                                      |         |    |         |    |         |     |         |     |                                |   |
| running                     | 146                                                                                                                                                                                                                                                                                                                                                                  |                             |                                      |         |    |         |    |         |     |         |     |                                |   |
| (b)                         | <div>Any four from:<ul style="list-style-type: none"><li>take pulse rate at rest(1)</li><li>using monitor/from wrist/neck(1)</li><li>walk (for one minute)(1)</li><li>take pulse rate after walking(1)</li><li>repeat for jogging and running(1)</li><li>rest between each exercise(1)</li></ul></div>                                                               |                             | 4                                    |         |    |         |    |         |     |         |     |                                |   |
| (c)                         | exercise for the same amount of time/same terrain/environmental conditions/wear same clothing                                                                                                                                                                                                                                                                        |                             | 1                                    |         |    |         |    |         |     |         |     |                                |   |
| (d)                         | breathing/metabolism/respiration/blood pressure/sweating                                                                                                                                                                                                                                                                                                             |                             | 1                                    |         |    |         |    |         |     |         |     |                                |   |

**Total for Question 2 = 9 marks**

| Question number | Answer                                                                                                                                                                                                                                                                    | Notes         | Marks |
|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------|
| 3 (a) (i)       | <b>The only correct answer is C lens</b><br><i>A is incorrect because this is where the image is formed</i><br><i>B is incorrect because that is what controls the size of the pupil</i><br><i>D is incorrect because the pupil is the hole in the middle of the iris</i> |               | 1     |
| (ii)            | <ul style="list-style-type: none"> <li>• retina(1)</li> <li>• pupil (1)</li> <li>• choroid(1)</li> </ul>                                                                                                                                                                  |               | 3     |
| (b)             | Value between 190 and 230 ( $\mu\text{m}$ )                                                                                                                                                                                                                               |               | 1     |
| (c) (i)         | <ul style="list-style-type: none"> <li>• transmit (nerve/electrical) impulses(1)</li> <li>• to the brain/CNS/relay neurones(1)</li> </ul>                                                                                                                                 |               | 2     |
| (ii)            | <ul style="list-style-type: none"> <li>• less/no impulses able to reach the brain(1)</li> <li>• vision blurred/less clear/less focussed/image not formed/seen/reference to blindness(1)</li> </ul>                                                                        | Allow signals | 2     |

**Total for Question 3 = 9 marks**

| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                                                            | Notes                                        | Marks |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|-------|
| 4 (a)(i)        | pinworms/eggs in faeces/nutritional deficiency/named deficiency/weight loss/malnutrition(1)                                                                                                                                                                                                                                                                                                                       | Accept fatigue                               | 1     |
| (ii)            | Any two from: <ul style="list-style-type: none"> <li>itching transfers eggs (from anus) to fingers/hand(1)</li> <li>eggs transferred from fingers to other surfaces/people(1)</li> <li>eggs ingested when other people touch (contaminated) surfaces (and put hands in their mouth)(1)</li> </ul>                                                                                                                 |                                              | 2     |
| (b)             | Any two from: <ul style="list-style-type: none"> <li>correct temperature/pH/provides warmth(1)</li> <li>plenty of nutrients(1)</li> <li>no predators(1)</li> </ul>                                                                                                                                                                                                                                                | Allow food                                   | 2     |
| (c) (i)         | lacking in one or more nutrients/vitamins/minerals / other named nutrient(1)                                                                                                                                                                                                                                                                                                                                      |                                              | 1     |
| (ii)            | any named nutritional deficiency such as anaemia/scurvy                                                                                                                                                                                                                                                                                                                                                           | Allow named nutrient e.g. protein deficiency | 1     |
| (iii)           | <ul style="list-style-type: none"> <li>pinworms absorb nutrients/named nutrient(1)</li> <li>less nutrients absorbed/pass into blood/body/cells receive less nutrients(1)</li> </ul>                                                                                                                                                                                                                               | Allow food                                   | 2     |
| (d)             | Reference to eggs/pinworms on transparent tape (where they can be seen)                                                                                                                                                                                                                                                                                                                                           |                                              | 1     |
| (e)             | Any two from: <ul style="list-style-type: none"> <li>refrain from itching/scratching (anus)(1)</li> <li>use medication (to kill pinworms)(1)</li> <li>don't share towels/clothing(1)</li> <li>wash bedclothes/linen regularly/do not shake bed linen(1)</li> <li>don't bite nails/keep fingernails short / clean/wash hands (after using toilet)(1)</li> <li>don't allow children to bathe together(1)</li> </ul> |                                              | 2     |

**Total for Question 4 = 12 marks**

| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                                    | Notes | Marks |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|-------|
| 5 (a)           | <ul style="list-style-type: none"> <li>(layer 1) epidermis(1)</li> <li>(layer 2) dermis (1)</li> <li>(layer 3) fat/subcutaneous fat/fat layer/fat tissue/adipose layer/adipose tissue</li> </ul>                                                                                                                                                                                          |       | 3     |
| (b)             | <p><b>The only correct answer is A</b> blood vessels and sebaceous glands</p> <p><i>B is incorrect because these are in the third layer</i></p> <p><i>C is incorrect because these are in the third layer</i></p> <p><i>D is incorrect because the fat tissue is the third layer</i></p>                                                                                                  |       | 1     |
| (c)             | <ul style="list-style-type: none"> <li>skin/epidermis/tissues/blood vessels damaged/open to air(1)</li> <li>bacteria can enter bloodstream/body(1)</li> </ul>                                                                                                                                                                                                                             |       | 2     |
| (d)             | <p>Any four from:</p> <ul style="list-style-type: none"> <li>platelets accumulate at wound/damaged area(1)</li> <li>enzyme/thromokinase/thromboplastin released (1)</li> <li>prothrombin converted to thrombin(1)</li> <li>fibrinogen to fibrin(1)</li> <li>mesh traps red blood cells(1)</li> <li>scab/clot formed(1)</li> <li>prevents entry of bacteria / microorganisms(1)</li> </ul> |       | 4     |

**Total for Question 5 = 10 marks**

| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Notes                                                                                                    | Marks |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|-------|
| 6 (a) (i)       | <ul style="list-style-type: none"> <li>more males than females die (from <i>S.aureus</i> and MRSA)(1)</li> <li>number of deaths from both <i>S.aureus</i> and MRSA increase with age(1)</li> </ul>                                                                                                                                                                                                                                                                                                 | Allow other valid conclusions e.g more deaths from both microorganisms in males/females aged 85 and over | 2     |
| (ii)            | $416.6 \div 1.8(1)$<br>$231.4:1(1)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Allow 231:1<br>Allow full marks for correct final answer                                                 | 2     |
| (iii)           | $41.2 + 21.9 = 63.1(1)$<br>$53 \times 63.1 = 3344(1)$                                                                                                                                                                                                                                                                                                                                                                                                                                              | Allow 3344.3<br>Allow full marks for correct final answer                                                | 2     |
| (iv)            | Any two from: <ul style="list-style-type: none"> <li>MRSA is resistant (1)</li> <li>to (many) antibiotics(1)</li> <li>(MRSA infection) difficult to treat(1)</li> <li>reference to MRSA infection being (highly) contagious/out of control/easily transferred(1)</li> </ul>                                                                                                                                                                                                                        |                                                                                                          | 2     |
| (b) (i)         | microorganisms/bacteria/fungi                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Ignore viruses<br>Ignore named antibiotics                                                               | 1     |
| (ii)            | Any six from: <ul style="list-style-type: none"> <li>sterilise Petri dishes/agar/nutrient broth(1)</li> <li>obtain sample(1)</li> <li>sterile inoculating loop/sterile swab(1)</li> <li>pass neck of flask containing culture through a flame(1)</li> <li>smear culture/sample/swab onto agar(1)</li> <li>reference to adding antibiotics (to agar)(1)</li> <li>seal Petri dishes/cover with lid(1)</li> <li>incubate(1)</li> <li>measure area of clear zone around antibiotic discs(1)</li> </ul> | Allow description of how loop/swab is sterilised                                                         | 6     |

Total for Question 6 = 15 marks

| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                            | Notes                               | Marks    |      |         |                                   |   |                 |                      |  |              |                                |   |            |                              |   |                                                    |   |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|----------|------|---------|-----------------------------------|---|-----------------|----------------------|--|--------------|--------------------------------|---|------------|------------------------------|---|----------------------------------------------------|---|
| 7 (a) (i)       | <table><tr><th>Part</th><th>Function</th><th>Tick</th></tr><tr><td>medulla</td><td>controls heart rate and breathing</td><td>✓</td></tr><tr><td>pituitary gland</td><td>involved in language</td><td></td></tr><tr><td>hypothalamus</td><td>responsible for osmoregulation</td><td>✓</td></tr><tr><td>cerebellum</td><td>controls voluntary movements</td><td>✓</td></tr></table> | Part                                | Function | Tick | medulla | controls heart rate and breathing | ✓ | pituitary gland | involved in language |  | hypothalamus | responsible for osmoregulation | ✓ | cerebellum | controls voluntary movements | ✓ | Maximum of two marks if all four boxes are ticked. | 3 |
| Part            | Function                                                                                                                                                                                                                                                                                                                                                                          | Tick                                |          |      |         |                                   |   |                 |                      |  |              |                                |   |            |                              |   |                                                    |   |
| medulla         | controls heart rate and breathing                                                                                                                                                                                                                                                                                                                                                 | ✓                                   |          |      |         |                                   |   |                 |                      |  |              |                                |   |            |                              |   |                                                    |   |
| pituitary gland | involved in language                                                                                                                                                                                                                                                                                                                                                              |                                     |          |      |         |                                   |   |                 |                      |  |              |                                |   |            |                              |   |                                                    |   |
| hypothalamus    | responsible for osmoregulation                                                                                                                                                                                                                                                                                                                                                    | ✓                                   |          |      |         |                                   |   |                 |                      |  |              |                                |   |            |                              |   |                                                    |   |
| cerebellum      | controls voluntary movements                                                                                                                                                                                                                                                                                                                                                      | ✓                                   |          |      |         |                                   |   |                 |                      |  |              |                                |   |            |                              |   |                                                    |   |
| (ii)            | <ul style="list-style-type: none"><li>transmit impulses to effector organs/muscles/glands/controls movement/voluntary actions(1)</li></ul>                                                                                                                                                                                                                                        | 1                                   |          |      |         |                                   |   |                 |                      |  |              |                                |   |            |                              |   |                                                    |   |
| (b)             | <ul style="list-style-type: none"><li>lack of dopamine/no dopamine produced / released/release of dopamine inconsistent(1)</li><li>less nerve impulses generated/nerve impulses (to muscles/along motor neurones) inconsistent (1)</li><li>tremor/rigidity/slowness of movement/imbalance occur(1)</li></ul>                                                                      | Allow neurotransmitter for dopamine | 3        |      |         |                                   |   |                 |                      |  |              |                                |   |            |                              |   |                                                    |   |

Total for Question 7 = 7 marks

| Question number | Answer                                                                                                                                                                                                                                                                                                      | Notes                                                                                                                                                | Marks |
|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 8               | <ul style="list-style-type: none"> <li>antigen injected into a mouse/other named animal(1)</li> <li>spleen cells produce antibodies(1)</li> <li>spleen cells are fused with tumour/myeloma cells(1)</li> <li>hybridoma cells formed(1)</li> <li>hybridoma cells produce monoclonal antibodies(1)</li> </ul> | <p>Allow lymphocytes from spleen cells produce antibodies</p> <p>Allow cancer cells for myeloma</p> <p>Allow lymphocytes from spleen cells fused</p> | 5     |

**Total for Question 8 = 5 marks**

| Question number | Answer                                                                                                                                                                                                                                                                 | Notes                                                      | Marks |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|-------|
| 9 (a) (i)       | Any three from: <ul style="list-style-type: none"> <li>amino group removed/broken down(1)</li> <li>in liver(1)</li> <li>by deamination(1)</li> <li>to produce urea (1)</li> </ul>                                                                                      | Allow description of amino group e.g. nitrogenous group    | 3     |
| (ii)            | Any three from: <ul style="list-style-type: none"> <li>less protein broken down by protease(1)</li> <li>to amino acids 1)</li> <li>in stomach/small intestine(1)</li> <li>reference to reduced amount of phenylalanine/amino acids (in low protein diet)(1)</li> </ul> |                                                            | 3     |
| (iii)           | <ul style="list-style-type: none"> <li>reduced number of amino acids available(1)</li> <li>during translation(1)</li> <li>on ribosomes(1)</li> <li>incorrect/less protein formed(1)</li> </ul>                                                                         | Allow less translation<br><br>Allow less protein synthesis | 3     |
| (b) (i)         | heterozygous/Nn(1)                                                                                                                                                                                                                                                     |                                                            | 1     |
| (ii)            | 100% (1)                                                                                                                                                                                                                                                               |                                                            | 1     |
| (iii)           | <ul style="list-style-type: none"> <li>both parents carry recessive allele/allele for PKU/heterozygous(1)</li> <li>person 3 has inherited one recessive allele from each parent(1)</li> <li>person 3 has PKU/homozygous recessive(1)</li> </ul>                        | Reject any reference to sex-linked                         | 3     |

Total for Question 9 = 14 marks

