



# **Mark Scheme (Results)**

January 2017

Pearson Edexcel International GCSE  
in Human Biology (4HB0) Paper 01



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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                                                  | Accept | Reject | Marks    |
|-----------------|---------------------------------------------------------|--------|--------|----------|
| 1               | (a) A;                                                  |        |        | 1        |
|                 | (b) A; (artery, vein, capillary, vein)                  |        |        | 1        |
|                 | (c) C; (moving mucus to the throat)                     |        |        | 1        |
|                 | (d) D; (decreases, no change)                           |        |        | 1        |
|                 | (e) A; (chlorination)                                   |        |        | 1        |
|                 | (f) D; (tuberculosis, bacterium)                        |        |        | 1        |
|                 | (g) B; (G – C and T – A)                                |        |        | 1        |
|                 | (h) B; (50%)                                            |        |        | 1        |
|                 | (i) C; (49.5, 60.1)                                     |        |        | 1        |
|                 | (j) D; (they are each specific to one type of reaction) |        |        | 1        |
|                 |                                                         |        |        | Total 10 |

| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                               | Accept                                         | Reject                                                  | Marks      |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------|---------------------------------------------------------|------------|
| 2               | <p>During inhalation (breathing in) the <b>intercostal</b>; muscles contract and pull the ribs upwards and <b>out (wards)</b>; . At the same time the <b>diaphragm</b>; contracts and becomes flattened.</p> <p>Both of these processes increase the <b>volume</b>; of the thoracic cavity and decrease the <b>pressure</b>; .</p> <p>This causes air from the atmosphere to be <b>forced</b>; into the <b>trachea</b>; and then into the lungs.</p> | <p>drawn/pushed</p> <p>mouth/nose/windpipe</p> | <p>ignore internal/external</p> <p>inhaled/breathed</p> | Total<br>7 |

| Question number | Answer                                                |                       | Accept | Reject | Marks      |
|-----------------|-------------------------------------------------------|-----------------------|--------|--------|------------|
| 3               | Function of substance                                 | Function of substance |        |        | 1          |
|                 | stored under the skin and around some organs          | lipids;               |        |        | 1          |
|                 | used to strengthen tooth enamel                       | calcium;              |        |        | 1          |
|                 | broken down into amino acids during digestion         | protein;              |        |        | 1          |
|                 | assists peristalsis                                   | fibre;                |        |        | 1          |
|                 | used for the formation of visual purple in the retina | vitamin A;            |        |        | 1          |
|                 | used in the formation of haemoglobin                  | iron;                 |        |        | 1          |
|                 | a medium in which chemical reactions occur in a cell  | water;                |        |        | 1          |
|                 | needed for the growth of tissues                      | protein;              |        |        | 1          |
|                 |                                                       |                       |        |        | Total<br>8 |

| Question number | Answer                                                                                                                                                                                                                               | Accept                   | Reject | Marks |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|--------|-------|
| 4 (a) (i)       | A = cartilage;<br>B = compact bone;<br>C = bone marrow;                                                                                                                                                                              |                          |        | 3     |
| (ii)            | <ul style="list-style-type: none"> <li>• shock absorber/cushions;</li> <li>• to reduce friction/prevents bones rubbing/grinding;</li> </ul>                                                                                          |                          |        | 2     |
| (b) (i)         | Two of <ul style="list-style-type: none"> <li>• safety glasses;</li> <li>• wipe up spills of liquid/wash hands;</li> <li>• use tongs;</li> </ul>                                                                                     | Ignore gloves<br>forceps |        | 2     |
| (ii)            | <ul style="list-style-type: none"> <li>• (acid) dissolves calcium salts/named salt/compact bone;</li> <li>• these provide strength/rigidity to bone;</li> <li>• if they are not present remaining material is soft/bendy;</li> </ul> |                          |        | 3     |

| Question number       | Answer                                                                                                                                                                                                                                                                                 | Accept  | Reject  | Marks                 |                            |                |                 |          |           |  |  |   |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|-----------------------|----------------------------|----------------|-----------------|----------|-----------|--|--|---|
| 4 (c) (i)             | X = ulna;<br><br>Y = radius;                                                                                                                                                                                                                                                           |         |         | 2                     |                            |                |                 |          |           |  |  |   |
| (ii)                  | <ul style="list-style-type: none"><li>muscle must be attached to structure that will move/it allows bone Y to move;</li><li>humerus would not move if both ends attached;</li></ul>                                                                                                    |         |         | 2                     |                            |                |                 |          |           |  |  |   |
| (iii)                 | two of <ul style="list-style-type: none"><li>(biceps) relaxes;</li><li>becomes elongated/stretching;</li><li>becomes thinner/flattens;</li></ul>                                                                                                                                       |         |         | 2                     |                            |                |                 |          |           |  |  |   |
| (iv)                  | two of <ul style="list-style-type: none"><li>ligaments;</li><li>synovial fluid/capsule;</li><li>synovial membrane;</li></ul>                                                                                                                                                           |         |         | 2                     |                            |                |                 |          |           |  |  |   |
| (d)                   | two of <table border="1"><thead><tr><th>Muscles</th><th>Tendons</th></tr></thead><tbody><tr><td>1 attaches to tendons</td><td>attaches muscles to bones;</td></tr><tr><td>2 can contract</td><td>can't contract;</td></tr><tr><td>3 fibres</td><td>no fibres</td></tr></tbody></table> | Muscles | Tendons | 1 attaches to tendons | attaches muscles to bones; | 2 can contract | can't contract; | 3 fibres | no fibres |  |  | 2 |
| Muscles               | Tendons                                                                                                                                                                                                                                                                                |         |         |                       |                            |                |                 |          |           |  |  |   |
| 1 attaches to tendons | attaches muscles to bones;                                                                                                                                                                                                                                                             |         |         |                       |                            |                |                 |          |           |  |  |   |
| 2 can contract        | can't contract;                                                                                                                                                                                                                                                                        |         |         |                       |                            |                |                 |          |           |  |  |   |
| 3 fibres              | no fibres                                                                                                                                                                                                                                                                              |         |         |                       |                            |                |                 |          |           |  |  |   |
|                       |                                                                                                                                                                                                                                                                                        |         |         | Total 20              |                            |                |                 |          |           |  |  |   |



| Question number | Answer                                                                                                                                                   | Accept                                  | Reject                   | Marks |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------|-------|
| 5 (a) (i)       | mouth;                                                                                                                                                   |                                         |                          | 1     |
| (ii)            | blue-black/black;                                                                                                                                        |                                         |                          | 1     |
| (iii)           | 20 minutes;                                                                                                                                              | Any number over 18 and up to 20 minutes |                          | 1     |
| (iv)            | <ul style="list-style-type: none"> <li>enzyme in saliva/(salivary) amylase;</li> <li>digests/breaks down starch;</li> </ul>                              |                                         |                          | 2     |
| (v)             | <ul style="list-style-type: none"> <li>repeat with boiled saliva/enzyme/amylase or no saliva/enzyme/amylase/starch (solution) only;</li> </ul>           | Use denatured enzyme                    |                          | 1     |
| (vi)            | <ul style="list-style-type: none"> <li>uses saliva;</li> <li>risk of disease/AIDS transmission/saliva may contain pathogens/bacteria/viruses;</li> </ul> |                                         | Causes disease/infection | 2     |
| (b) (i)         | <ul style="list-style-type: none"> <li>tube heated;</li> <li>in water bath/for (less than) 2 minutes;</li> </ul>                                         |                                         |                          | 2     |
| (ii)            | <ul style="list-style-type: none"> <li><u>starch</u> converted to maltose;</li> <li>(maltose is) a reducing sugar;</li> </ul>                            | Accept glucose                          |                          | 2     |

| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                                                 | Accept | Reject | Marks       |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|-------------|
| 5 (c) (i)       | <ul style="list-style-type: none"> <li>body temperature;</li> <li>so optimum temperature of enzyme / maximum reaction rate;</li> </ul>                                                                                                                                                                                                                                                                 |        |        | 2           |
| (ii)            | <p>three of</p> <ul style="list-style-type: none"> <li>test A will take longer for no blue-black colouration to appear/no colour change/iodine gives a positive result for longer;</li> <li>because enzyme/(salivary) amylase catalyses more slowly;</li> <li>test B would give the same results (as before);</li> <li>since the same concentration of maltose would be produced in test A;</li> </ul> |        |        | 3           |
|                 |                                                                                                                                                                                                                                                                                                                                                                                                        |        |        | Total<br>17 |

| Question number | Answer                                                                                                                                                                                                                            | Accept          | Reject | Marks      |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------|------------|
| 6 (a)           | A; (adrenal)                                                                                                                                                                                                                      |                 |        | 1          |
| (b)             | <ul style="list-style-type: none"> <li>• endocrine gland;</li> <li>• secretion straight into blood;</li> </ul>                                                                                                                    |                 |        | 2          |
| (c) (i)         | ureter;                                                                                                                                                                                                                           |                 |        | 1          |
| (ii)            | bladder;                                                                                                                                                                                                                          | urinary bladder |        | 1          |
| (d)             | renal vein;                                                                                                                                                                                                                       |                 |        | 1          |
| (e)             | two of <ul style="list-style-type: none"> <li>• less urea in Y/more urea in X;</li> <li>• more carbon dioxide in Y/less carbon dioxide in X;</li> <li>• less oxygen in Y/Y deoxygenated/more oxygen in X/X oxygenated;</li> </ul> |                 |        | 2          |
|                 |                                                                                                                                                                                                                                   |                 |        | Total<br>8 |

| Question number | Answer                                                                                                                                                                                                                                                                                           | Accept | Reject | Marks    |
|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|----------|
| 7 (a)           | <ul style="list-style-type: none"> <li>sulfur dioxide dissolves/combines/reacts;</li> <li>in water/vapour/rain water in clouds;</li> <li>sulphurous/sulfuric acid formed;</li> </ul>                                                                                                             |        |        | 3        |
| (b)             | three of <ul style="list-style-type: none"> <li>collect rainwater in a container;</li> <li>use pH meter/<u>universal</u> indicator;</li> <li>note reading/colour change/correct colour change described;</li> <li>lower the reading greater the acidity/use chart to determine value;</li> </ul> |        |        | 3        |
| (c)             | (i)                                                                                                                                                                                                                                                                                              |        |        | 2        |
|                 | (ii)                                                                                                                                                                                                                                                                                             |        |        | 2        |
|                 | (iii)                                                                                                                                                                                                                                                                                            |        |        | 2        |
|                 |                                                                                                                                                                                                                                                                                                  |        |        | Total 12 |

| Question number     | Answer                                                                                                                                                                                                                                                                                                                                                                                            | Accept                                       | Reject | Marks |                 |                |            |           |               |  |   |   |                      |   |  |   |                     |  |   |   |
|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|--------|-------|-----------------|----------------|------------|-----------|---------------|--|---|---|----------------------|---|--|---|---------------------|--|---|---|
| 8 (a) (i)           | 1 mark for each correct row.                                                                                                                                                                                                                                                                                                                                                                      |                                              |        |       |                 |                |            |           |               |  |   |   |                      |   |  |   |                     |  |   |   |
|                     | <table><tr><th>Feature of cell</th><th>Red blood cell</th><th>Lymphocyte</th><th>Phagocyte</th></tr><tr><td>has a nucleus</td><td></td><td>✓</td><td>✓</td></tr><tr><td>contains haemoglobin</td><td>✓</td><td></td><td>;</td></tr><tr><td>produces antibodies</td><td></td><td>✓</td><td>;</td></tr></table>                                                                                     |                                              |        |       | Feature of cell | Red blood cell | Lymphocyte | Phagocyte | has a nucleus |  | ✓ | ✓ | contains haemoglobin | ✓ |  | ; | produces antibodies |  | ✓ | ; |
|                     | Feature of cell                                                                                                                                                                                                                                                                                                                                                                                   |                                              |        |       | Red blood cell  | Lymphocyte     | Phagocyte  |           |               |  |   |   |                      |   |  |   |                     |  |   |   |
|                     | has a nucleus                                                                                                                                                                                                                                                                                                                                                                                     |                                              |        |       |                 | ✓              | ✓          |           |               |  |   |   |                      |   |  |   |                     |  |   |   |
|                     | contains haemoglobin                                                                                                                                                                                                                                                                                                                                                                              |                                              |        |       | ✓               |                | ;          |           |               |  |   |   |                      |   |  |   |                     |  |   |   |
| produces antibodies |                                                                                                                                                                                                                                                                                                                                                                                                   | ✓                                            | ;      |       |                 |                |            |           |               |  |   |   |                      |   |  |   |                     |  |   |   |
| (ii)                | <ul style="list-style-type: none"><li>• transport oxygen;</li><li>• produces antibodies;</li><li>• engulfs/digests/destroys bacteria;</li></ul>                                                                                                                                                                                                                                                   | Accept points from suitably labelled diagram |        | 3     |                 |                |            |           |               |  |   |   |                      |   |  |   |                     |  |   |   |
| (iii)               | Three of: <ul style="list-style-type: none"><li>• biconcave shape gives greater surface area for gaseous exchange / to absorb oxygen;</li><li>• contains haemoglobin to combine with/transport oxygen;</li><li>• lack of nucleus/other cellular structures to allow more space for haemoglobin;</li><li>• elastic membrane/flexible shape to allow cell to squeeze through capillaries;</li></ul> |                                              |        |       |                 |                |            |           |               |  |   |   |                      |   |  |   |                     |  |   |   |

|         |                                                                                                                                                                                                                                            |  |  |                          |
|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--------------------------|
| (b) (i) | <p>A = tissue fluid;<br/>B = lymph;</p>                                                                                                                                                                                                    |  |  | 2                        |
| (ii)    | <ul style="list-style-type: none"> <li>• contraction;<br/>• of left ventricle;</li> </ul>                                                                                                                                                  |  |  | 2                        |
| (iii)   | <ul style="list-style-type: none"> <li>• resistance of blood/red blood cells/resistance of (walls) of blood vessels;<br/>• loss of water/fluid;</li> </ul>                                                                                 |  |  | 2                        |
| (iv)    | <p>Two of</p> <ul style="list-style-type: none"> <li>• BP greater than OP (at the beginning);</li> <li>• forces fluid out of capillary;</li> <li>• through pores in capillary wall;</li> <li>• OP greater than BP (at the end);</li> </ul> |  |  | <p>2</p> <p>Total 17</p> |

| Question number                                     | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Accept                        | Reject                                                           | Marks    |          |                  |                    |                |                                                    |                                   |          |                               |                 |                                                     |                                   |                 |                                                                  |  |  |   |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|------------------------------------------------------------------|----------|----------|------------------|--------------------|----------------|----------------------------------------------------|-----------------------------------|----------|-------------------------------|-----------------|-----------------------------------------------------|-----------------------------------|-----------------|------------------------------------------------------------------|--|--|---|
| 9 (a) (i)                                           | A = axon;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                               |                                                                  | 2        |          |                  |                    |                |                                                    |                                   |          |                               |                 |                                                     |                                   |                 |                                                                  |  |  |   |
|                                                     | B = cell body;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                               |                                                                  |          |          |                  |                    |                |                                                    |                                   |          |                               |                 |                                                     |                                   |                 |                                                                  |  |  |   |
| (ii)                                                | arrow drawn pointing from top to bottom;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                               |                                                                  | 1        |          |                  |                    |                |                                                    |                                   |          |                               |                 |                                                     |                                   |                 |                                                                  |  |  |   |
| (iii)                                               | Two of <ul style="list-style-type: none"><li>• shorter axon;</li><li>• longer dendron/dendrite;</li><li>• cell body in middle not at end;</li><li>• sensory transmits impulse to CNS, motor away from CNS;</li></ul>                                                                                                                                                                                                                                                                                                                                                                          |                               |                                                                  | 2        |          |                  |                    |                |                                                    |                                   |          |                               |                 |                                                     |                                   |                 |                                                                  |  |  |   |
| (b)                                                 | <table><tr><th>Stimulus</th><th>Receptor</th><th>Effector</th><th>Response</th></tr><tr><td>(hit below knee)</td><td>(stretch receptor)</td><td>(thigh muscle)</td><td><i>knee jerk/lower leg raised/leg straightens;</i></td></tr><tr><td>(change from dim to bright light)</td><td>(retina)</td><td><i>iris/circular muscles;</i></td><td>(smaller pupil)</td></tr><tr><td><i>Touching a hot object/heat/high temperature;</i></td><td>(temperature receptor in fingers)</td><td>(biceps muscle)</td><td><i>arm raised / hand moved away from object/biceps contract;</i></td></tr></table> | Stimulus                      | Receptor                                                         | Effector | Response | (hit below knee) | (stretch receptor) | (thigh muscle) | <i>knee jerk/lower leg raised/leg straightens;</i> | (change from dim to bright light) | (retina) | <i>iris/circular muscles;</i> | (smaller pupil) | <i>Touching a hot object/heat/high temperature;</i> | (temperature receptor in fingers) | (biceps muscle) | <i>arm raised / hand moved away from object/biceps contract;</i> |  |  | 4 |
| Stimulus                                            | Receptor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Effector                      | Response                                                         |          |          |                  |                    |                |                                                    |                                   |          |                               |                 |                                                     |                                   |                 |                                                                  |  |  |   |
| (hit below knee)                                    | (stretch receptor)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | (thigh muscle)                | <i>knee jerk/lower leg raised/leg straightens;</i>               |          |          |                  |                    |                |                                                    |                                   |          |                               |                 |                                                     |                                   |                 |                                                                  |  |  |   |
| (change from dim to bright light)                   | (retina)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <i>iris/circular muscles;</i> | (smaller pupil)                                                  |          |          |                  |                    |                |                                                    |                                   |          |                               |                 |                                                     |                                   |                 |                                                                  |  |  |   |
| <i>Touching a hot object/heat/high temperature;</i> | (temperature receptor in fingers)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | (biceps muscle)               | <i>arm raised / hand moved away from object/biceps contract;</i> |          |          |                  |                    |                |                                                    |                                   |          |                               |                 |                                                     |                                   |                 |                                                                  |  |  |   |
|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                               |                                                                  | Total 9  |          |                  |                    |                |                                                    |                                   |          |                               |                 |                                                     |                                   |                 |                                                                  |  |  |   |

| Question number | Answer                                                                                                                                                                                                                                                                                                                                                                                                   | Accept                                                 | Reject | Marks |
|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|--------|-------|
| 10 (a)          | <ul style="list-style-type: none"> <li>carried on X/sex chromosome;</li> <li>passed onto next generation/inherited with sex chromosome;</li> </ul>                                                                                                                                                                                                                                                       |                                                        |        | 2     |
| (b) (i)         | $\frac{2500 \times 0.8}{100}$ 20 (males);                                                                                                                                                                                                                                                                                                                                                                | 2 marks for correct answer without working<br>Ecf 5000 |        | 2     |
| (ii)            | four of <ul style="list-style-type: none"> <li>greater percentage/numbers of males have condition;</li> <li>use of figures from table;</li> <li>only possible if carried on X chromosome;</li> <li>can be more readily expressed in males/only need one chromosome/allele to be affected;</li> <li>females don't show condition in heterozygous/two chromosomes affected/two alleles present;</li> </ul> |                                                        |        | 4     |



| Question number | Answer                                                                                                                                                                                                                                                                                                                       | Accept | Reject | Marks                    |
|-----------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|--------|--------------------------|
| 10 (c) (i)      | <p>(parents) <math>X^B X^b</math> x <math>X^B Y</math>;</p> <p>(gametes) <math>X^B</math> <math>X^b</math> <math>X^B</math> <math>Y</math>;</p> <p>(fertilisation) <math>X^B X^B</math> <math>X^B Y</math> <math>X^B X^b</math> <math>X^b Y</math>;</p> <p>(phenotype) ..... (3 normal vision) ..... 1 colour blind boy;</p> |        |        | <p>4</p> <p>Total 12</p> |

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