



**Cambridge Assessment International Education**  
Cambridge International General Certificate of Secondary Education

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**BIOLOGY**

**0610/51**

Paper 5 Practical Test

**October/November 2017**

MARK SCHEME

Maximum Mark: 40

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**Published**

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This document consists of **9** printed pages.



**Mark schemes will use these abbreviations**

- ; separates marking points
- / alternatives
- **I** ignore
- **R** reject
- **A** accept (for answers correctly cued by the question, or guidance for examiners)
- AW alternative wording (where responses vary more than usual)
- AVP any valid point
- **ecf** credit a correct statement / calculation that follows a previous wrong response
- **ora** or reverse argument
- ( ) the word / phrase in brackets is not required, but sets the context
- underline actual word given must be used by candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given

| Question  | Answer  | Marks    | Guidance  |
|-----------|---|----------|---|
| 1(a)(i)   | <p>one table drawn with appropriate number of columns ;</p> <p>correct column and row headings with appropriate units (pH and intensity / minutes) ;</p> <p>pH recorded for each solution ;</p> <p>colour of apple slices recorded by intensity for 0 and 10 minutes (numerical values not words) ;</p> <p>colour of apple slices recorded by intensity for 20 minutes (numerical values not words) ;</p> <p>suitable trend ;</p> | <b>6</b> | <p><b>I</b> control if added to table</p> <p><b>R</b> if units in data cell</p> <p><b>I</b> units in data cells</p> <p><b>A</b> if the correct data is not linked to a time</p>   |
| 1(a)(ii)  | 2 and/or 3, 7, then 8 and/or 9 ;  | <b>1</b> | <b>A B</b> and <b>C</b> in either order, <b>A, D</b> and <b>E</b> in either order   |
| 1(a)(iii) | to compare (what happens to the apple) with the solution and with no solution / at different pH values and no pH / with different pH values and the air / with the solution and with the air ;  | <b>1</b> | <p><b>I</b> for comparison unqualified</p> <p><b>A</b> to see what happens to the crushed apple when it is not exposed to the solution</p> <p><b>A</b> to observe what would happen without the effect of pH</p> <p><b>A</b> idea that the control shows that the liquid (or change in pH) is causing the results (and not the air)</p> |
| 1(a)(iv)  | <p>lemon juice ;</p> <p>has low pH/is acidic/(lemon juice has a pH of 2 and) previous experiment showed that apple won't go brown at pH2 ;</p>  | <b>2</b> | <p><b>A</b> olive oil</p> <p><b>A</b> (olive oil) keeps out air/oxygen</p> <p><b>A</b> enzyme doesn't work / denatured at pH2</p>   |

| Question  | Answer   | Marks           | Guidance   |   |                           |                    |                                    |                          |                       |                                   |  |          |   |
|---|--|-----------------|--|---|---------------------------|--------------------|------------------------------------|--------------------------|-----------------------|-----------------------------------|--|----------|---|
| 1(b)(i)   | <table border="1"> <thead> <tr> <th><i>variable</i></th> <th><i>controlled by</i></th> </tr> </thead> <tbody> <tr> <td>volume / amount / mass, of solution / named solution / liquid</td> <td>adding 20 cm<sup>3</sup></td> </tr> <tr> <td>(same / one) apple</td> <td>all slices cut from the same apple</td> </tr> <tr> <td>time soaking in solution</td> <td>all soaked for 2 mins</td> </tr> <tr> <td>observation time / time intervals</td> <td>left for 20 min / results checked every 10 minutes</td> </tr> </tbody> </table> <p style="text-align: center;">; ;</p> | <i>variable</i> | <i>controlled by</i>   | volume / amount / mass, of solution / named solution / liquid | adding 20 cm <sup>3</sup> | (same / one) apple | all slices cut from the same apple | time soaking in solution | all soaked for 2 mins | observation time / time intervals | left for 20 min / results checked every 10 minutes | <b>2</b> | <p>1 mark for the variable, 1 mark for method of controlling which must related</p> <p><b>I</b> temperature</p> <p><b>I</b> time unqualified unless explanation clarifies</p> <p><b>A</b> time apple was left in the Petri dish<br/><b>A</b> oxygen / air exposure time</p> |
| <i>variable</i>   | <i>controlled by</i>   |                 |  |   |                           |                    |                                    |                          |                       |                                   |  |          |   |
| volume / amount / mass, of solution / named solution / liquid | adding 20 cm <sup>3</sup>  |                 |  |   |                           |                    |                                    |                          |                       |                                   |  |          |   |
| (same / one) apple  | all slices cut from the same apple   |                 |  |   |                           |                    |                                    |                          |                       |                                   |  |          |   |
| time soaking in solution                                      | all soaked for 2 mins  |                 |  |   |                           |                    |                                    |                          |                       |                                   |  |          |   |
| observation time / time intervals                             | left for 20 min / results checked every 10 minutes   |                 |  |   |                           |                    |                                    |                          |                       |                                   |  |          |   |
| 1(b)(ii)  | oxygen is needed (from the air) for the reaction ;   | <b>1</b>        | <p><b>A</b> to expose the apple to oxygen<br/><b>I</b> air</p> |   |                           |                    |                                    |                          |                       |                                   |  |          |   |

| Question   | Answer  | Marks        | Guidance                                    |   |  |                 |                                 |  |                      |  |                      |                                      |                                   |   |   |
|--|---|--------------|---|---|--|-----------------|---------------------------------|--|----------------------|--|----------------------|--------------------------------------|-----------------------------------|---|---|
| 1(c)   | <p><i>any 1 from:</i><br/>           idea that it is a qualitative/subjective, method/judged by eye/<br/>           similar browning looks the same /AW ;</p>   | 1            | A there are more than three shades of brown |   |  |                 |                                 |  |                      |  |                      |                                      |                                   |   |   |
| 1(d)   | <p><i>any pair from:</i></p> <table border="1"> <thead> <tr> <th><i>error</i></th> <th><i>improvement</i></th> </tr> </thead> <tbody> <tr> <td>amount of apple not the same/cutting inaccurate</td> <td>use same mass/weight/use a set volume of crushed apple</td> </tr> <tr> <td>crushing uneven</td> <td>use a blender/mortar and pestle</td> </tr> <tr> <td>idea some may have more time in solution than others</td> <td>test each separately</td> </tr> <tr> <td>some apple exposed to air while others being crushed</td> <td>test each separately</td> </tr> <tr> <td>only one slice of apple per solution</td> <td>have at least two more replicates</td> </tr> </tbody> </table> <p style="text-align: center;">; ;</p> | <i>error</i> | <i>improvement</i>                          | amount of apple not the same/cutting inaccurate | use same mass/weight/use a set volume of crushed apple | crushing uneven | use a blender/mortar and pestle | idea some may have more time in solution than others | test each separately | some apple exposed to air while others being crushed | test each separately | only one slice of apple per solution | have at least two more replicates | 2 | A (cut to the same size) by using a cutter/ruler, slicer, cutting instrument / AW |
| <i>error</i>   | <i>improvement</i>  |              |   |   |  |                 |                                 |  |                      |  |                      |                                      |                                   |   |   |
| amount of apple not the same/cutting inaccurate      | use same mass/weight/use a set volume of crushed apple  |              |   |   |  |                 |                                 |  |                      |  |                      |                                      |                                   |   |   |
| crushing uneven                                      | use a blender/mortar and pestle   |              |   |   |  |                 |                                 |  |                      |  |                      |                                      |                                   |   |   |
| idea some may have more time in solution than others | test each separately  |              |   |   |  |                 |                                 |  |                      |  |                      |                                      |                                   |   |   |
| some apple exposed to air while others being crushed | test each separately  |              |   |   |  |                 |                                 |  |                      |  |                      |                                      |                                   |   |   |
| only one slice of apple per solution                 | have at least two more replicates   |              |   |   |  |                 |                                 |  |                      |  |                      |                                      |                                   |   |   |

| Question | Answer  | Marks    | Guidance   |
|----------|---|----------|--|
| 1(e)     | <p><b>1</b> ref to using at least three temperatures ;</p> <p><b>2</b> stated temperatures or a description ;</p> <p><b>3</b> method described to maintain temperature(s) ;</p> <p><b>4</b> methodology described e.g. ref to leaving the enzyme and substrate separately to reach a set temperature ;</p> <p><b>5</b> ref to constant pH/experiment carried out at the optimum pH;</p> <p><b>6 and 7</b> <i>controlled variables any two from:</i><br/>same concentration of enzyme/same concentration of substrate/<br/>same volume of enzyme/same volume of substrate ;;</p> <p><b>8</b> leaving for 20 minutes/leaving for a set time /check at stated time intervals ;</p> <p><b>9</b> ref to substrate at optimum temperature turning brown first or having the highest colour intensity value ;</p> <p><b>10</b> repeat (at least) twice ;</p> <p><b>11</b> AVP e.g. repeat the investigation at temperatures near the optimum to obtain a more accurate optimum temperature ;</p> | <b>6</b> | <p><b>A</b> ref. to measuring time for brown colour to appear</p> <p><b>A</b> optimum temperature shows the darkest colour</p> |

| Question | Answer  | Marks    | Guidance   |
|----------|---|----------|--|
| 1(f)(i)  | <p><b>A(xes)</b> – labelled with units (time / minutes and percentage of enzyme activity remaining) ;</p> <p><b>S(cale)</b> – suitable, even scale and data occupies at least half the grid ;</p> <p><b>P(lot)</b> – all points plotted accurately <math>\pm\frac{1}{2}</math> square ;</p> <p><b>L(ines)</b> – each line drawn with a ruler point to point or smoothed line ;</p> <p>Lines labelled or a key shown ;</p> | <b>5</b> |  |
| 1(f)(ii) | <p>for both fruits the enzyme activity decreased as time went on ;</p> <p>the apricot enzyme shows the greatest reduction after 15 minutes ;</p> <p>avocado retains enzyme activity for longer after heating than the apricot ;</p>   | <b>1</b> | <b>A</b> apricot enzymes are the most easily destroyed by heat / denatured faster / <b>ora</b> ; |

| Question | Answer  | Marks    | Guidance |
|----------|---|----------|----------|
| 2(a)(i)  | <p>red blood cells do not have a nucleus / white blood cells have a nucleus ;</p> <p>red blood cells, have a light area in the centre / are biconcave ;</p> <p>there are more red blood cells / fewer white blood cells ;</p> <p>red blood cells contents not granular AW / white blood cells contents granular ;</p> <p>red blood cells smaller than phagocytes / <b>ora</b> ;</p> <p>red blood cells are overlapping / white blood cells do not overlap ;</p> | <b>2</b> |          |
| 2(a)(ii) | <p><b>O</b> single clear lines on both cell membranes <u>and</u> no shading in the nucleus ;</p> <p><b>S</b> monocyte larger than 2.5 cm and neutrophil larger than 2 cm provided ;</p> <p><b>D1</b> monocyte is larger than the neutrophil ;</p> <p><b>D2</b> neutrophil nucleus has two distinct parts joined by a narrow section, larger part at least twice the size of the smaller part ;</p>  | <b>4</b> |          |



| Question           | Answer   |                      |  | Marks              | Guidance                         |                      |                |              |        |            |              |        |           |              |        |          |  |
|--------------------|--|----------------------|--|--------------------|----------------------------------|----------------------|----------------|--------------|--------|------------|--------------|--------|-----------|--------------|--------|----------|--|
| 2(b)(i)            | <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">type of blood cell</th> <th style="width: 25%;">diameters /mm</th> <th style="width: 25%;">average diameter /mm</th> </tr> </thead> <tbody> <tr> <td>red blood cell</td> <td>13±1<br/>12±1</td> <td>12.5±1</td> </tr> <tr> <td>lymphocyte</td> <td>12±1<br/>11±1</td> <td>11.5±1</td> </tr> <tr> <td>phagocyte</td> <td>22±1<br/>18±1</td> <td>20.0±1</td> </tr> </tbody> </table> <p style="text-align: right;">;;;</p> |                      |  | type of blood cell | diameters /mm                    | average diameter /mm | red blood cell | 13±1<br>12±1 | 12.5±1 | lymphocyte | 12±1<br>11±1 | 11.5±1 | phagocyte | 22±1<br>18±1 | 20.0±1 | <b>3</b> | mp1 for header units<br>mp2 for six measurements<br>mp3 for three correct averages from candidates results |
| type of blood cell | diameters /mm  | average diameter /mm |  |                    |                                  |                      |                |              |        |            |              |        |           |              |        |          |  |
| red blood cell     | 13±1<br>12±1   | 12.5±1               |  |                    |                                  |                      |                |              |        |            |              |        |           |              |        |          |  |
| lymphocyte         | 12±1<br>11±1   | 11.5±1               |  |                    |                                  |                      |                |              |        |            |              |        |           |              |        |          |  |
| phagocyte          | 22±1<br>18±1   | 20.0±1               |  |                    |                                  |                      |                |              |        |            |              |        |           |              |        |          |  |
| 2(b)(ii)           | 8 or 9 (µm) ;;;  |                      |  | <b>3</b>           | <b>A</b> ecf from <b>2(b)(i)</b> |                      |                |              |        |            |              |        |           |              |        |          |  |