



**General Certificate of Education
June 2010**

Human Biology

HB16X

Externally Marked Practical Assignment

Unit 6

Final

Mark Scheme

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the candidates' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of candidates' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

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TASK SHEET 1 (10 marks)

| Question | Part | Sub Part | Marking Guidance | Mark | Comments | | | | | | | | | | | | | | | |
|---|------------------------|----------------------------|--|---|--|----------------------------|---|-----|-----|---|-----|-----|---|-----|-----|---|-----|-----|---|--|
| 1 | | | <table><thead><tr><th>Percentage concentration of urease solution</th><th>Volume of water / unit</th><th>Volume of 5% urease / unit</th></tr></thead><tbody><tr><td>4</td><td>0.2</td><td>0.8</td></tr><tr><td>3</td><td>0.4</td><td>0.6</td></tr><tr><td>2</td><td>0.6</td><td>0.4</td></tr><tr><td>1</td><td>0.8</td><td>0.2</td></tr></tbody></table> <p>All volumes correct (allow other volumes with the same ratio); Appropriate units shown, units the same and not in body of table;</p> | Percentage concentration of urease solution | Volume of water / unit | Volume of 5% urease / unit | 4 | 0.2 | 0.8 | 3 | 0.4 | 0.6 | 2 | 0.6 | 0.4 | 1 | 0.8 | 0.2 | 2 | |
| Percentage concentration of urease solution | Volume of water / unit | Volume of 5% urease / unit | | | | | | | | | | | | | | | | | | |
| 4 | 0.2 | 0.8 | | | | | | | | | | | | | | | | | | |
| 3 | 0.4 | 0.6 | | | | | | | | | | | | | | | | | | |
| 2 | 0.6 | 0.4 | | | | | | | | | | | | | | | | | | |
| 1 | 0.8 | 0.2 | | | | | | | | | | | | | | | | | | |
| 2 | | | Hydrolysis; | 1 | | | | | | | | | | | | | | | | |
| 3 | a | | Equilibration / bring to same temperature (before mixing); | 1 | Accept test tubes reach room temperature | | | | | | | | | | | | | | | |
| 3 | b | | Yes – to keep temperature constant / control temperature / so temperature is not a variable; OR No – reaction is fast / little or no change in temperature of water / surroundings; | 1 | | | | | | | | | | | | | | | | |
| 3 | c | | Take regular readings/eq. with a thermometer; | 1 | Accept use of datalogger | | | | | | | | | | | | | | | |
| 4 | | | To show there is no (colour) change without enzyme / (colour) change is due to enzyme/urease; | 1 | | | | | | | | | | | | | | | | |
| 5 | | | Reaction not too quick to measure / reaction not too slow for 'session' / would allow time for repeats; | 1 | Check concentration proposed against data Accept reference to tube letter | | | | | | | | | | | | | | | |

| | | | | | |
|---|--|--|--|---|--|
| 6 | | | End point/colour change/result depends on a change in pH/neutralisation of acid; Buffer would stop/reduce change in pH/stop reaction; | 2 | |
|---|--|--|--|---|--|

TASK SHEET 2 (10 marks)**Question 7****Assessment of presentation of raw data table**

| Marking Guidance | Mark | Comment |
|--|----------------|---|
| Data presented clearly with full descriptions of both the independent (temperature) and dependent variable (time taken for colour change to occur / indicator/phenol red to go to pink-red); | 1 | This may be recorded either by a full title or by complete headings at the top of the table. (Eg if 'Time' only recorded in the table, the title should give more detail by reference to colour change). Only one/two temperatures means data are incomplete and unclear |
| Temperature in first column; | 1 | Ignore extraneous columns e.g. tube number |
| Units clearly stated and only in the heading to the appropriate columns; | 1 | Time must be measured in appropriate units eg, minutes or seconds, not a combination of both. |
| Data show that 30°C (or lowest used) is not the optimum temperature; | 1 | Cannot achieve with supplied data |
| | Total 4 | |

Question 8**Assessment of use of statistical test**

| Marking Guidance | Mark | Comments |
|--|----------------|--|
| Null hypothesis clearly stated; | 1 | e.g. temperature has no effect on urease activity |
| Choice of statistical test appropriate for data collected; (t-test / standard error) | 1 | |
| Valid explanation for choice of statistical test; | 1 | e.g. comparing two means / comparing two measurements |
| Test statistic calculated accurately; | 1 | Allow correct calculation of chosen test (even if wrong test used) |
| Correct interpretation of statistical test in terms of acceptance or rejection of null hypothesis; | 1 | Allow correct explanation of chosen test |
| Interpretation involves appropriate reference to both chance and probability; | 1 | But in correct context |
| | Total 6 | |

Written Paper (30 marks)**Section A (14 marks)**

| Question | Part | Sub Part | Marking Guidance | Mark | Comments |
|----------|------|----------|---|-------|--|
| 9 | | | Measured to same pink/red colour; Made a reference/standard / compared all to first tube; Allow to run past end-point for confirmation; | 2 max | Look for idea of same colour |
| 10 | | | Based on judgement of end-point/colour change; Variation between people / individual variation with readings; Differences in accuracy with how temperature maintained; Might have used different source/batch of urease/urea/materials; | 2 max | |
| 11 | | | (No mark for temperature chosen) Mean values different / greatest/least difference between mean values / SDs low OR Consistent/little variation in data at these temperatures/no/few anomalies / produced enough values (for statistical test); | 1 | |
| 12 | a | | Result not due to chance / null hypothesis rejected; (Because) probability/p is less than 0.05/5%; | 2 | |
| 12 | b | | Principle: (Yes) all (SDs) overlap; And any two from: No difference between results (because SDs overlap)/mean values not reliable; Need more (intermediate) temperatures; Optimum might be outside of range chosen; | 3 max | Idea of three temperatures is not enough |

| | | | | | |
|----|--|--|--|-------|---|
| 13 | | | (Some bacteria) do not produce urease; (Some bacteria) cannot / do not produce ammonia; Acid pH denatures enzymes / changes shape of enzyme / alters tertiary structure / changes shape of active site / bonds are broken (in enzyme); | 2 max | Reject breaking of peptide bonds |
| 14 | | | Temperature / specified value; Substrate concentration / volume of nutrient medium; Volume of bacteria (culture) used; Same species of bacterium; Time exposed; | 2 max | Ignore reference to enzyme concentration Reject control of pH Accept same 'type' of bacteria |

Section B (16 marks)

| Question | Part | Sub Part | Marking Guidance | Mark | Comments |
|----------|------|----------|---|-------|---|
| 15 | a | | (pH indicator) still yellow / no colour change shown; | 1 | |
| 15 | b | | (<i>E.coli</i>) produces little / no urease; | 1 | |
| 15 | c | | (No) Not specific/ could be confused with/mistaken for <i>H.pylori</i> ; (Since) both cause change in colour (of phenol red); (Yes) Need a comparison (of time); | 2 max | |
| 16 | | | Urea and pH indicator / phenol red / other named indicator; | 1 | Need both |
| 17 | a | | Carbon dioxide is detected (in breath); (Carbon dioxide) is radioactive; (CO ₂) produced from breakdown / hydrolysis of urea (by urease); (CO ₂ moves) from gut to blood / from blood to lungs; | 3 max | |
| 17 | b | | <i>H.pylori</i> might/might not be the cause of condition; Valid reference to data/Table 2; Need (appropriate) antibiotic that will act on <i>H.pylori</i> / other type of treatment needed if not <i>H.pylori</i> ; Non-specific antibiotic could destroy other species/types of bacteria (in gut); | 2 max | e.g. only 94% with gastric cancer infected with <i>H. pylori</i> Accept 'broad-spectrum' |
| 18 | a | | Accept 16 or 17; | 1 | Reject unrounded number of 16.92 |
| 18 | b | | Based on just one study; Do not know sample size (of study); Data in the form of a proportion / percentage (of patients); Do not know actual number of patients in each category; | 2 max | |

| | | | | |
|----|--|--|-------|--|
| 19 | | <i>Answers should be in context of urease test strip but allow reference to:</i> Non-invasive / easy to perform / nothing to swallow; Quick <u>result</u> ; Does not need access to laboratory facilities / equipment is portable; Does not need specialist facilities / method of detecting radioactivity; Could be carried out by non-specialist; | 3 max | |
|----|--|--|-------|--|