

Mark Scheme (Results)

GCE

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.

Quality of Written Communication

Questions which involve the writing of continuous prose will expect candidates to:

- write legibly, with accurate use of spelling, grammar and punctuation in order to make the meaning clear
- select and use a form and style of writing appropriate to purpose and to complex subject matter
- organise information clearly and coherently, using specialist vocabulary when appropriate.

Full marks will be awarded if the candidate has demonstrated the above abilities.

Questions where QWC is likely to be particularly important are indicated (QWC) in the mark scheme, but this does not preclude others.

GENERAL INFORMATION

The following symbols are used in the mark schemes for all questions:

| Symbol | Meaning of symbol |
|--------------------|--|
| ; semi colon | Indicates the end of a marking point |
| Eq | Indicates that credit should be given for other correct alternatives to a word or statement, as discussed in the Standardisation meeting |
| / oblique | Words or phrases separated by an oblique are alternatives to each other |
| { } curly brackets | Indicate the beginning and end of a list of alternatives (separated by obliques) where necessary to avoid confusion |
| () round brackets | Words inside round brackets are to aid understanding of the marking point but are not required to award the point |
| [] square brackets | Words inside square brackets are instructions or guidance for examiners |
| [CE] or [TE] | Consecutive error / transferred error |

Crossed out work

If a candidate has crossed out an answer and written new text, the crossed out work can be ignored. If the candidate has crossed out work but written no new text, the crossed out work for that question or part question should be marked, as far as it is possible to do so.

Spelling and clarity

In general, an error made in an early part of a question is penalised when it occurs but not subsequently. The candidate is penalised once only and can gain credit in later parts of the question by correct reasoning from the earlier incorrect answer.

No marks are awarded specifically for quality of language in the written papers, except for the essays in the synoptic paper. Use of English is however taken into account as follows:

- the spelling of technical terms must be sufficiently correct for the answer to be unambiguous
e.g. for amylase, 'ammalase' is acceptable whereas 'amylose' is not
e.g. for glycogen, 'glicojen' is acceptable whereas 'glucagen' is not
e.g. for ileum, 'illeum' is acceptable whereas 'ilium' is not
e.g. for mitosis, 'mytosis' is acceptable whereas 'meitosis' is not
- candidates must make their meaning clear to the examiner to gain the mark.
- a correct statement that is contradicted by an incorrect statement in the same part of an answer gains no mark - irrelevant material should be ignored

| Question Number | Answer | Mark |
|-----------------|--------|------|
| 1 (a) (i) | B ; | (1) |

| Question Number | Answer | Mark |
|-----------------|--------|------|
| 1 (a) (ii) | C ; | (1) |

| Question Number | Answer | Mark |
|-----------------|--------|------|
| 1 (a) (iii) | A ; | (1) |

| Question Number | Answer | Mark | | |
|-----------------|--|-----------------------------|------------------------------|-----|
| 1(b) | Features | Totipotent stem cell | Pluripotent stem cell | |
| | Can give rise to totipotent stem cells | ✓ | ✗ | |
| | Can give rise to differentiated cells | ✓ | ✓ | |
| | Any two correct for 1 mark | | | |
| | | | | (2) |

| Question Number | Answer | Mark |
|-----------------|--|--------------------|
| *1 (c) QWC | <p>QWC - Spelling of technical terms (<i>shown in italics</i>) must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> 1. idea of correct stimulus e.g. chemical ; 2. (causes) {some genes active / some inactive} (in bone marrow stem cell) / eq ; 3. only the active genes are transcribed / eq ; 4. (because) mRNA made (only at active genes) / eq ; 5. protein made / eq ; 6. which (determine / eq) cell {structure / function} / permanently modifies cell / eq ; | <p>max (4)</p> |

| Question Number | Answer | Mark |
|-----------------|---|--------------------|
| 2 (a) | <p>Similarity</p> <p>idea of extracting drug (from the plant / soup) / tested on patients / idea of try to find suitable dose ;</p> <p>Any two differences from</p> <ol style="list-style-type: none"> 1. idea that only contemporary testing will use animals / eq ; 2. idea that only contemporary testing will {test on healthy people / have phase 1} ; 3. idea that only contemporary testing will pay volunteers ; 4. idea that only contemporary testing may involve double-blind trials ; 5. idea that only contemporary testing will {use statistical analysis / reference to phase 3 / use large number } ; 6. idea of more regulation ; 7. idea of controlling {factors /variables / eq} in tested cohort e.g. age, lifestyle ; | <p>max (3)</p> |

| Question Number | Answer | Mark |
|-----------------|--------|------|
| 2 (b)(i) | 0 ; | (1) |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 2 (b)(ii) | idea of the emotional state of the patient e.g. belief that {it will work / they are receiving the drug} ; | (1) |

| Question Number | Answer | Mark | | | | | | | | | | | | |
|-----------------|--|--------------------------------------|----------------------------|--------------------------------------|--|--|-----|--|--|------|--|--|--------|-----|
| 2 (b)(iii) | All three figures correct for one mark <table border="1"> <thead> <tr> <th>treatment</th> <th>Concentration of drug / mg</th> <th>Actual improvement / Arbitrary Units</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td>6.0</td> </tr> <tr> <td></td> <td></td> <td>12.1</td> </tr> <tr> <td></td> <td></td> <td>12.5 ;</td> </tr> </tbody> </table> | treatment | Concentration of drug / mg | Actual improvement / Arbitrary Units | | | 6.0 | | | 12.1 | | | 12.5 ; | (1) |
| treatment | Concentration of drug / mg | Actual improvement / Arbitrary Units | | | | | | | | | | | | |
| | | 6.0 | | | | | | | | | | | | |
| | | 12.1 | | | | | | | | | | | | |
| | | 12.5 ; | | | | | | | | | | | | |

| Question Number | Answer | Mark |
|-----------------|---|------------|
| 2 (b) (iv) | <ol style="list-style-type: none"> 1. reference to positive {relationship / correlation} / increased improvement with increased concentration ; 2. larger improvement between 400 and 600 / improvement increases less {between 600 and 800 / after 600} ; 3. credit correct manipulation of the data / eq ; | max (2) |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 3 (a) | <ol style="list-style-type: none"> idea that, GD considers one species but SR considers {different / number} species ; idea that, GD considers {alleles / genotypes / eq} but SR is within a {habitat / area / eq} ; | (2) |

| Question Number | Answer | Mark |
|-----------------|--|------------|
| 3 (b)(i) | <ol style="list-style-type: none"> take {less / smaller} space / eq ; can have more individuals / eq ; reference to {greater / more} genetic variety ; idea of less {maintenance / cost} ; likely to survive longer / eq ; can freeze seeds / eq ; | max (2) |

| Question Number | Answer | Mark |
|-----------------|---|------------|
| 3 (b)(ii) | <ol style="list-style-type: none"> idea of {greater / maintain} genetic variety e.g. wider gene pool, different alleles ; idea of less chance of inbreeding ; idea of reducing chance of storing seeds with {low viability / disease / eq} ; | max (2) |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 3 (c)(i) | <p>correct working shown e.g. $(3/48) \times 100$;</p> <p>correct answer = {6.3 / 6.25} ;</p> <p><u>Note:</u> 2 marks for correct answer 1 mark for incorrect answer but correct working</p> | (2) |

| Question Number | Answer | Mark |
|-----------------|---|------------|
| 3 (c)(ii) | <ol style="list-style-type: none"> 1. species B ; 2. lowest germination success / eq ; 3. idea that decrease in mean germination success is the greatest after drying ; 4. credit manipulated figures e.g. 17 less after drying, planted immediately is 8 lower than highest{A / D}, after drying 22 less than highest {A /C} ; | max (3) |

| Question Number | Answer | Mark |
|-----------------|--|------------|
| 3 (c)(iii) | <ol style="list-style-type: none"> 1. reference to drying ; 2. reference to sterilisation / fungicide ; 3. reference to low temperature e.q. freezing, cool ; 4. reference to low oxygen / eq; 5. reference to low humidity/ eq ; 6. reference to absence of light / eq; 7. reference to check viability e.g. germination / embryo presence / eq; | max (2) |

| Question Number | Answer | Mark |
|-----------------|---|------------|
| 4 (a) | <p>It is a form of cell division that</p> <ol style="list-style-type: none"> halves the chromosome number / eq ; so that at fertilisation the {full complement / eq} of chromosomes is restored / eq ; allows genetic variation (in gametes) / eq ; through independent assortment / eq ; through crossing over / eq ; | max (3) |

| Question Number | Answer | Mark | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|-------------------------------------|-------------------------------------|---|---|-------------------------------------|-------------------------------------|---|---|-------------------------|--|--|-------------------------------------|--|--|--|--|--------------------------|--|--|--|--|--|-------------------------------------|--|---|--|-------------------------------------|--|--|--|--|--|------------------------------|--|--|--|--|--|--|-------------------------------------|-----|
| 4 (b)(i) | <table border="1"> <thead> <tr> <th>Statements</th> <th>A</th> <th>B</th> <th>C</th> <th>D</th> <th>E</th> <th>F</th> <th>G</th> </tr> </thead> <tbody> <tr> <td>Site containing acrosin</td> <td></td> <td></td> <td><input checked="" type="checkbox"/></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Site where acrosin works</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td><input checked="" type="checkbox"/></td> <td></td> </tr> <tr> <td>Site containing the haploid number of chromosomes</td> <td></td> <td><input checked="" type="checkbox"/></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>Site containing mitochondria</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td><input checked="" type="checkbox"/></td> </tr> </tbody> </table> <p>....</p> | Statements | A | B | C | D | E | F | G | Site containing acrosin | | | <input checked="" type="checkbox"/> | | | | | Site where acrosin works | | | | | | <input checked="" type="checkbox"/> | | Site containing the haploid number of chromosomes | | <input checked="" type="checkbox"/> | | | | | | Site containing mitochondria | | | | | | | <input checked="" type="checkbox"/> | (4) |
| Statements | A | B | C | D | E | F | G | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Site containing acrosin | | | <input checked="" type="checkbox"/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Site where acrosin works | | | | | | <input checked="" type="checkbox"/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Site containing the haploid number of chromosomes | | <input checked="" type="checkbox"/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Site containing mitochondria | | | | | | | <input checked="" type="checkbox"/> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

| Question Number | Answer | Mark |
|-----------------|--|------------|
| 4(b)(ii) | <ol style="list-style-type: none"> idea of stimulus e.g. receptors, contact with {zona / eq} , presence of chemicals ; reference to acrosome swells ; reference to {vesicle / acrosome} fuses ; with (sperm) cell (surface) membrane ; exocytosis ; | max (2) |

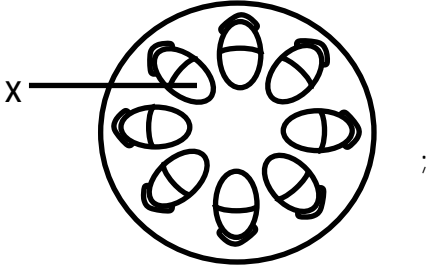
| Question Number | Answer | Mark |
|-----------------|---|------|
| 4(c)(i) | idea that as the activity of acrosin increases so does fertilisation rate e.g. positive correlation ; | (1) |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 4 c)(ii) | no data on {zero acrosin activity /zero percentage fertilisation} / cannot accurately extrapolate back from the data ; | (1) |

| Question Number | Answer | Mark |
|-----------------|--|------------|
| 5 (a) | <ol style="list-style-type: none"> 1. (organs) made up of tissues ; 2. (organs) made up of many different cell types / eq ; 3. (organs) can have more than 1 function /eq ; | max (2) |

| Question Number | Answer | Mark |
|-----------------|---|------------|
| *5(b)(i) QWC | <p>(QWC - Spelling of technical terms (<i>shown in italics</i>) must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> 1. both made up of <i>glucose</i> / eq ; 2. both {have(1-4) <i>glycosidic</i> bonds / made by <i>condensation</i> reactions} / eq ; 3. both have 1-4(<i>glycosidic</i>) bonds ; 4. starch is α <i>glucose</i>, <i>cellulose</i> is β <i>glucose</i> ; 5. starch composed of {more than one type of molecule / <i>amylose</i> and <i>amylopectin</i> ; 6. correct reference to {branching / 1-6 bonds / helix} in starch / straight chain in <i>cellulose</i> ; 7. all monomers same orientation in starch / every other one inverted in <i>cellulose</i> ; | max (4) |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 5 (b)(ii) | <ol style="list-style-type: none"> idea of (tensile) strength / flexible / inelastic / eq ; {parallel arrangement / eq} / reference to hydrogen bonding / several layers of fibres / reference to {criss cross / net like} arrangement (of microfibrils) ; | (2) |

| Question Number | Answer | Mark |
|-----------------|---|------|
| 5 (c)(i) | <p>Any one or more of the inner segments e.g.</p>  <p>Comment Allow x within appropriate segment(s).</p> | (1) |

| Question Number | Answer | Mark |
|-----------------|--|------------|
| 5 (c)(ii) | <ol style="list-style-type: none"> support /stability / eq ; transport of water ; transport of {minerals / ions / eq} ; | max (2) |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 6(a) | 1. growth / eq ; 2. asexual reproduction / eq ; | (2) |

| Question Number | Answer | Mark |
|-----------------|--------|------|
| 6(b)(i) | B ; | (1) |

| Question Number | Answer | Mark |
|-----------------|--------|------|
| 6(b)(ii) | D ; | (1) |

| Question Number | Answer | Mark | | |
|--|--|--|---|---------|
| 6(c) | <table border="0" style="width: 100%;"> <tr> <td style="width: 50%; vertical-align: top;"> <p>Metaphase</p> <p>1. idea of {chromatids/ chromosomes) at {equator / eq} of cell</p> <p>2. idea of chromatids attached (to each other / at equator)</p> <p>3. idea of centromere complete OR</p> <p>4. idea of spindle complete OR</p> </td> <td style="width: 50%; vertical-align: top;"> <p>Anaphase</p> <p>Not at equator / separated / pulled apart / eq ;</p> <p>chromatids separated / pulled apart</p> <p>centromere {splits / eq} ;</p> <p>fibres {shorter / shortening / contracting} ;</p> </td> </tr> </table> | <p>Metaphase</p> <p>1. idea of {chromatids/ chromosomes) at {equator / eq} of cell</p> <p>2. idea of chromatids attached (to each other / at equator)</p> <p>3. idea of centromere complete OR</p> <p>4. idea of spindle complete OR</p> | <p>Anaphase</p> <p>Not at equator / separated / pulled apart / eq ;</p> <p>chromatids separated / pulled apart</p> <p>centromere {splits / eq} ;</p> <p>fibres {shorter / shortening / contracting} ;</p> | max (3) |
| <p>Metaphase</p> <p>1. idea of {chromatids/ chromosomes) at {equator / eq} of cell</p> <p>2. idea of chromatids attached (to each other / at equator)</p> <p>3. idea of centromere complete OR</p> <p>4. idea of spindle complete OR</p> | <p>Anaphase</p> <p>Not at equator / separated / pulled apart / eq ;</p> <p>chromatids separated / pulled apart</p> <p>centromere {splits / eq} ;</p> <p>fibres {shorter / shortening / contracting} ;</p> | | | |

| Question Number | Answer | Mark |
|-----------------|---|------------|
| 7 (a) (i) | <p>Any three from:</p> <ol style="list-style-type: none"> 1. length (of fibre) / eq ; 2. diameter (of fibre) / eq ; 3. temperature / eq ; 4. fibre came from the same source / eq ; 5. stored for the same length of time / eq ; 6. same way of applying the {masses / knots / eq} ; 7. same humidity / eq ; 8. water content of fibre / level of drying ; | max (3) |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 7(a)(ii) | <ol style="list-style-type: none"> 1. {all / four} sets of results added together ; 2. divided by 4 / eq ; | (2) |

| Question Number | Answer | Mark |
|-----------------|---|------|
| 7(b) | idea that break mass would be to the nearest 50 grams (rather than 100 grams) / reference to smaller percentage error ; | (1) |

| Question Number | Answer | Mark |
|-----------------|---|------|
| 7(c) | cannot land on {foot / person / eq} / cannot cause injury ; | (1) |

| Question Number | Answer | Mark |
|-----------------|---|------|
| 7 (d) (i) | (sample 2) anomalous / outlier / does not fit the {trend / pattern} ; | (1) |

| Question Number | Answer | Mark |
|-----------------|---|------------|
| 7 (d) (ii) | <ol style="list-style-type: none">1. oil is a {non-renewable / finite / eq} (resource) ;2. (plant fibres) can be regrown / replanted / eq (so is sustainable) ;3. ref to time scale ; | max (2) |

| Question Number | Answer | Mark |
|-----------------|--|------------|
| 8 (a) | <ol style="list-style-type: none"> 1. appearance / the outward expression (of a cell or organism) / eq ; 2. reference to {genotype / eq} contribution ; 3. reference to environmental factors ; | max (2) |

| Question Number | Answer | Mark |
|-----------------|---|------|
| 8 (b)(i) | <ol style="list-style-type: none"> 1. non smokers / eq ; 2. idea that it acts as a comparison / shows the situation without smoking ; | (2) |

| Question Number | Answer | Mark |
|-----------------|--------------------------------|------|
| 8 (b)(ii) | lung cancer / no lung cancer ; | (1) |

| Question Number | Answer | Mark |
|-----------------|---|------|
| 8 (b)(iii) | <ol style="list-style-type: none"> 1. the more (packs) smoked, the higher the chance of developing lung cancer / positive correlation / eq ; 2. small increase in risk if smoke up to 20 packs per year / eq ; 3. greater increase in risk if smoke 21 or more (packs) per year / eq ; 4. linear increase for 21 or more / eq ; 5. credit correct manipulation of the data e.g. 35X greater; | (2) |

| Question Number | Answer | Mark |
|-----------------|--|------------|
| 8 (b)(iv) | <ol style="list-style-type: none"> 1. idea that increased chance of lung cancer if close relative has cancer 2. for those that do not smoke there is risk if cancer in family / eq ; 3. that close family members will have more alleles in common (with those involved in the investigation) ; | max (2) |

| Question Number | Answer | Mark |
|-----------------|--|------|
| 8 (b)(v) | in the 1-20 (packs) smoked per year cohort, there was a {lower risk of getting lung cancer if a close relative has had cancer / higher risk if no close relative with cancer} / eq ; | (1) |

| Question Number | Answer | Mark |
|-----------------|---|------|
| 8 (b)(vi) | idea that the more (packs) smoked per year, the greater the risk of getting lung cancer ; | (1) |