

# Mark Scheme (Results)

## 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)	A ;	(1)

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

Question Number	Answer	Mark
1(a)(iii)	<p>1. D ;</p> <p>Any two from:</p> <p>2. idea that endemic means species restricted to one (geographical) area ;</p> <p>3. {a species/ flag shape } only present in (Area D/Box 4) ;</p> <p>4. all other shapes appear in {at least one other box / more than one area} ;</p>	(3)

Question Number	Answer	Mark
*1(b)QWC	<p>(QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <p><b>General points:</b></p> <ol style="list-style-type: none"> <li>1. to increase numbers/population size ;</li> <li>2. to {maintain / increase} genetic diversity/ reduce genetic drift / eq ;</li> <li>3. protect from {predators / poachers / eq} / eq ;</li> </ol> <p><b>For captive breeding</b></p> <ol style="list-style-type: none"> <li>4. inter-zoo animal movement / eq ;</li> <li>5. selection of mates / use of stud books / records kept of breeding programme / eq ;</li> <li>6. process involved described e.g. IVF / AI / use of surrogates / DNA profiling / eq ;</li> </ol> <p><b>For reintroduction</b></p> <ol style="list-style-type: none"> <li>7. preparation for reintroduction described e.g. idea of reinforcing wild behaviour / idea of hacking out / reduce food intake to encourage hunting ;</li> <li>8. select {habitat / reserves} ;</li> <li>9. raise {awareness / education} of local population / eq ;</li> </ol>	(5)

Question Number	Answer	Mark
2 (a)(i)	circle labelled G between one glucose monomer and the next ;	(1)

Question Number	Answer	Mark
2 (a)(ii)	circle labelled H placed on diagonal bonds (dotted lines) between adjacent cellulose molecules ;	(1)

Question Number	Answer	Mark
2 (b)(i)	1. B ; 2. {most/highest} magnesium (ions) ;	(2)

Question Number	Answer	Mark
2 (b)(ii)	1. B ; 2. {most/highest} calcium (ions) ; 3. (calcium) is a component of {middle lamella / primary cell wall/ calcium pectate / pectin} / eq ;	(3)

Question Number	Answer	Mark
2 (c)(i)	2.65 to 2.70 ;	(1)

Question Number	Answer	Mark
2 (c)(ii)	<p>Any one from:</p> <ol style="list-style-type: none"> <li>1. {less/reduced} genetic variation/ reduced effect of genotype</li> <li>2. seeds are the {same age / produced under the same conditions} ;</li> </ol>	(1)

Question Number	Answer	Mark
2 (c)(iii)	<p>Any two from</p> <ol style="list-style-type: none"> <li>1. volume of solution ;</li> <li>2. light / eq ;</li> <li>3. temperature ;</li> <li>4. concentration of other mineral ions ;</li> <li>5. pH ;</li> <li>6. initial status of seedlings e.g. height ;</li> </ol>	(2)

Question Number	Answer	Mark
3 (a)	<p>context - as diameter increases, the mass needed to break the rope</p> <ol style="list-style-type: none"> <li>1. increases / positive correlation (for both) ;</li> <li>2. idea that relationship is not linear (for both) e.g. gradient increases for both ;</li> <li>3. is always higher for nylon / eq ;</li> <li>4. difference between the two increases as the diameter increases / eq ;</li> <li>5. credit correct comparative manipulation of the data, e.g. at 5mm the mass taken to break nylon was 350-400 kg more than manila, at 10mm it was 1300-1350kg more ;</li> </ol>	(3)

Question Number	Answer	Mark
3(b) (i)	<p>A = flagellum / flagella ;</p> <p>B = (bacterial/ murein / peptidoglycan ) cell wall ;</p>	(2)


Question Number	Answer	Mark
3 (b) (ii)	<p>Any <b>two</b> structures drawn and labelled from the following</p> <ol style="list-style-type: none"> <li>1. plasmids ;</li> <li>2. circular DNA ;</li> <li>3. ribosomes ;</li> <li>4. glycogen granule ;</li> <li>5. lipid droplets ;</li> </ol>	(2)

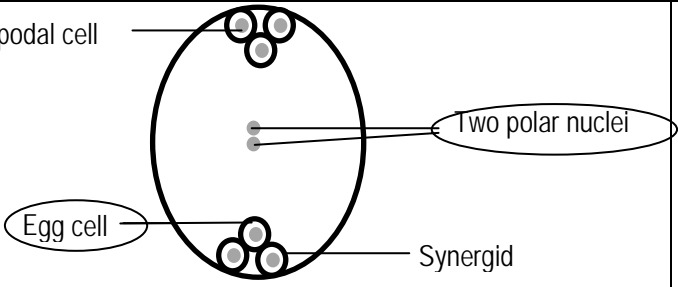


Question Number	Answer	Mark
4 (a)(i)	C ;	(1)

Question Number	Answer	Mark
4 (a)(ii)	C ;	(1)

Question Number	Answer	Mark
4 (b)	<ol style="list-style-type: none"> <li>1. idea that chromosomes will be in the process of {decondensing / uncoiling/ becoming invisible / eq} ;</li> <li>2. idea that the {nucleus / nuclear envelope(s)} is visible;</li> <li>3. idea that a nucleolus may be present ;</li> <li>4. idea that spindle has {contracted / broken down / absent / eq} ;</li> <li>5. two {separate nuclei/masses of chromatin} now visible ;</li> <li>6. idea that there will be evidence of cell plate formation ;</li> </ol>	(3)

Question Number	Answer	Mark
4 (c)(i)		(1)

Question Number	Answer	Mark
4 (c) (ii)	 <p>The diagram shows a cross-section of a plant embryo sac. It is an oval structure containing several cells. At the top, there are three small circles labeled 'Antipodal cell'. At the bottom, there are three small circles labeled 'Synergid'. In the center, there are two small dots labeled 'Two polar nuclei'. To the left of the center, there is a larger circle labeled 'Egg cell'.</p>	(2)

Question Number	Answer	Mark
4 (c) (iii)	<p>Any <b>one</b> from</p> <ol style="list-style-type: none"> <li>1. half the number (of chromosomes) found in {body cells / somatic cells / named body cell / eq}</li> <li>2. the number of chromosomes in {gametes/sex cells}</li> <li>3. the number (of chromosomes) in a cell following meiosis ;</li> </ol>	(1)

Question Number	Answer	Mark
5 (a)	<ol style="list-style-type: none"> <li>1. {position / location / eq} of {gene / allele};</li> <li>2. on a chromosome / eq ;</li> </ol>	(2)

Question Number	Answer	Mark
5 (b)(i)	C ;	(1)

Question Number	Answer	Mark
5(b)(ii)	<ol style="list-style-type: none"> <li>1. higher number of alleles (per locus) / 7.7 compared with 4.6 for Q ;</li> <li>2. (means) higher genetic variation / greater genetic diversity / more allele combinations / eq ;</li> <li>3. idea that {greater variety of alleles / eq} in gene pool/larger gene pool ;</li> <li>4. idea that {alleles / genotypes} may give a selective advantage for changes in the environment / eq ;</li> <li>5. (therefore) more likely to survive and breed / eq ;</li> <li>6. passing on these favourable allele combinations / eq ;</li> <li>7. ref to natural selection ;</li> <li>8. ref to (change in allele frequency) over many generations ;</li> </ol>	(5)

Question Number	Answer	Mark
5(c)	<ol style="list-style-type: none"> <li>1. chance / eq ;</li> <li>2. ref to difference in sample size, e.g. more dogs in Group 1 than in Group 2 ;</li> <li>3. ref to rare alleles in group 1 ;</li> <li>4. idea of how representative the samples are of the whole breeding population ;</li> </ol>	(2)

Question Number	Answer	Mark
5(d)	D ;	(1)

Question Number	Answer	Mark
6 (a)(i)	<ol style="list-style-type: none"> <li>1. C ;</li> <li>2. mitochondria are present (and only Eukaryota possess mitochondria) ;</li> </ol>	(2)

Question Number	Answer	Mark
6 (a)(ii)	<ol style="list-style-type: none"> <li>1. B ;</li> <li>2. EITHER (because) it has { more / most / three / any two named } characteristics in common (with the eukaryotes/Group C) ; OR the idea that (because) A is sensitive to antibiotics, A must be Bacteria therefore B is Archaea / eq ;</li> </ol>	(2)

Question Number	Answer	Mark
6 (b) (i)	<ol style="list-style-type: none"> <li>1. stacks / eq ;</li> <li>2. cisternae ;</li> <li>3. smooth membranes / no ribosomes / eq ;</li> <li>4. (cisternae) curved / flattened ;</li> <li>5. idea of different sizes (cisternae) ;</li> <li>6. presence of vesicles ;</li> </ol>	(3)

Question Number	Answer	Mark
*6 (b) (ii) QWC	<p>(QWC - Spelling of technical terms must be correct and the answer must be organised in a logical sequence)</p> <ol style="list-style-type: none"> <li>1. {<i>protein / polypeptides</i>} produced by <i>ribosome</i> ;</li> <li>2. <i>ribosomes</i> {held on/attached to/eq} rER ;</li> <li>3. <i>proteins</i> {stored / transported / within rER / eq} ;</li> <li>4. <i>proteins</i> {folded/assume 3-D shape/tertiary structure} within (lumen of) rER / eq ;</li> <li>5. (rER) produce <i>vesicles</i> / packages <i>proteins</i> /eq ;</li> <li>6. <i>vesicles</i> fuse with <i>Golgi</i> (apparatus) / eq ;</li> <li>7. <i>Golgi</i> {modifies/processes} <i>protein</i> ;</li> <li>8. details of modification e.g. <i>glycoprotein / carbohydrate</i> added, trimming of <i>carbohydrate</i> ;</li> <li>9. water removed (to concentrate) / eq ;</li> <li>10. <i>Golgi</i> produces {<i>lysosomes / secretory vesicles</i>} ;</li> </ol>	(6)

Question Number	Answer	Mark
7 (a)	<ol style="list-style-type: none"> <li>1. C ;</li> </ol> <p>Any two of the following</p> <ol style="list-style-type: none"> <li>2. all genes (potentially) active / as <u>no</u> genes {switched off / deactivated} / {cell A / cell B} has genes switched off / eq ;</li> <li>3. idea that therefore it can {give rise to/differentiate to become} all cell (types) ;</li> <li>4. differentiation has occurred in cell {A / B} / eq ;</li> </ol>	(3)

Question Number	Answer	Mark
7 (b)(i)	<ol style="list-style-type: none"> <li>1. {undifferentiated / unspecialised} cell ;</li> <li>2. some genes {deactivated / switched off} ;</li> <li>3. idea that it can give rise to most specialised cells / eq ;</li> <li>4. but not totipotent stem cells / extra embryonic cells / eq ;</li> </ol>	(2)

Question Number	Answer	Mark
7 (b)(ii)	<ol style="list-style-type: none"> <li>1. fertilised egg allowed to {grow for a few days/ divide several times / eq} ;</li> <li>2. reference to a {blastocyst/ blastula / hollow ball of cells / eq} ;</li> <li>3. cells in inner cell mass are {pluripotent / harvested} ;</li> <li>4. procedure for extraction of cells / eq ;</li> <li>5. ref to source of fertilised egg e.g. spare embryo after IVF ;</li> </ol>	(3)

Question Number	Answer	Mark
8 (a) (i)	<ol style="list-style-type: none"> <li>1. ref to aseptic technique (used to prevent contamination of plate), e.g. use of sterile equipment, such as a pipette ;</li> <li>2. idea of uniform spreading of bacteria e.g. lawn, spread (over agar), mixed in with molten agar, seeded ;</li> </ol>	(2)

Question Number	Answer	Mark
8 (a) (ii)	<ol style="list-style-type: none"> <li>1. reduces contamination (of culture) / eq ;</li> <li>2. allows { aerobic conditions / entry of air / entry of oxygen} / prevents anaerobic conditions ;</li> <li>3. reduces {growth / eq} of {harmful / anaerobic} bacteria being {cultured / eq} ;</li> </ol>	(2)

Question Number	Answer	Mark
8 (a) (iii)	encourages growth of bacteria that are {harmful / pathogenic / eq} (to humans) ;	(1)

Question Number	Answer	Mark
8 (b)(i)	{3 species of bacteria / B1, B2 and B4 / most} {killed more effectively / had a larger zone of inhibition} (when using ethanol) / eq ;	(1)

Question Number	Answer	Mark
8 (b)(ii)	Idea of mean zone of inhibition larger when using hot water e.g. mean diameter 0.5mm larger for hot water extract ;	(1)



Question Number	Answer	Mark
8 (c) (i)	<ol style="list-style-type: none"> <li>the ranges overlap / largest diameter for cold water method is { bigger / eq } than the smallest for hot water / eq ;</li> <li>use of calculated figures to support this e.g. hot water is 16.8 mm <b>AND</b> cold water is 17.0 mm <b>OR</b> reference to 0.2 mm overlap;</li> </ol>	(2)

Question Number	Answer	Mark
8 (c) (ii)	<ol style="list-style-type: none"> <li>cold water ;</li> <li>{smaller / eq} range / spread of data is less / eq ;</li> </ol>	(2)