Pearson Edexcel

Mark Scheme (Results)

January 2025

Pearson Edexcel International Advanced Subsidiary Level In Biology (WBI12)
Paper 01 Cells, Development, Biodiversity, and Conservation

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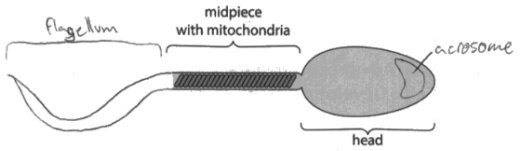
General Marking Guidance

- 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	Additional guidance	Mark
1(a)(i)	An answer that makes reference to the following point: • flagellum and acrosome correctly drawn and labelled (1)	<u>Example of diagram</u>  	**(1)**

Question Number	Answer	Additional guidance	Mark
1(a)(ii)	An answer that makes reference to one of the following points: • aerobic respiration / {produce / provide} ATP for {movement / motility} (1)	ACCEPT {provide / release} energy for {movement / motility} REJECT produce energy IGNORE glycolysis / respiration unqualified	**(1)**

Question Number	Answer	Additional guidance	Mark
1(b)(i)	An answer that makes reference to two of the following points: • as the midpiece length increases so does the swimming speed of the sperm (cells) (1) • males who mate with more than one female have sperm with a faster swimming speed (1) • greater spread of data for males who mate with more than one female (1)	ACCEPT converse ACCEPT positive correlation between midpiece length and swimming speed IGNORE positive correlation unqualified IGNORE no correlation ACCEPT converse ACCEPT converse	**(2)**

Question Number	Answer	Additional guidance	Mark
1(b)(ii)	• correlation coefficient / Spearmans rank / Pearsons	Mark first answer ACCEPT PMCC	**(1)**

Question Number	Answer	Mark
2(a)(i)	The only correct answer is C 0.48 *A is not correct because 2 × 0.6 × 0.4 = 0.48* *B is not correct because 2 × 0.6 × 0.4 = 0.48* *D is not correct because 2 × 0.6 × 0.4 = 0.48*	**(1)**

Question Number	Answer	Additional guidance	Mark
2(a)(ii)	• q^2	IGNORE q IGNORE q2	**(1)**

Question Number	Answer	Additional guidance	Mark
2(b)	An explanation that makes reference to four of the following points: • genetic variation in Lokrum island rabbit population (1) • viral disease acts as selection pressure (1) • some rabbits had advantageous allele(s) that enabled them to survive (the viral disease) (1) • (these) rabbits reproduced and passed the advantageous allele(s) on to their offspring (1) • increasing the frequency of the {advantageous / beneficial} allele(s) (1) • one gene may have greater effect so there will be a greater change in allele frequencies for this gene (1)	ACCEPT rabbits have different alleles ACCEPT mutation resulted in {genetic variation / different allele / advantageous allele} IGNORE gene / immune / characteristics ACCEPT converse IGNORE gene IGNORE gene	**(4)**

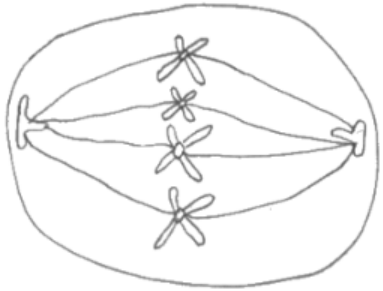
Question Number	Answer	Additional guidance	Mark
3(a)	An explanation that makes reference to three of the following points: • many hydrogen bonds form between {cellulose molecules / microfibrils} (1) • microfibrils arranged in {layers / sheets} at different angles (1) • (microfibril arrangement / it) gives added {tensile strength / rigidity / structural support / stability} (to maintain the structure of the xylem) (1) • gaps between cellulose microfibrils allow movement of {water / mineral ions / dissolved solutes} (1)	ACCEPT microfibrils arranged in {criss-cross pattern / a mesh / matrix / different directions} IGNORE {lignin / secondary thickening} providing strength ACCEPT {embedded in / held together by} {calcium pectate / hemicellulose} to provide strength REJECT if in context of {pits/plasmodesmata} and not cell wall	**(3)**

Question Number	Answer	Additional guidance	Mark
3(b)(i)	An answer that makes reference to two of the following points: • {in normal conditions / with no treatment} A and B absorb similar mass of calcium ions (1) • both chemicals reduce the {mean mass / absorption} of calcium ions (1) • EDTA {reduces mass in type A more / has greater effect on type A / reduces absorption more in type A} (1) • citric acid {reduces mass in type B more / has greater effect on type B / reduces absorption more in type B} (1)	needs to be about effect of treatment clear statement required IGNORE no treatment had higher mass of calcium ions IGNORE both treatments improve the transport of calcium ions from root to other parts of plant ACCEPT converse IGNORE A has more calcium ions with EDTA than type B / converse ACCEPT converse IGNORE B has more calcium ions with citric acid than A / converse	**(2)**

Question Number	Answer	Additional guidance	Mark
3(b)(ii)	An answer that makes reference to two of the following points: • fewer calcium ions (1) resulting in reduced {calcium pectate / middle lamella} (1) • therefore, EDTA reduces the {strength / stability} of the cell wall in the roots of type A (1)	REJECT calcium unqualified IGNORE calcium pectate strengthens cell wall	**(2)**

Question Number	Answer	Mark
4(a)(i)	The only correct answer is B formation of microtubules *A is not correct because the centriole is not involved in lysosome formation* *C is not correct because the centriole is not involved in RNA formation* *D is not correct because the centriole is not involved in vesicle formation*	**(1)**

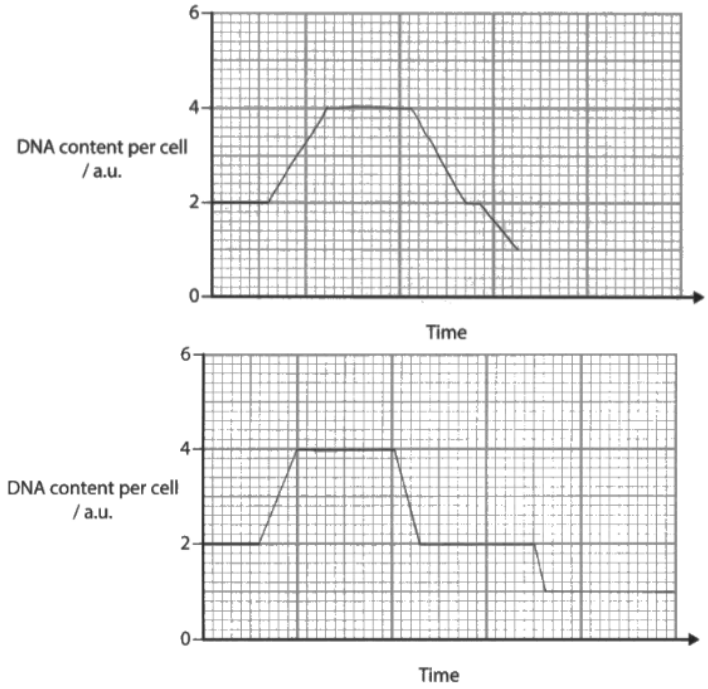
Question Number	Answer	Additional guidance	Mark
4(a)(ii)	• viewed from a different angle / one was transverse and one is longitudinal when the cell was {sliced / cut} (1)		**(1)**

Question Number	Answer	Additional guidance	Mark
4(b)(i)	An answer that makes reference to the following points: • 4 pairs of chromosomes each joined at centromere (1) • lined up vertically on equator (1) • spindle fibres and centrioles shown (1)	<u>Example of diagram</u> 	**(3)**

Question Number	Answer	Additional guidance	Mark
4(b)(ii)	A description that makes reference to two of the following points: • centromere {splits / divides} (1) • {spindle fibres / microtubules} contract (1) • one copy of each chromosome pulled to {poles / sides} of cell (1)	ACCEPT on a diagram ACCEPT the chromosomes {are separated / pulled apart / move apart}	**(2)**

Question Number	Answer	Additional guidance	Mark
4(c)	• 6 / six (hours)	REJECT answers given as fractions	**(1)**

Question Number	Answer	Additional guidance	Mark
4(d)	• the number of cells in mitosis divided by the total number of cells (× 100)	ACCEPT correct equation IGNORE cells with visible chromosomes / dividing cells	**(1)**

Question Number	Answer	Additional guidance	Mark
5(a)	• initial doubling to 4 a.u. (1) • staying at {4 a.u. / new DNA content} for a period of time and then {halving / returning back to 2 a.u.} for a period of time (1) • reduction of DNA content to {haploid / 1 a.u.} with no further {increase / decrease} (1)		**(3)**

Question Number	Answer	Additional guidance	Mark
5(b)	A calculation in which: • correct measurement and conversion (1) • correct magnification given to two significant figures (1)	<u>Example of calculation:</u> 16 × 1000= 16 000 µm ACCEPT tolerance of ±0.5 mm 16 000 ÷ 24= ×670 max 1 if given incorrect unit ACCEPT 2 sig fig answers in range 650 to 690 ACCEPT answers in standard form Correct answer scores full marks	**(2)**

Question Number	Answer	Additional guidance	Mark
5(c)	A description that makes reference to five of the following points: • tube created due to release of {digestive / hydrolytic} enzymes (1) • {nucleus / nuclei / gamete(s)} transported to {ovule / ovary / micropyle / egg cell / polar nuclei / female gamete} (1) • generative nucleus divides to form two {male / haploid} nuclei (1) • double fertilisation occurs (1) • one (male) nucleus fuses with {egg cell / haploid / female} nucleus resulting in formation of zygote (1) • one male nucleus fuses with the two polar {nuclei / bodies} resulting in formation of endosperm (nucleus) (1)	REJECT pollen transported IGNORE gametes / sperm / cells REJECT forms two × {generative nucleus} REJECT diploid / meiosis REJECT generative nucleus {fusing / fertilizing} ecf for gametes / sperm IGNORE cells REJECT generative nucleus {fusing / fertilizing} ecf for gametes / sperm IGNORE cells	**(5)**

Question Number	Answer	Mark
5(d)(i)	The only correct answer is A 15 *B is not correct because 0.036 × 418 = 15 heterozygotes* *C is not correct because 0.036 × 418 = 15 heterozygotes* *D is not correct because 0.036 × 418 = 15 heterozygotes*	**(1)**

Question Number	Answer	Mark
5(d)(ii)	The only correct answer is C *A is not correct because leaf width shows continuous variation* *B is not correct because leaf width is determined by multiple alleles for several genes* *D is not correct because leaf width shows continuous variation*	**(1)**

Question Number	Answer	Mark
6(a)(i)	The only correct answer is C Y *A is not correct because the xylem is Y* *B is not correct because the xylem is Y* *D is not correct because the xylem is Y*	**(1)**

Question Number	Answer	Mark
6(a)(ii)	The only correct answer is B W *A is not correct because the phloem is W* *C is not correct because the phloem is W* *D is not correct because the phloem is W*	**(1)**

Question Number	Answer	Additional guidance	Mark
6(a)(iii)	An answer that makes reference to the following points: • millipede gains {water / mineral ions} from xylem (1) • millipede gains {sucrose / organic solutes / organic substances / amino acids} from phloem (1) • appropriate description of use of gained material (1)	IGNORE xylem contains {water / mineral ions} IGNORE glucose IGNORE phloem contains {sucrose / organic solutes} IGNORE nutrients / sugar / water from phloem e.g. {sucrose / glucose} used for respiration / amino acids to allow growth / energy source for growth / water for hydrolysis reactions / water for solvent / water to prevent dehydration / calcium ions for exoskeleton ACCEPT more efficient than getting from other sources IGNORE nitrates IGNORE increase survival of millipede IGNORE produce energy	**(3)**

Question Number	Answer	Additional guidance	**Mark**
6(b)(i)	An answer that makes reference to the following points: • (hard exoskeleton) for {defence / protection} from {predators / damage} / protection of {tissues / organs} (1) • (poison glands) kill {predators / prey} / for {defence / protection / deterrent} from predators (1)	ACCEPT for muscle attachment to allow movement ACCEPT to protect soft insides / withstand high pressure ACCEPT it can't be eaten ACCEPT to prevent {dehydration / loss of water} IGNORE protection unqualified IGNORE camouflage / survival / help make holes IGNORE for movement unqualified IGNORE to digest plants	**(2)**

Question Number	Answer	Additional guidance	Mark
6(b)(ii)	An answer that makes reference to the following points: • analysis of {genotype / phenotype} of both species of millipede (1) • identification of the number of {similarities / differences} between the two species (1)	e.g. looking at {DNA/mRNA/amino acid/ gene / allele} {sequences / structure} / protein structure / named phenotypic characteristics / proteomics / molecular phylogeny IGNORE genetic mapping ACCEPT the more similarities the more closely related / converse IGNORE compare sequences unqualified	**(2)**

Question Number	Answer	Additional guidance	Mark
6(c)	An answer that makes reference to three of the following points: <u>Similarities: max 2</u> • correct similarity (1) • second correct similarity (1) <u>Differences: max 2</u> • correct difference (1) • second correct difference (1)	 e.g. both contain a cell membrane both contain cell wall both contain ribosomes both contain cytoplasm both contain glycogen granules both contain {DNA / genetic material} REJECT incorrect similarities e.g. differences in cell wall / nucleus / nucleoid / mitochondria / type of ribosome / pilus / flagellum / DNA format REJECT incorrect differences	**(3)**

Question Number	Answer	Additional guidance	Mark
7(a)	An explanation that makes reference to three of the following points: • all introns {cut out / removed} (1) • some exons {cut out / removed} (1) • by {spliceosomes / enzymes} (1) • exons are joined together to form active mRNA (1)	 REJECT some introns removed IGNORE exons removed unqualified ACCEPT splicing / pre-mRNA spliced ACCEPT exons can be {rearranged / joined together in different order} IGNORE coding regions	**(3)**

Question Number	Answer	Mark
7(b)(i)	The only correct answer is C rough endoplasmic reticulum *A is not correct because the Golgi apparatus does not have ribosomes on its surface* *B is not correct because mitochondria do not have ribosomes on its surface* *D is not correct because smooth endoplasmic reticulum does not have ribosomes on its surface*	**(1)**

Question Number	Answer	Additional guidance	Mark
7(b)(ii)	An answer that makes reference to the following point: • (site of) {translation / polypeptide synthesis} (1)	ACCEPT {produce / make} {polypeptides / 1° structure} ACCEPT form {chains / sequence} of amino acids IGNORE proteins	**(1)**

Question Number	Answer	Mark
7(b)(iii)	The only correct answer is B polypeptide and RNA strand *A is not correct because Z is RNA* *C is not correct because X is a polypeptide* *D is not correct because X is a polypeptide*	**(1)**

Question Number	Answer	Additional guidance	Mark
7(c)(i)	An answer that makes reference to the following points: • binds {methyl group / CH_3 molecule} to DNA (1) • to {cytosine / CpG} (in promoter region) (1)	**REJECT** (occurring on) histones / amino acids IGNORE {removing / bringing} methyl groups **REJECT** cysteine	**(2)**

Question Number	Answer
***7(c)(ii)**	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material indicated as relevant. Additional content included in the response must be scientific and relevant. • over the 21 days the tumour volume increased in all four groups • there was the greatest increase in tumour volume in group A / lowest increase in group D • group D increased in a similar way to group B and C until day 13 / group D decreases in volume after day 15 • higher concentration of peperomin E extract resulted in a smaller tumour mass • after 21 days there was the {greatest mean tumour mass in group A / untreated group} / after 21 days there was the {lowest mean tumour mass in group D / current treatment} • {current drug / D} most effective / converse • higher concentration of peperomin E extract is more effective than lower / converse • tumour {increases / formation} due to {mitosis / uncontrolled cell division} • higher mitotic index in group A / converse • {peperomin E extract / current drug} reduces mitotic rate • {peperomin E extract / drug(s)} {removes methyl groups on gene / is involved in demethylation / inhibits DNMT} • suggestions of method of action for current drug • demethylation allows {transcription factors / RNA polymerase} to bind / DNA uncoils / euchromatin / no supercoiling eq • {RASSF1 / tumour suppressor} gene is {activated / switched on} • {RASSF1 / tumour suppressor} gene is transcribed / translation occurs / {RASSF1 / tumour suppressor} protein synthesised • {RASSF1 / tumour suppressor gene} protein slows down {cell division / growth of tumours} / suitable suggestions of function of tumour suppressor protein e.g. disruption of spindle fibres (ignore gene slows cell division etc) • no information on starting mass of tumour / do not know if the mass of tumour increased with current drug • suitable comments on methodology of investigation e.g. only done on lung cancer tumours / short time scale / don't know long term effect / no comparison of side effects from different drugs / no SD bars so unsure if significant difference between groups / small numbers of mice / no information on controlled variables / overlapping of volume lines for the 2 peperomin concentrations / no current drug concentration information (6)

		Additional guidance
Level 0	0	No awardable content
Level 1	1-2	An explanation may be attempted but with limited interpretation or analysis of the scientific information and with a focus on mainly just one piece of scientific information. The explanation will contain basic information, with some attempt made to link knowledge and understanding to the given context.
Level 2	3-4	An explanation will be given, with occasional evidence of analysis, interpretation and / or evaluation of both pieces of scientific information. The explanation shows some linkages and lines of scientific reasoning, with some structure.
Level 3	5-6	An explanation is made that is supported throughout by sustained application of relevant evidence of analysis, interpretation and / or evaluation of both pieces of scientific information. The explanation shows a well-developed and sustained line of scientific reasoning, which is clear and logically structured.

Question Number	Answer	Additional guidance	Mark
8(a)(i)	An explanation that makes reference to two of the following points: • {cats / rats} {ate / destroyed / preyed on} the {eggs / chicks / plovers} (1) • few(er) chicks to {reproduce / survive to breeding age} / fewer birds to reproduce (next year) (1) • increased competition for food / {rats / cats} carried diseases which killed the birds (1)	ACCEPT fewer chicks hatch ACCEPT death rate higher than birth rate IGNORE habitat loss	**(2)**

Question Number	Answer	Additional guidance	Mark
8(a)(ii)	36	REJECT answers given as fractions	**(1)**

Question Number	Answer	Additional guidance	Mark
8(b)(i)	An answer that makes reference to two of the following points: • consideration of analysis of {alleles / gene pool} (1) • take pollen from one gumwood tree and use it to pollinate another gumwood tree (1) • planting of {seeds / young saplings / shoots} {where they won't be grazed by rabbits / in a safe area / protected area / area with no rabbits} (1)	IGNORE store in seedbanks ACCEPT {maintenance / increase} of genetic {variation / diversity} of trees ACCEPT outbreeding / breed trees with different alleles REJECT if context of a different organism ACCEPT {artificial / manual} {pollination / fertilisation} ACCEPT descriptions of {artificial / manual} {pollination / fertilisation} ACCEPT {asexual reproduction / cloning} of St Helena trees IGNORE captive breeding / IVF IGNORE planting unqualified IGNORE captivity IGNORE comments relating to {planting / protecting} {adult / existing} trees	**(2)**

Question Number	Answer	Additional guidance	Mark
8(b)(ii)	An answer that makes reference to the following points: • build {fences / barriers} around young trees / spray trees with chemical to deter rabbits (1) • to prevent rabbits from being able to eat {trees / shoots} (1) **Or** • {kill rabbits / reduce rabbit population / introduce predators} (1) • to reduce risk of young trees being eaten / fewer {trees / shoots} are eaten (1)	ACCEPT grow in areas with no rabbits e.g. greenhouse IGNORE give rabbits other sources of food	**(2)**

Question Number	Answer	Additional guidance	Mark
8(b)(iii)	A description that includes four of the following points: • St Helena gumwood seeds would be selected from {different trees / different areas / genetically different trees} (1) • seeds would be x-rayed (1) • seeds would be prepared by being {dried / dehydrated} (1) • seeds would be treated with an antimicrobial (1) • seeds would be stored in suitable conditions (1)	ACCEPT collect seeds with different alleles REJECT collect seeds from different species ACCEPT {germination / growth / pollination} of plants to collect new seeds ACCEPT store in {dry conditions / low humidity} ACCEPT sterilised / disinfected IGNORE wash seeds / clean seeds IGNORE sterile container e.g. seeds are frozen / placed in {temperatures below 0°C / freezer} / store in a vacuum IGNORE low temperatures / cool space	**(4)**

Question Number	Answer	Additional guidance	Mark
8(c)(i)	An answer that includes the following points: • N(N-1) correctly calculated (1) • ∑n(n-1) correctly calculated (1) • D=1.44 (1)	 818120 566906 ecf for mp3 ACCEPT standard form to 2 d.p. correct answer on answer line scores 3 marks	**(3)**

Question Number	Answer	Additional guidance	Mark
8(c)(ii)	• {agree / yes} because the {D value / diversity index / number} for {habitat 1 / 1.44} is smaller / agree because the {D value / diversity index / number} for {habitat 2 / 2.80} is larger	ecf applies ACCEPT agree because habitat 2 has more species / converse IGNORE habitat 2 has higher biodiversity	**(1)**

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