Pearson Edexcel

Mark Scheme (Results)

Summer 2025

Pearson Edexcel AS Level GCE
In Biology A Salters – Nuffield (8BN0)
Paper 02: Development, Plants, and the Environment

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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 explanation that makes reference to the following: • (because) it is { a chloroplast /membrane bound } (1) • prokaryotic cells do not have membrane-bound organelles / only eukaryotic cells have membrane bound organelles (1)	ALLOW mark for membrane bound if organelle incorrectly identified ALLOW (photosynthetic) prokaryotes use folded cell membrane for photosynthesis IGNORE cell (membrane)?	(2)

Question number	Answer	Additional guidance	Mark
1(a)(ii)	An answer that makes reference to the following: • division of image size by magnification (1) • correct conversion to μm and answer to two significant figures (1)	<u>Example of calculation</u> 40 (mm) ÷ 44000 0.91 (μm) ECF ALLOW one mark for 0.09 / 0.909 ALLOW one mark for 40 000 if magnification factor not used. Correct answer with no working gains full marks	(2)

Question number	Answer	Mark
1(b)(i)	The only correct answer is – C – mitochondrion, centriole and nuclear membrane • A is incorrect because E is not a chloroplast • B is incorrect because E is not a chloroplast and F is not the Golgi apparatus • D is incorrect because F is not the Golgi apparatus	(1)

Question number	Answer	Mark
1(b)(ii)	The only correct answer is – C - structure E respiration and structure F mitosis • A is incorrect because E is a mitochondrion and does not carry out photosynthesis • B is incorrect because E is a mitochondrion and does not carry out photosynthesis and F is a centriole and is not involved in protein synthesis • D is incorrect because F is a centriole and is not involved in protein synthesis	(1)

Question number	Answer	Mark
2(a)	The only correct answer is – B - found in only in one geographical location • A is incorrect because the same type of habitat may be found in more than one geographical location • C is incorrect because endemic refers to one location and not many different locations • D is incorrect because a niche refers to the role of an organism in its habitat and not its physical location	(1)

Question number	Answer	Mark
2(b)(i)	The only correct answer is – C – 2, 3 and 4 (webbed feet, long snout and nostrils on top of snout) • A is incorrect because 1 (feeding on insects) Is a behavioural adaptation • B is incorrect because 1 (feeding on insects) Is a behavioural adaptation • D is incorrect because 5 (being nocturnal) Is a behavioural adaptation	(1)

Question number	Answer	Additional guidance	Mark
2(b)(ii)	An explanation that makes reference to five of the following: • genetic variation in populations of (shrews / common ancestor / moles) (1) • selection pressure identified (1) • identification of favourable characteristic (1) • those with alleles for favourable characteristics survive and reproduce (1) • passing on advantageous allele to offspring (1) • over time there is a change in allele frequency / desmans no longer able to breed with the original species (1)	ALLOW mutations lead to {genetic variation / new alleles} e.g. availability of food, competition for food, presence of predators e.g. webbed feet, long snout or nostrils on upper surface of snout ALLOW converse – those without advantageous allele do not survive or reproduce ALLOW increase frequency of advantageous allele	(5)

Question number	Answer	Additional guidance	Mark
3(a)	An answer that makes reference to the following: • an organ is made of { more than one type of tissue / different tissues }		(1)

Question number	Answer	Mark
3(b)(i)	The only correct answer is – D - sclerenchyma and xylem • A is incorrect because sclerenchyma and xylem both contain lignin • B is incorrect because sclerenchyma and xylem both contain lignin • C is incorrect because sclerenchyma and xylem both contain lignin	(1)

Question number	Answer	Additional guidance	Mark
3(b)(ii)	An explanation that makes reference to four of the following: • (xylem vessels are) hollow / have no cytoplasm / have no end walls (1) • (therefore) no resistance to flow of water / allows uninterrupted flow of water (1) • (cell) walls contain lignin (1) • (lignin) provides support / enables xylem to withstand pressure (1) • pits in (cell) walls allow transfer of water (1)	IGNORE 'dead' ALLOW idea of lignin waterproofing cell walls	(4)

Question number	Answer	Additional guidance	Mark
3(c)	An explanation that makes reference to two of the following: • (pineapple plants) can be regrown / are renewable (1) • therefore the resource { will not run out / is available for future generations} (1) • oil is a finite resource (1)		(2)

Question number	Answer	Additional guidance	Mark
4(a)	An answer that makes reference to the following: • group of organisms with similar {characteristics / features } (1) • that can reproduce (with one another) to produce fertile offspring (1)	ALLOW 'interbreed / breed / mate' for 'reproduce'	(2)

Question number	Answer	Additional guidance	Mark
4(b)(i)	A description that makes reference to two of the following: • count the number of species present / species richness measures the number of different species present (1) • (to compare) use same size area of each habitat (1) • higher species richness indicates greater biodiversity (1)		(2)

Question number	Answer	Additional guidance	Mark
4(b)(ii)	An explanation that makes reference to the following: • correct numerator or denominator in the equation (1) • correct use of both values to calculate diversity and answer given to two decimal places (1)	<u>Example of calculation</u> Numerator 1722 Denominator 290 1722 ÷ 290 = 5.94 Correct answer with no working gains full marks.	(2)

Question number	Answer	Additional guidance	Mark
4(b)(iii)	An explanation that makes reference to the following: • species richness only gives the number of species in an area (1) • however the index of diversity also takes into account {population sizes / abundance / species evenness} (1)	ALLOW species richness does not take into account {abundance /population sizes / species evenness }	(2)

Question number	Answer	Additional guidance	Mark
5(a)(i)	A description that makes reference to the following: • showing a range of differences (1) • that are measurable / not distinct categories (1)	ALLOW differences fall along a spectrum of values ALLOW an example such as height, eye colour,	(2)

Question number	Answer	Additional guidance	Mark
5(a)(ii)	An explanation that makes reference to four of the following: • many genes involved (1) • at different loci (1) • each having a small effect on the phenotype (1) • therefore having a cumulative effect (1) • therefore causing a range within the characteristic (1)	ALLOW more than one gene involved ALLOW description of a cumulative effect ALLOW example such as eye colour there is a range from pale blue to dark brown	(4)

Question number	Answer	Additional guidance	Mark
5(b)	An answer that makes reference to four of the following: • canine hip dysplasia shows different grades of severity (1) • suggesting dogs inherit different alleles at multiple {different genes / loci} (1) • therefore more severe condition caused by more {disadvantageous / dysplasia} alleles present (1) • as 42% dogs in sample had dysplasia the adverse alleles are relatively common in gene pool (1) • relevant comment about alleles for dysplasia being recessive (1)	ALLOW reference to continuous variation ALLOW this suggests several genes responsible for the condition ALLOW polygenic inheritance accounts for range of severity of the disorder depending on number of alleles present in the genotype ALLOW 58% of dogs unaffected / have normal hip joints	(4)

Question number	Answer	Mark
6(a)(i)	The only correct answer is – B the characteristics shown by an organism • A is incorrect because it is a definition of genotype • C is incorrect because the genes inherited are not the phenotype • D is incorrect because the environment is not the phenotype	(1)

Question number	Answer	Mark
6(a)(ii)	The only correct answer is – C genotype and environmental temperature • A is incorrect because the pattern of fur colour is not due to body temperature only • B is incorrect because the pattern of fur colour is not due to environmental temperature only • D is incorrect because the pattern of fur colour is not due to genotype only	(1)

Question number	Answer	Mark
6(b)(i)	The only correct answer is – B a fertilised egg divides by mitosis to produce four embryos • A is incorrect because the fertilised egg does not divide by meiosis • C is incorrect because four sperm cells would produce genetically different offspring • D is incorrect because four egg cells and four sperm cells would produce genetically different offspring	(1)

Question number	Answer	Additional guidance	Mark
6(b)(ii)	An answer that makes reference to the following: • several individuals with the same genotype can be tested (1) • any differences between them when placed in different environments would be due to the environment and not to genotype (1)	ALLOW genotype controlled IGNORE genetically identical offspring (repeating from the stem of the question) ALLOW any variation will be due to the environment	(2)

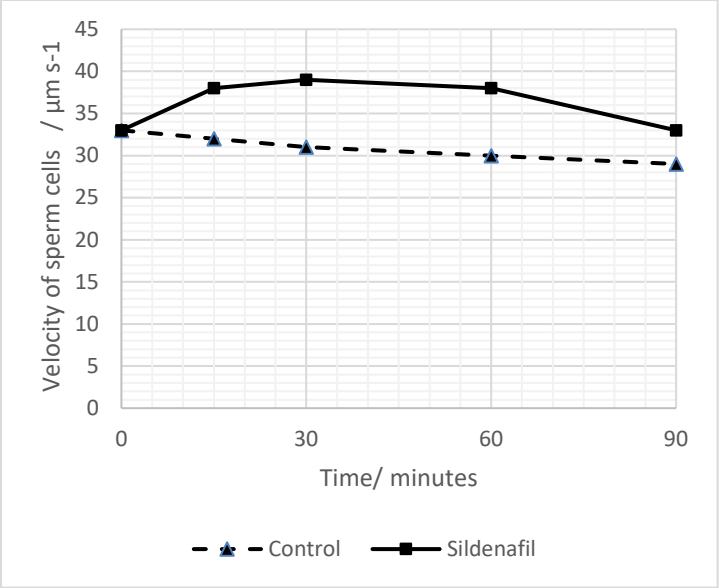
Question number	Answer	Additional guidance	Mark
6(c)	An explanation that makes reference to three of the following: • methyl groups attach to the { gene / DNA / cytosine} (1) • causing DNA to coil more tightly (around histones) (1) • {mRNA / RNA polymerase / transcription factors / RNA nucleotides} cannot bind to { DNA / gene / promoter region of gene} (1) • preventing transcription (of the gene) (1)	ALLOW methyl group attached to CpG site ALLOW idea of gene being {deactivated / silenced / 'switched off'}	(3)

Question number	Answer	Additional guidance	Mark
6(d)(i)	An answer that makes reference to three of the following: • those given diet high in methyl groups had brown fur / those given diet low in methyl groups had yellow fur (1) • (because) DNA methylation deactivates the agouti gene (1) • methylation of the agouti gene affects health (1) • health affected as diet low in methyl groups might alter the methylation of other genes (apart from the agouti gene) (1)	ALLOW 'gene for yellow fur' instead of agouti gene ALLOW diet high in methyl groups deactivates agouti gene ALLOW agouti gene linked to poor health	(3)

Question number	Answer	Additional guidance	Mark
6(d)(ii)	An explanation that makes reference to two of the following: • (mother mice all had yellow fur and) the only difference was their diet (1) • the mothers given a diet low in methyl groups had offspring with yellow fur (1) • because the {agouti gene / gene for yellow fur} was activated (1)	ALLOW diet high in methyl groups produced offspring with brown fur ALLOW agouti gene deactivated in offspring with brown fur	(2)

Question number	Answer	Additional guidance	Mark
7(a)	A description that makes reference to the following: • flagellum moves to propel sperm (1) • mitochondria provide {energy / ATP} for movement (1) • enzymes in acrosome { digest / break down} the zona pellucida (1)	ALLOW movement of flagellum allows sperm to swim / motility ALLOW acrosin for the enzyme	(3)

Question number	Answer	Additional guidance	Mark
7(b)	An answer that makes reference to three of the following: • reduces fertility (1) • increases number of (sperm cells with) fully reacted acrosomes (1) • correct use of data from graph (1) • fewer sperm with intact acrosome to allow sperm to break down zona pellucida (1) • no acrosome reaction at ovum surface so { no entry of male nucleus / no fertilisation} (1)	e.g. 10% more sperm with reacted acrosome, 5% fewer with intact acrosome	(3)

Question number	Answer	Additional guidance	Mark
7(c)(i)	An answer that makes reference to the following: • A – Axes the right way around and labelled including units (1) • S – Scales on axes linear, y axis to at least 40 and x axis to at least 90 (1) • P – Plotting accurate (1) • L - Lines drawn accurately with key (1)	Example of graph  ALLOW marks for A, P and L if a bar chart is drawn instead of a line graph ALLOW scatter graph if there is a key for points ALLOW y axis not starting at zero ALLOW correct labelling of lines for key ALLOW L mark for bar chart if columns drawn accurately and there is a key ALLOW line of best fit, or points joined with straight line DO NOT ALLOW extrapolated lines	(4)

Question number	Answer	Additional guidance	Mark
7(c)(ii)	An answer that makes reference to four of the following: • increased velocity from 0-30 minutes with sildenafil (1) • velocity greater with sildenafil than control {from 0 – 90 minutes / throughout} (1) • in the control the velocity decreases steadily (from 0 to 90 minutes) (1) • improved functioning of mitochondria would mean more {ATP/ energy} available (1) • therefore flagellum has more energy for movement (1)	ALLOW velocity faster with sildenafil than the control ALLOW energy available more quickly ALLOW more ATP produced DO NOT ALLOW energy produced ALLOW flagellum {propelled/moved} sperm faster	(4)

Question number	Answer	Additional guidance	Mark
8(a)(i)	An explanation that makes reference to two of the following: • (removal of water) prevents {enzyme/metabolic} activity (1) • (because drying) prevents germination (1) • (because drying) prevents growth of microbes (1)	ALLOW converse if seeds not dried ALLOW to prevent { bacterial growth / decay / seeds rotting }	(2)

Question number	Answer	Additional guidance	Mark
8(a)(ii)	An explanation that makes reference to three of the following: • at low temperatures growth is slow / as temperature increases so does growth of bacteria (1) • because enzyme activity is {reduced at lower temperatures / increased at higher temperatures } (1) • because at { low temperatures enzymes have less kinetic energy / high temperatures enzymes have more kinetic energy } (1) • at high temperatures bacterial growth stops as enzymes are denatured (1)	ALLOW bacteria cannot grow at low temperatures	(3)

Question number	Answer	Additional guidance	Mark
8(b)	An answer that makes reference to the following: • leaves have most antimicrobial property (1) • as zone of inhibition is greatest / no overlap of range with either fruit or seed (1) • ranges overlap for seed and fruit (1)		(3)

Question Number	Indicative content
*8(c)	Answers will be credited according to candidate's 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 which is indicated as relevant. Additional content included in the response must be scientific and relevant. Basic method • Extracts of coffee seeds • Agar plates with bacteria • Larger zones of inhibition indicate greater antimicrobial activity Variables – independent and dependent, and controlled • Independent - Coffee seeds stored for a range of suitable storage times – weeks/ months/years • Dependent variable - zones of inhibition measured in terms of diameter or calculation of area • Controlled abiotic variables - storage conditions e.g. temperature or humidity • Controlled biotic variables e.g. source of coffee seeds and species of bacteria • Method for placing extracts in agar plates seeded with bacteria – e.g. filter paper discs Measures to increase validity • Volume of coffee seed extract the same • Extracts made with same solvent • Extracts produced of same concentration / with same mass of coffee seeds to allow comparability • Seeds treated to remove bacteria before extract made • Details of incubation time/temperature to allow comparability • Aseptic technique to prevent contamination – including cleaning of seeds before making extract • Relevant statistical test to determine if results significant e.g. Spearman's rank correlation between storage time and size of inhibition zone Effect of storage time on antimicrobial properties linked to viability of seed in seedbanks 6 marks

Level	Marks		**Additional Guidance**
0	0	No awardable content	
1	1-2	An explanation of how the investigation should be modified may be attempted but with limited analysis, interpretation and/or evaluation of the scientific information. Generalised comments made. The explanation will contain basic information with some attempt made to link knowledge and understanding to the given context.	A basic method described with reference to agar plates with bacteria OR use of coffee seed extract. Consideration of one of the following factors: • abiotic variable to be controlled • biotic variable to be controlled • suitable range of storage times • how to measure antimicrobial properties • incubation details – temp/time
2	3-4	An explanation of how the investigation should be modified will be given with occasional evidence of analysis, interpretation and/or evaluation of the scientific information. The explanation shows some linkages and lines of scientific reasoning with some structure.	Method described with reference to how bacteria are applied to agar plates **or** application of coffee seed extract. Consideration of a further two factors from: • abiotic variable to be controlled • biotic variable to be controlled • suitable range of storage times • how to measure antimicrobial properties • incubation details – temp/time
3	5-6	An explanation of how the investigation should be modified is given which is supported throughout by evidence from the analysis, interpretation and/or evaluation of the scientific information. The explanation shows a well-developed and sustained line of scientific reasoning which is clear, coherent and logically structured.	In addition to evidence supporting Level 2: Measures to ensure validity of results such as: • details of how the extract was prepared • relevant details of aseptic technique • reference to a relevant statistical test

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