GradeMax



Mark Scheme (Results)

January 2020

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

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

January 2020
Publications Code IAL_2001_WBI12_01
All the material in this publication is copyright
© Pearson Education Ltd 2020

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)	The only correct answer is B X *A is not correct because W is chromosomal DNA / nucleoid* *C is not correct because Y is a pilus* *D is not correct because Z is the cell wall*		**(1)**

Question Number	Answer	Additional guidance	Mark
1(a)(ii)	The only correct answer is C Y *A is not correct because V is a ribosome* *B is not correct because X is a plasmid* *D is not correct because Z is the cell wall*		**(1)**

Question Number	Answer	Additional guidance	Mark
1(a)(iii)	An answer that includes one of the following points: • ribosomes in prokaryotic cells are smaller (than those in eukaryotic cells) (1) Or • ribosomes in prokaryotic cells are 70S whereas those in eukaryotic cells are 80S (1)	Accept ribosomes in prokaryotic cells contain less RNA (than those in eukaryotic cells)	**(1)**

Question Number	Answer	Additional guidance	Mark
1(b)	An answer that includes the following points: • (capsule) prevents dehydration of cell (1) • (flagellum) for (cell) motility (1)	Mark first answer Accept capsule has adhesive properties / covers antigens / protection of cell from a correct factor e.g. {bacteriophages / phagocytes / antibodies / antibiotics / (described) harsh conditions} Accept movement of cell	**(2)**

Question Number	Answer	Additional guidance	Mark
2(a)	An explanation that includes the following points: • they are all (genetically identical due to being) derived from the **zygote** (cell) (1) • {DNA/ chromosomes} are replicated (in interphase / in semi-conservative replication) (1) • (therefore) each cell receives one identical copy of each {strand of DNA / chromosome} (1)	Accept the cells have divided by mitosis / mitosis results in daughter cells that are genetically identical ignore genetic material	**(2)**

Question Number	Answer	Additional guidance	Mark
2(b)(i)	blastocyst		**(1)**

Question Number	Answer	Additional guidance	Mark
2(b)(ii)	An answer that includes the following points: • pluripotent stem cells have the ability to differentiate into {most cells types / heart (muscle) cells} (1) • replace the dead heart (muscle) cells / so the heart will have improved function (1)	Accept repair damage caused (to the heart muscle) by the heart attack ignore repair heart muscle cells ignore references to regeneration	**(2)**

Question Number	Answer	Additional guidance	Mark
3(a)(i)	An answer that includes two of the following points: • many genes / genes at different loci (1) • {contribute to / code for} the same {characteristic / trait} (1)	ignore alleles unless correctly qualified Accept different positions on a chromosome	**(2)**

Question Number	Answer	Additional guidance	Mark
3(a)(ii)	The only correct answer is B *A is not correct because it does not show a normal distribution* *C is not correct because it does not show a normal distribution* *D is not correct because it does not show a normal distribution*		**(1)**

Question Number	Answer	Additional guidance	Mark
3(b)(i)	1.61(m)		**(1)**

Question Number	Answer	Additional guidance	Mark
3(b)(ii)	An explanation that includes three of the following points: • {height / phenotype / a characteristic} is also affected by the environment (1) • {malnutrition / lack of nutrients} (1) • example of another environmental factor (which would reduce energy available for growth) (1) • height depends on the combination of alleles inherited (1)	Accept named nutrient Accept (could be taller) due to more nutrients than her parents e.g. disease, lives in very cold climate and more energy used for heat production, idea of excessive exercise, death of child, mutation Accept reverse argument (for child being taller)	**(3)**

Question Number	Answer	Additional guidance	Mark
4(a)(i)	• to make the {chromosomes / chromatids} visible (1)	Accept DNA ignore organelles / cells	**(1)**

Question Number	Answer	Additional guidance	Mark
4(a)(ii)	The only correct answer is C R *A is not correct because the cell is in telophase* *B is not correct because the cell is in prophase* *D is not correct because the cell is in anaphase*		**(1)**

Question Number	Answer	Additional guidance	Mark
4(a)(iii)	• addition (1) • correct calculation (1)	Example of calculation: 33 and 150 (33 ÷ 150) x 100=22 (%) or (33 ÷ 150) = 0.22 Correct answer with no working shown scores full marks	**(2)**

Question Number	Answer	Additional guidance	Mark
4(b)	An answer that includes the following points: • (tendrils coiling) {secures / gives support to} the pea shoot / prevents the pea shoot falling over (1) • allows the pea plant to {grow taller / climb higher} (than other plants) (1) • (therefore) the pea plant will {outcompete other plants / absorb more light (energy) / carry out more photosynthesis} (1)	Accept allows the plant to climb up other {plants / structures} Accept allows the pea plant to divert fewer resources into {strengthening stem / producing (named) supporting tissue (in stem)} ignore increase surface area	**(3)**

Question Number	Answer	Additional guidance	Mark
4(c)	An explanation that includes the following points: • independent assortment (of chromatids) (1) • will result in {mixture of (maternal and paternal) chromatids / different combination of alleles} in the gametes (1) • which gametes are involved (in fertilisation) are random (1)	Accept random assortment Accept chromosomes	**(3)**

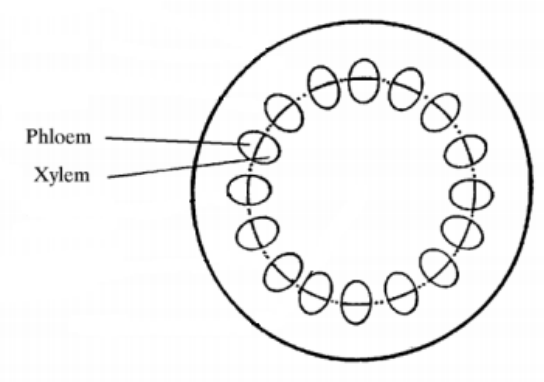
Question Number	Answer	Additional guidance	Mark
5(a)(i)	• the (Madagascan pygmy) kingfisher is found only in (forests in) Madagascar (1)		**(1)**

Question Number	Answer	Additional guidance	Mark
5(a)(ii)	• Eukarya / Eukaryote (1)		**(1)**

Question Number	Answer	Additional guidance	Mark
5(b)(i)	An answer that includes the following points: • *Alcedo leucogaster* and *Alcedo cristata* (1) • because they share (the most) recent common ancestor (1)	Accept they share most similarities in their {DNA / named biological molecule} Accept converse for *Ceyx lecontei* and *Ceyx picta*	**(2)**

Question Number	Answer	
5 (b)(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. • classification definitions historically based on similarities and differences in phenotype • some examples of phenotypes used for previous classification, e.g. beak shape, bird size, diet, habitat • previous classification had *Ceyx madagascariensis* as more closely related to other *Ceyx* kingfishers • more recent classification based on molecular evidence / molecular phylogeny • similarities and differences in mRNA / DNA / amino acid sequences identified • explanation of how they are compared • fewer differences means they are more closely related / have more recent common ancestor • reference to closer together on evolutionary tree • proposed classification had *Ceyx madagascariensis* as more closely related to *Alcedo* (*leucogaster* and / or *cristata*) • scientist proposing a reclassification • published in scientific journal • reference to peer review (of molecular evidence) • repetition of experiments by other scientists (to see if same data are collected) • extend the analysis e.g. look for similarities / differences in more genes • analysis of data to see if same conclusions can be reached / more research • statistical analysis **(6)** **Expert**	

			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.	1 mark – information from one section 2 marks - information from two sections
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.	3 marks - information from three sections 4 marks - information from four sections
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.	5 marks - information from five sections 6 marks - Information from all six sections applied to the given context showing a good understanding of the review process leading to an accepted reclassification by the scientific community

Question Number	Answer	Additional guidance	Mark
6(a)(i)	• correct position of xylem and phloem shown (1)	Example answer:  Accept P for phloem and X for xylem	**(1)**

Question Number	Answer	Additional guidance	Mark
6(a)(ii)	The only correct answer is A 1 *B is not correct because statements 2,3,4 are incorrect* *C is not correct because statements 2,3,4 are incorrect* *D is not correct because statements 2,3,4 are incorrect*		**(1)**

Question Number	Answer	Additional guidance	Mark
6(b)(i)	• subtraction using correct data from table (1) • calculation of percentage decrease (1) • answer correctly rounded to an appropriate number of decimal places (1)	Example of calculation: 26.95–21.62(= 5.33) (5.33÷26.95) x 100 = 19.78(%) 19.78(%) or 19.8(%) Correct answer with no working shown scores full marks	**(3)**

Question Number	Answer	Additional guidance	Mark
6(b)(ii)	An answer that includes the following points: • (lack of water causes) reduction in (all three measurements of) growth of (core) fibres / causes the largest reduction in {growth / length / diameter / cell wall thickness} {one month after germination / in row 2} (1) • not a significant difference for {core fibre diameter / mean cell wall thickness} {at flowering stage / in row 3} compared with row 1 as SD overlaps (1) • row 1 did not develop water stress / row {2/3} developed water stress (1) • water stress before flowering has a greater impact than water stress after flowering (1)	Accept description of correct trend from table e.g. row 1 has greatest values for all three measurements of growth, row 2 has the lowest values for all three measurements of growth Accept significant difference for two correct values from table as SD does not overlap Accept reliability of results for {significant / not significant difference}	**(4)**

Question Number	Answer	Additional guidance	Mark
6(c)	The only correct answer is B *A is not correct because the monomers are not β-glucose* *C is not correct because the monomers are not β-glucose* *D is not correct because cellulose does not contain 2,6 glycosidic bonds*		**(1)**

Question Number	Answer	Additional guidance	Mark
6(d)	An explanation that includes the following points: Support • structure described (1) • adaptation explained (1) Transport • structure described (1) • adaptation explained (1)	e.g. (cell) walls have secondary thickening / lignin in (cell) wall (1) e.g. (lignin in the cell wall) provides strength (1) ignore support e.g. hollow tubes with no {end walls / cytoplasm} (1) no obstruction to vertical movement / enables formation of continuous water column (1) e.g. narrow (1) to aid capillary action (1) e.g. contain {pits / non-lignified areas / tracheids} (1) to allow movement of water {in / out} of xylem (1) e.g. lignin (1) allows {impermeability to water / waterproofing } to keep water in xylem (1)	**(4)**

Question Number	Answer	Additional guidance	Mark
7(a)(i)	The only correct answer is C - R *A is not correct because ribosomes are not produced in cytoplasm* *B is not correct because ribosomes are not produced in endoplasmic reticulum* *D is not correct because ribosomes are not produced in the nuclear membrane*		**(1)**

Question Number	Answer	Additional guidance	Mark
7(a)(ii)	An answer that includes two of the following points: • viewed from a different angle / one was transverse and one is longitudinal (1) • when the cell was {sliced / cut} (1) • different sizes due to different stages of {growth / development} (1)	Accept when the mitochondria / structure {T / U} was {sliced / cut}	**(2)**

Question Number	Answer	Additional guidance	Mark
7(a)(iii)	A calculation showing the following steps: • conversion of units (1) • calculation of magnification (1)	Example of calculation: 52 × 1000 = 52 000 (52 000 ÷ 3.0) = (×) 17300 / 17333 / 17333.3$\dot{}$ Correct answer with no working shown scores full marks Incorrect unit loses one mark	**(2)**

Question Number	Answer	Additional guidance	Mark
7(b)	A description that includes the following points: • rER packages insulin (protein) in vesicle (1) • vesicle fuses to become part of Golgi apparatus and insulin (protein) {enters Golgi apparatus / is modified} (1) • Golgi packages insulin (protein) in (secretory) vesicle / vesicle containing insulin (protein) pinched off Golgi (1) • (secretory) vesicles fuse with the cell (surface) membrane (1) • the insulin (protein) exits (beta cell) via exocytosis (1)		**(5)**

Question Number	Answer	Additional guidance	Mark
7(c)	An explanation that includes the following points: • cell specialisation (1) • because gene (for insulin production) switched off in (other pancreas cells) due to {epigenetic modification / DNA methylation / histone modification} (1) • because gene (for insulin production) {active / switched on / expressed} in these (beta) cells (1) • therefore transcription of (active insulin) gene / (active) mRNA produced (1) • translation of (active) mRNA leads to synthesis of insulin protein (1)	Accept differential gene expression in these cells Accept transcription of insulin gene only occurs in beta cells Accept reverse argument for other pancreas cells Accept reverse argument for other pancreas cells	**(5)**

Question Number	Answer	Additional guidance	Mark
8(a)(i)	The only correct answer is D the number of species *A is not correct because it refers to more than just animals* *B is not correct because it refers to more than just plants* *C is not correct because that is species evenness*		**(1)**

Question Number	Answer	Additional guidance	Mark
8(a)(ii)	A description that includes two of the following points: • determining the genetic {diversity / variation} (of a species) (1) • by the number of different alleles present (1) • by calculating the heterozygosity index (1)	Mark their first method ignore allele frequency ignore genes Accept correct equation	**(2)**

Question Number	Answer	Additional guidance	Mark
8(b)	An explanation that includes three of the following points: • deforestation (of mangroves) causing habitat loss (1) • reduction in food due to {deforestation (of mangroves) / competition with other species / overfishing} (1) • {pollution / change in salinity} of river making it unsuitable habitat (for the crocodile) (1) • {disease / hunting} (causing death of crocodiles) (1)	 ignore water levels Accept reduction in food due to pollution of river Accept pollution killed {crocodiles / caused migration of crocodile} Accept fewer mates due to lower population / {gender imbalance / fewer eggs hatching} due to global warming	**(3)**

Question Number	Answer	Additional guidance	Mark
8(c)(i)	A calculation that shows the following steps: • calculation of percentage of females (1) • calculation of number that would develop (1)	Example of calculation: 100-23 = 77 (350 ÷ 100) x 77 = 269 / 270 Do not accept a decimal answer Correct answer with no working shown scores full marks	**(2)**

Question Number	Answer	
***8 (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. • numbers will increase faster if there are more females hatching • as more females to lay eggs • more eggs increases likelihood of more offspring hatching • 31°C not selected as there are significantly more males hatching than females / 82:18 • more females develop at 29/30/32/33°C • too few males develop at 29°C • future offspring would only inherit these alleles • reduction in genetic diversity of a population could occur when there are small numbers of one of the sexes • as offspring would only inherit these few alleles • increased number of homozygotes for these few alleles / reduction in heterozygosity index of population over time • reference to competition for mates • more males develop at 30/32/33°C than 29°C • too few males hatching could reduce genetic diversity of offspring • therefore reduced probability of reduction in genetic diversity of future population • eggs taken from nests throughout National Park are likely to contain different alleles • analyse genetic makeup of individuals • use this analysis to choose individuals for breeding programme / prevent inbreeding • use of stud books **(6)** **Expert**	

			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.	A temperature selected with an attempt to explain why OR basic recognition of male:female ratio = 1 mark attempt at explanation of need for acceptable male:female ratio (e.g. more females than males would increase population faster) = 2 marks basic comments linked to genetic diversity (not linked to graph)
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 1 content plus supported reasoning of selection of {30/32/33} °C to address idea of increase population quickly e.g. consideration of appropriate male:female ratio (depth of answer determines mark) OR explanation linked to way(s) in which genetic diversity could be maintained (depth of answer determines mark)
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.	All level 2 content plus Supported reasoning of selection of {30/32/33}°C plus linked to maintaining genetic diversity (depth of answer determines mark)

Pearson Education Limited. Registered company number 872828
with its registered office at 80 Strand, London, WC2R 0RL, United Kingdom