Markscheme

November 2024

Biology

On-screen examination

16 pages

The following are the annotations available to use when marking responses.

Annotation	Explanation
	Correct point, place at the point in the response where it is clear that the candidate deserves the mark. For use in analytically marked questions only.
	Omission, incomplete
CON	Contradiction
	Valid part (to be used when more than one element is required to gain the mark)
	Error carried forward
	Dynamic annotation, it can be expanded to surround work
	Horizontal wavy line that can be expanded
	Highlight tool that can be expanded to mark an area of a response

Annotation	Explanation
	Not good enough
	The candidate has given a response but it is not worthy of any marks
	Text box used for additional marking comments
	Seen; must be stamped on all blank response areas and on duplicate pages of concatenated responses
	Vertical wavy line that can be expanded
	Words to that effect
	Award 1, 2, 3, 4 marks. For use in holistically marked questions only

Markscheme instructions

1 Mark positively. Give candidates credit for what they have achieved and what is correct. Do not deduct marks for incorrect responses. Do not deduct marks for spelling errors.

2 Follow the markscheme provided and award only whole marks.

3 Each marking point appears on a separate line.

4 The maximum mark for each subpart is indicated in the "Total" column.

5 Where a mark is awarded a tick should be placed in the text at the precise point where it is clear the candidate deserves the mark.

6 Each marking point in a question part should be awarded separately unless there is an instruction to the contrary in the Notes column.

7 A question subpart may have more marking points than the total allows. This will be indicated by the word "***max***" in the Answer column. Further guidance may be given in the Notes column.

8 Additional instructions on how to interpret the markscheme are in bold italic text in the Answer column.

9 Alternative wording may be indicated in the Answer column by a slash (/). Either alternative is equally acceptable but the candidate cannot be rewarded for both as they are associated with the same marking point.

10 Alternative answers are indicated in the Answer column by "***or***". Either alternative is equally acceptable but the candidate cannot be rewarded for both as they are associated with the same marking point.

11 If two related points are required to award a mark, this is indicated by "***and***" in the answer column.

12 Words in brackets ( ) in the Answer column are not necessary to gain the mark.

13 Words that are underlined are essential for the mark.

14 In some questions a reverse argument is also acceptable. This is indicated by the abbreviation *ORA (or reverse argument)* in the Notes column. Candidates should not be rewarded for reverse arguments unless *ORA* is given in the Notes column.

15 If the candidate's response has the same meaning or is clearly equivalent to the expected answer the mark should be awarded. In some questions this is emphasized by the abbreviation *WTTE (or words to that effect)* in the Notes column.

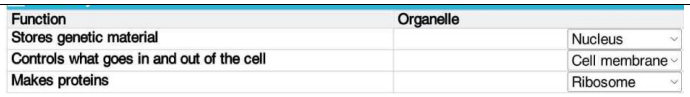
16 When incorrect answers are used correctly in subsequent question parts the follow through rule applies. Award the mark and add ECF (error carried forward) to the candidate response.

17 The order of marking points does not have to be the same as in the Answer column unless stated otherwise.

18 Marks should not be awarded where there is a contradiction in an answer. Add CON to the candidate response at the point where the contradiction is made.

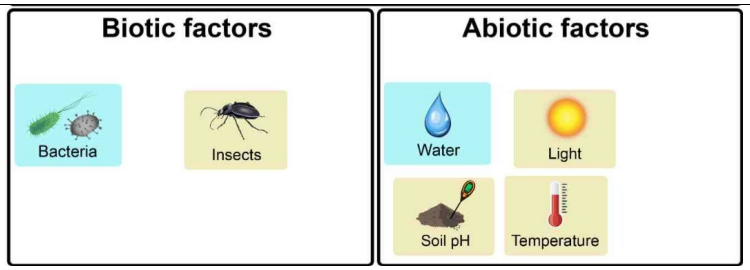
19 Do not penalize candidates for errors in units or significant figures unless there is specific guidance in the Notes column.

20 Questions with higher mark allocations will generally be assessed using a level response method using task specific clarifications developed with reference to the criteria level descriptors. A candidate's work should be reviewed to determine holistically the mark for each row of the holistic grid and a mark awarded for each row.

Question		Answers	Notes	Total	
1	a	 Two correct All correct		2	A
	b	Transports oxygen ***or*** CO_2 Produces antibodies ***or*** immune system defence ***or*** fights infection ***or*** fights disease	*WTTE*	2	A
	c	Nucleus is haploid ***or*** contains 23 chromosomes ***or*** half the genetic material required When sperm fertilizes an egg, the zygote will be diploid ***or*** have 46 chromosomes ***or*** full set of chromosomes ***Any correct use of a term from the list:*** haploid, diploid, gamete, zygote	*Accept to avoid polyploidy*	**3**	A D
	d	Aerobic requires oxygen and anaerobic does not Aerobic releases more energy or ATP than anaerobic ***Accept any further point from the list [max 1]*** • aerobic produces water (and carbon dioxide) ***and*** anaerobic produces lactic acid • aerobic respiration occurs in the mitochondria (and cytoplasm) ***and*** anaerobic respiration occurs in the cytoplasm		**3**	A

2	**a**	***Changes in females <u>only</u>, accept any change, [max 1]*** • breasts develop • hips widen • ovulation starts ***Changes in males <u>only</u>, accept any change, [max 1]*** • facial hair grows • penis enlargement • enlargement of larynx • voice deepens • shoulders broaden	*Do **not** accept start to menstruate as this is given in the question* *Do **not** accept start to produce sperm as this is given in the question*	**2**	A
	b	Estrogen thickens (uterus) lining Progesterone maintains (uterus) lining So that a <u>fertilized</u> egg ***or*** zygote can implant or survive		**3**	A
	c	Triggers ovulation	*WTTE*	**1**	A
	d	1. HGH gene extracted 4. Combined genetic material is inserted into bacteria 5. Genetically modified bacteria reproduce ***and*** make HGH		**3**	A
	e	Goes directly into the blood Will not be digested or denatured	*Accept "Hormones are transported in the blood"*	**2**	A

3	**a**	***Accept any characteristic from the list, [max 1]*** • have mammary glands • fed with milk • give birth to live young • have hair or fur		**1**	A
	b	It is present in mammals ***and*** (some) non-mammals Example from the diagram – frog and bird are not mammals So it cannot be used to identify mammals	*Only award mp 3 if another mark is awarded*	**3**	A
	c	***Dense bones [max 1]*** • increase strength • increase stiffness ***Air pockets [max 1]*** • reduce weight • allow oxygen to circulate ***Linked justification, for example [max 1]*** • support take-off or landing • do not bend excessively in flight • reduce energy demand • Increase aerobic respiration	*WTTE*	**3**	A

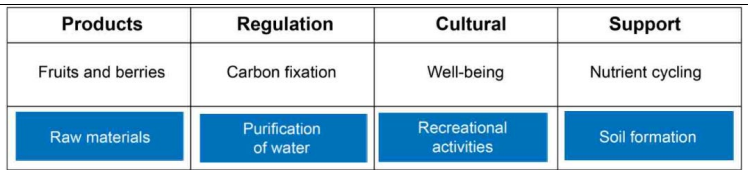
4	**a**	 All correct		1	A
	b	Calculation of mean (5.35666) 5.36 (to three sig figs)	*Award two marks if 5.36 is seen. Please check table and response box.*	2	C
	c	y axis labelled (average) soil pH x axis labelled colour (of flower) Equal intervals on y axis starting at zero Two bars correctly labelled ***and*** plotted (within relevant grid lines and ± half a square) Four bars correctly labelled ***and*** plotted	*Do **not** accept species* *ECF from part b*	**5**	C
	d	IV is categorical data ***or*** qualitative data ***or*** discrete data ***or*** colour is not continuous	*WTTE*	**1**	C
	e	Increase the number of trials More representative ***or*** reduced impact of random errors ***or*** gets closer to the true value		**2**	C
	f	White identified White plants are found in a wider range of soil pH ***or*** At the range of pH tested it does not change colour (unlike the other species)		**2**	C

5	**a**	Wear protective equipment ***or*** safety goggles ***or*** gloves A hazard is identified ***and*** connected to acidic or alkaline soils		**2**	B
	b	IV: (soil) pH DV: number of blades or leaves ***Accept two CV from the list [max 2]:*** • watered with same volume of water • same plant species / (*Zoysia*) grass used • length of experiment • size of pot • proximity to other seeds • mass of soil		**4**	B
	c	***Accept any two reasonable variables, for example [max 2]*** • light intensity • light exposure or duration • temperature of the soil or surroundings • age of seeds • soil composition	*Do **not** accept* • *watered with same volume of water* • *same plant species / Zoysia grass used* • *length of experiment* • *size of pot* • *proximity to other seeds* • *mass of soil*	**2**	C
	d	Maximum number of blades at pH 7 (but also there are the) same number of blades at pH 6 (so) only partially supported ***or*** it is not supported	*Do **not** award mp 3 if mp 2 is not awarded*	**3**	C
	e	pH7 This is the pH giving the most blades ***and*** the greatest (average) height		**2**	C

	f	Repeat both tests for soil with pH=6.5		**1**	C
	g	***Accept any two improvements [max 2]*** • consistent significant figures ***or*** same number of decimal places • consistent units • units should be in header only		**2**	C

6			17	B

	1 mark	**2 marks**	**3 marks**	**4 marks**	***Notes***
1.V	Explicitly states IV as temperature ***or*** DV as biomass	Explicitly states IV as temperature ***and*** DV as biomass	Explicitly states IV as temperature ***and*** DV as biomass ***and*** one CV	Explicitly states IV as temperature ***and*** DV as biomass ***and*** two CVs	*Only requirement is to state using the terminology of IV, DV and CV. No need to explain further.* ***Do not accept "****keeping equipment the same" as a CV.* ***Do not accept*** *calculated values as DV unless explicitly shown how calculated from measured values.*
2.H	Formulates a hypothesis connected to the variables but not explicitly linked to the DV	Formulates a hypothesis correctly linked to the DV	Formulates a hypothesis correctly linked to the DV with correct scientific reasoning		
3.E	Specified equipment to measure biomass	Specified equipment to measure biomass ***and*** monitor any CV			*Equipment needs to be correct for the given situation and stated CVs.* ***Do not accept*** *oven or incubator as this is mentioned in the question / instructions.*
4.M	Method is linked to IV ***or*** DV	Method is linked to IV ***and*** DV but is incomplete	Method linked to IV ***and*** DV and can be followed	Method linked to IV ***and*** DV and can be followed and include details on how to control main CVs and mushrooms are dried to measure biomass	*A method that does not include how to vary the IV is incomplete.* *Limited information about CVs mean that data is unlikely to be relevant*
5.D	Any reference made to different variations of the IV	At least five variations of the IV ***or*** at least three trials	At least five values of the IV ***and*** at least three trials		*The values of the five or more variations should be explicitly stated for 3 marks*
6.S	Care with hot oven ***or*** do not eat mushrooms				***Do not accept*** *general considerations not linked to the specific investigation, e.g. wear a mask, tie hair back*

7	**a**	 All correct		1	D
	b	(leads to) increased availability of nutrients ***Accept any reasonable effect, for example [max 1]*** • increased food • increased raw materials • better organism health		2	D
	c	Increase in atmospheric carbon (dioxide) Less carbon stored in living organisms Increase in carbon in oceans ***or*** increase in carbonates in oceans ***Accept three reasonable explanatory points from the list only, [max 3]*** • due to less photosynthesis (as fewer trees) • increased combustion (from burned trees) • fewer trees to store carbon • fewer organisms to store carbon (as less food, habitats) • (as) more CO_2 is dissolved (from the atmosphere)		**6**	D
	d	***Accept any reasonable suggestions, for example [max 1]*** • reduction in biodiversity • disruption of the water cycle • soil degradation ***or*** erosion • habitat destruction ***or*** forced migration • urbanization		**1**	D

8			16	D

1.R (two reasons to regenerate forests)		
Mark	**Descriptor**	**Examples**
1	A statement	Statements • more resources • renewal of habitats • protect / promote/ increase biodiversity
2	Two statements	

2. S (a scientific explanation of why planning for regeneration is important)		
Mark	**Descriptor**	**Examples**
1	A statement	Statements • soil must be prepared • weeds must be removed • seeding trees to remain must be selected • need to plan timing of cutting down • need to plan for storage of seeds • nutrients must be added to prepare soil • healthiest trees are selected Support linked to science • to provide optimal conditions for growth • weeds removed to reduce competition • healthiest trees are selected • trees must be cut down before they release seeds • other trees must be removed to reduce competition • need space for machinery to get through • proper storage to increase chances of successful germination • to maximise seed production
2	A statement with further support ***or*** Two statements	
3	Two statements with further support for one	
4	Two statements with further support for both	

3.En (a discussion of different environmental consequences for two methods)		
Mark	**Descriptor**	**Examples**
1	One environmental consequence is stated	Consequences • herbicide use can affect wildlife • use of heavy machinery • airplanes used to spray forests • carbon emissions from transportation • refrigerated storage or vehicles required • large volume of water needed for seedlings Discussion points linked to a method • (herbicide use) linked to bioaccumulation, impact on the food chain, biodiversity • physical damage to the ecosystem • pollution from airplane • contributes to climate change • high energy usage for refrigeration • infrastructure required to water seedlings
2	Two different consequences are stated	
3	A consequence with further discussion is given for one method and a different consequence for the second method is stated	
4	A different consequence with further discussion is given for each method	

4.Ec (a discussion of different economic considerations for two methods)		
Mark	**Descriptor**	**Examples**
1	One consideration is stated	Considerations • cost of nutrients or fertilizer • cost of machinery • production costs are lower in natural regeneration
2	Any two different considerations are stated	Discussion points • fertilizer is a one-time cost or not an on-going cost • nutrients or fertilizer are required so that the trees grow • machinery is timesaving or more efficient • avoids manual labour costs • naming a process that occurs does not occur in natural regeneration (transport)
3	A consideration with further discussion is given for one method ***and*** a different consideration for the second method is stated	
4	A different consideration with further discussion is given for each method	

5.C (a concluding appraisal justifying your opinion of which is the best method of regeneration)		
Mark	**Descriptor**	**Examples**
1	A concluding opinion	Concluding opinion • direct seeding is best because the plants will grow well Specific detail or justification • although direct seeding isn't as good for the environment as natural regeneration its more efficient growth gives it the edge • GM seedlings require less time to mature and provide more economic benefits to the local area
2	A concluding appraisal with justification that includes specific detail	