Markscheme

November 2021

Biology

On-screen examination

16 pages

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

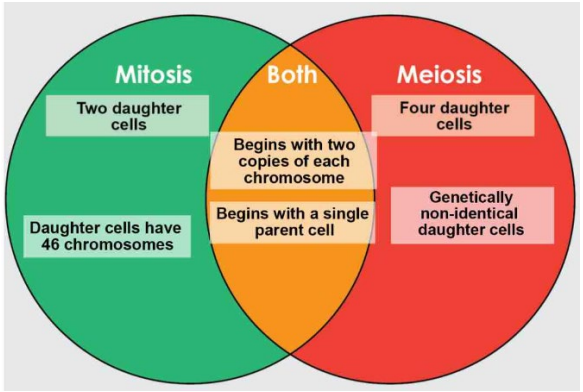
Annotation	Explanation
	Correct point, place at the point in the response where it is clear that the candidate deserves the mark. For use in analytically marked questions only.
	Omission, incomplete
CON	Contradiction
	Valid part (to be used when more than one element is required to gain the mark)
	Error 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

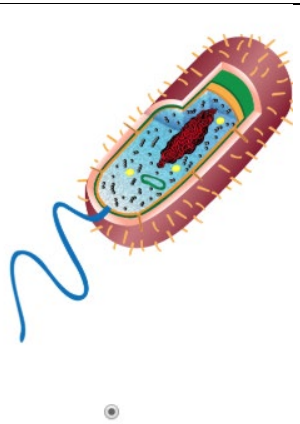
Markscheme instructions

1 Mark positively. Give candidates credit for what they have achieved and what is correct. Do not deduct marks for incorrect responses.
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 <u>underlined</u> 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	Criterion
1	a	Mammal		**1**	A
	b	***Pollination*** (pollen needs to be transferred from one plant to another) for reproduction ***or*** (pollen needs to be transferred from one plant to another) to increase variation ***Seed dispersal*** (seeds are transported away from parent plant for) better chance to survive ***or*** increased chance to grow ***or*** decreased competition	*Do **not** accept a description of pollen moving alone*	**2**	A
	c	palm tree ***or*** eucalyptus ***or*** mango tree ***or*** grass	*Do **not** accept tree alone*	**1**	A
	d	***Advantage*** (flying fox) eats moth larvae (which would destroy the mango crop) ***or*** (flying foxes) act as pollinators ***Disadvantage*** the flying foxes eat mango (so profit is decreased)	*Accept references to seed dispersal*	**2**	A

2	a	***Any two from [max 2]*** • growth • repair ***or*** replacement • (sexual) reproduction ***or*** to produce gametes • (asexual) reproduction	*Allow reproduction alone for one mark*	**2**	A
	b	 one correctly placed in mitosis ***and*** both ***and*** meiosis ***or*** mitosis ***or*** ***"***both"***or*** meiosis fully correct all correctly placed		**2**	A
	c	every individual has different genetic material every sex cell / gamete is unique genetic material from two parents is combined ***A further point, for example [max 1]*** • every sex cell / gamete has an equal chance of being fertilized • the offspring express traits from both parents or an individual is unique from both parents	*Allow reference to characteristics or traits* *Allow reference to sperm and egg*	**4**	A

3	a	nervous system cardio-vascular system ***or*** muscular system		**2**	A
	b	the nervous system detects ***or*** communicates (the reduction in temperature) causing vasoconstriction / blood vessels narrow ***or*** blood is diverted away from extremities (thereby) reducing heat loss ***Or*** the nervous system detects ***or*** communicates (the reduction in temperature) causing hairs to rise (thereby) reducing heat loss ***Or*** the nervous system detects ***or*** communicates (the reduction in temperature) causing shivering / involuntary muscle contractions produce heat ***or*** increased cellular respiration (in the muscles)	*ORA*	**3**	A
	c	enzymes have an optimum temperature too cold ***and*** reactions do not occur fast enough too hot ***and*** enzymes change shape and no longer function ***Correct use of a term from the list:*** active site; denature; catalyze; lock and key; substrate	*Do **not** accept die* *WTTE*	**5**	A D

4	a			**1**	A
	b	A		**1**	C
	c	***Qualitative data, for example [max 1]*** • colour • form • elevation • margin ***Quantitative data, for example [max 1]*** • number of colonies • measurement of size or diameter or radius	*Allow named examples*	**2**	C
	d	***An RQ linking different disinfecting agents*** ***With an implied DV for example [max 1]*** • zone of no growth • growth of bacteria • presence / absence of bacteria		**2**	B

<table>
<tr><td></td><td>e</td><td>IV: type of disinfectant

DV: diameter of zone of inhibition or clear zone around disk

Any two reasonable CV, for example [max 2]
• species of bacteria on the plate
• size of disk
• time of immersion of disk
• concentration of the disinfectant
• time period of bacterial growth</td><td>Do not accept growth, DV must be measurable</td><td>4</td><td>B</td></tr>
<tr><td></td><td>f</td><td>Any reasonable suggestion relating to sterility of disk or water, for example [max 1]
• it shows that the effect is not caused by the disk or water
• zone is caused by disinfectant (not disk, water, movement of liquid)
• it is a negative control
• to measure how effective water is as a disinfectant</td><td></td><td>1</td><td>B</td></tr>
<tr><td></td><td>g</td><td><table><tr><th>Liquid</th><th>Diameter of zone of no growth on plate 1 / mm</th><th>Diameter of zone of no growth on plate 2 / mm</th></tr><tr><td>bleach</td><td>22</td><td>24</td></tr><tr><td>ethanol</td><td>9</td><td>7</td></tr><tr><td>hydrogen peroxide</td><td>27</td><td>13</td></tr><tr><td>iodine</td><td>17</td><td>15</td></tr><tr><td>water</td><td>0</td><td>0</td></tr></table>two measurements correct to ± 1 mm

all measurements correct to ± 1 mm</td><td></td><td>2</td><td>C</td></tr>
</table>

	h	***Any reasonable strength, for example [max 1]*** • a range of disinfectants produced results that can be compared • a control (water) was used • reference to reliability of data linked to a named control variable ***Any reasonable weakness, for example [max 1]*** • only two trials • results cannot be verified with only two data points • cannot identify outliers • data for hydrogen peroxide was not reproducible ***Two additional statements from either list***	*ORA accept either but not both*	**4**	C

5	a	***Stage 2*** bacteria sensitive to an antibiotic are killed by it ***or*** only resistant individuals survive ***Stage 5*** no bacteria are killed (as all are resistant) ***or*** population of resistant bacteria increases (as antibiotic has no effect)	*Do **not** accept references to immunity*	**2**	A
	b	<table><tr><td>2010</td><td>6.0</td></tr><tr><td>2011</td><td>5.0</td></tr><tr><td>2012</td><td>6.5</td></tr><tr><td>2013</td><td>8.1</td></tr><tr><td>2014</td><td>8.9</td></tr></table> two data points plotted correctly ±0.1 for percentages all data points plotted correctly ±0.1 for percentages		**2**	C
	c	Trimethoprim ▾ it has the zone which is largest ***and*** clear(est) ***An attempt at a scientific explanation, for example [max 1]*** • there are no resistant bacteria so the zone is clear • (trimethoprim) is effective at a lower concentration (than the other antibiotics)		**3**	C
	d	the light absorbed increases as population of bacteria increases ***or*** positive relationship proportional ***or*** linear relationship	*Award two marks for directly proportional*	**2**	C

	e	***Two points from each stage [max 2]*** ***Stage 1*** • slow growth • plentiful resources • few bacteria to reproduce ***Stage 2*** • rapid ***or*** steady population growth • plentiful resources • many bacteria to reproduce ***Stage 3*** • no (net) population growth • (because) as many bacteria are dying as are reproducing • limiting factors are present	*Ignore names of stages* *Do **not** accept bacteria stop reproducing*	**6**	C

<table>
<tr>
<td>6</td>
<td></td>
<td>
<table>
<tr><th></th><th>1</th><th>2</th><th>3</th><th>4</th></tr>
<tr><td>V

(Identification of IV and DV)</td><td>Some variables are referred to that are connected to the problem but these may not be explicitly identified</td><td>concentration of salt solution identified as IV
or
% absorption identified as DV</td><td>concentration of salt solution identified as IV
and
% absorption identified as DV</td><td></td></tr>
<tr><td>CV (Control variables)</td><td>one control variable is identified</td><td>two control variables are identified</td><td></td><td></td></tr>
<tr><td>H (Hypothesis)</td><td>Formulates a hypothesis connected to the variables but not explicitly linked to IV or their DV</td><td>Formulate a testable hypothesis correctly linked to the IV and their DV (no explanation)</td><td>Formulate a testable hypothesis correctly linked to the IV and their DV with reference to osmosis or dehydration</td><td></td></tr>
<tr><td>M

(Manipulation of variables/ description of method)</td><td>Attempt at a method but detail is insufficient for manipulation of variables</td><td>Partial method is described with detail sufficient for CV and IV
or
CV and their DV</td><td>Partial method is described with detail sufficient for IV
and
their DV
and
one CV</td><td>Method is described with detail sufficient for IV
and
their DV
and
two CV</td></tr>
<tr><td>D

(Collection of data)</td><td>Plans to repeat at least three trials for a single concentration
or
measures for at least five different concentrations</td><td>Plans to repeat at least three trials
and
measures for at least five different concentrations</td><td>Plans to repeat at least three trials
and
measures for at least five different concentrations
and
range includes 0% concentration</td><td></td></tr>
<tr><td>S

(Safety)</td><td>A general comment relating to safety</td><td>A safety comment relating specifically to the safe handling or disposal of bacteria</td><td></td><td></td></tr>
</table>
</td>
<td>17</td>
<td>B</td>
</tr>
</table>

7	**a**	(coronary) <u>artery</u> narrows ***or*** is obstructed less (oxygenated) blood reaches the heart muscle / tissue ***or*** making blood flow more difficult the heart (muscle) is unable to respire sufficiently **or** cannot beat	*WTTE*	**3**	D
	b	inflating the balloon increases the diameter of the artery ***or*** squashes the plaque ***or*** keeps artery open allowing more blood to flow ***or*** making it easier for the blood to flow heart does not need to pump as hard (to supply the same volume of blood)	*WTTE*	**3**	D
	c	prevents ***or*** slows the pathway ***or*** reactions (that produce cholesterol) from occurring (because) statin molecule blocks the enzyme's <u>active site</u>	*Do **not** accept "affects the active site"*	**2**	D
	d	***Angioplasty*** ***Advantages, for example [max 1]*** • effective over a long time / one-time procedure • short recovery time from surgery ***Disadvantages, for example [max 1]*** • possible risk of complication (heart attack) / infection during surgery • risk of a clot developing near the stent / thrombosis • scar after surgical procedure • does not lower cholesterol levels ***Statins*** ***Advantages, for example [max 1]*** • reduce the amount of (LDL) cholesterol • increase the amount of HDL cholesterol • prevents other diseases ***Disadvantages, for example [max 1]*** • must be taken regularly / long term • possible side effects e.g. headache, nausea, reduction in vitamin D/hormones • effect is not instant – takes time to work.	*Allow generic advantages / disadvantages such as cost, waiting times, doesn't change behaviour/address underlying causes, links to genetics etc* *Take care to ensure each point is only awarded once* *Accept "bad" for LDL cholesterol and "good" for HDL cholesterol*	**4**	D

8

	1	2	3	4
impact on quality of life	A reduced quality of life is implied	A statement of one impact on quality of life	Statements of more than one impact on quality of life	Statements of more than one impact on quality of life with further support for at least one impact
economic	An advantage ***or*** disadvantage is implied	A statement of an advantage ***and*** a disadvantage ***or*** a statement of an advantage ***or*** a disadvantage that is justified clearly linked to economic factor	A statement of an advantage ***and*** a disadvantage ***and*** justification for one of these clearly linked to economic factor	A statement of an advantage ***and*** a disadvantage ***and*** justification for both clearly linked to economic factor
Individual	A statement of an individual's responsibility is implied	A statement of an individual's responsibility with justification ***Or*** Two statements of an individual's responsibility	More than one statement of an individual's responsibility with justification	
Society	A statement of a responsibility of society is implied	A statement of a responsibility of society with justification ***Or*** Two statements of a responsibility of society	More than one statement of a responsibility of society with justification	
Conclusion	A conclusion is given			

15 D