COMPONENT 1 - Concepts in Biology

HIGHER TIER

MARK SCHEME

GENERAL INSTRUCTIONS

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (apart from the questions where a level of response mark scheme is applied).

Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.

Crossed out responses not replaced should be marked.

Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statement.

Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao = correct answer only
ecf = error carried forward
bod = benefit of doubt

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
1	(a)			Cross the rose with large red flowers and thorns with the rose with small red flowers and few thorns (1) Grow seeds and select those with largest red flowers and fewest thorns and self-fertilise them (1) Grow seeds and select again those with largest red flowers and fewest thorns. Continue this process until all plants have large red flowers and few thorns.(1)		3		3		
	(b)	(i)		They have the same genotype/same genes/clones	1			1		
		(ii)		No potentially advantageous variation/resistance to disease (1) Could spread a harmful mutation (1)	2			2		
	(c)			Correct gametes Rr x Rr (1) Correct outcome: RR Rr Rr rr (1)		2		2		
				Question 1 total	**3**	**5**	**0**	**8**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
2	(a)			First row: Relaxes and fills with blood (1) Open (1)Closed (1) Second Row: Contracts to force blood through aorta (1)Closed (1)Open (1)	6			6		
	(b)			Ventricles have more muscle in walls (1) to force/pump blood a greater distance (1)	2			2		
				Question 2 total	**8**	**0**	**0**	**8**	**0**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)		A: Muscle contracts (1) B: Hair becomes erect (1) Air movement over skin reduced to reduce heat loss (1)	3			3		
		(ii)	I	Vessels widen/increase diameter so more blood flow near skin surface (1) More heat radiated/loss (from surface) (1)	2			2		
			II	Less/ no evaporation of sweat possible (1) So less heat loss from skin (1)	2			2		
	(b)	(i)		Exercise linked to increased sweating in both (1) Increase is less in athletic/ trained people (1)			2	2		
		(ii)		(0.6-0.5)/0.5 x100 (1) 20% (1)		2		2	2	
		(iii)		Males reach higher body temperature / Return to normal temperature more quickly(than females)			1	1		1
		(iv)		Faster cooling in males is accompanied by higher rates of sweating during exercise			1	1		1
		(v)		Ensure all of same age/ take reading at same body part			1	1		1
				Question 3 total	**7**	**2**	**5**	**14**	**2**	**3**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
4	(a)			Undifferentiated/unspecialized cells (1) which can become any type of cell/any specialized cell (1)	2			2		
	(b)	(i)		Unlikely to be rejected/more likely to be accepted as they are genetically identical	1			1		
		(ii)		Embryos	1			1		
				Question 4 total	**4**	**0**	**0**	**4**	**0**	**0**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
5	*(a)*			There is more fat in milk A than in milk B			1	1		1
	(b)			Lipase had digested/broken down/hydrolysed (1) fat to fatty acid [and glycerol] (1)		2		2		2
	(c)	(i)		It would stay at pH7			1	1		1
		(ii)		There is no substrate/fat in B		1		1		
	(d)			Boiling denatures enzyme (1) by altering the active site (1) Enzyme-substrate complex cannot form (1) so no product/fatty acid can be produced (1)		4		4		4
				Question 5 total	**0**	**7**	**2**	**9**	**0**	**8**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)		Thymine.adenine.guanine.thymine.cytosine.cytosine All 6 correct = 2 marks 5 correct = 1 mark	2			2		
		(ii)		2		1		1		
		(iii)		60% of 4000 = G + C = 2400 bp (1) Therefore A + T = 1600 bp Therefore A = 800 bp (1)		2		2	2	
	(b)			Phosphate (1) Linked to sugar (1) Linked to base (1)	3			3		
	(c)			The code for one or more amino acid is/are changed. (1) Sequence of amino acids is changed (1) Adrenaline is not produced (1)	1	 1 1		 3		
				Question 6 total	**6**	**5**	**0**	**11**	**2**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
7	*(a)*	(i)		Day 5 and day 17		1		1	1	
		(ii)		Menstruation		1		1		
		(iii)	I	Ovulation/triggers production of Luteinising Hormone	1			1		
			II	Preparation of uterus for pregnancy	1			1		
	(b)	(i)		FSH		1		1		
		(ii)		Causes follicles to grow (1) which produce oestrogen (1)	2			2		
		(iii)		Day 14	1			1	1	
		(iv)		Progesterone remains high		1		1		
				Question 7 total	**5**	**4**	**0**	**9**	**2**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
8	(a)			immigration(1) emigration(1) predation (1)	3			3		3
	(b)	(i)		Recessive	1			1		
		(ii)		In Adalia the background colour or colour of spots (1) The genotype is the genetic composition/constitution of an organism/its genes/genome/DNA (1)	1	1		2		
				Question 8 total	**5**	**1**	**0**	**6**	**0**	**3**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
9	(a)	(i)		Arrow on X pointing into capsule **+** Arrow at Y pointing away		1		1		
		(ii)		Q is narrower than P to increase pressure (1) for ultrafiltration (1)		2		2		
	(b)	(i)		Molecules of protein are too big to pass through filter		1		1		
		(ii)		All the glucose is reabsorbed in the tubule		1		1		
		(iii)		Some water is reabsorbed in the tubule		1		1		
	(c)			2600 – 150 = 2450. (2450 / 2600) × 100 (1) 94.23 (1)		2		2	2	
	(d)			The volume of water in B would decrease(1) The concentration of salts would increase (1) Concentration of urea would increase (1)	3			3		
				Question 9 total	**3**	**8**	**0**	**11**	**2**	**0**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
10	(a)			Bacteria produced an enzyme (1) Enzyme broke down urea into ammonium carbonate which is alkali/pH8 -11 (1)		1	1	2		2
	(b)			Burning the soil killed the bacteria (1) Enzyme denatured/active site destroyed (1) so contents remained neutral/pH7 (1)		1	1 1	3		3
				Question 10 total	**0**	**2**	**3**	**5**	**0**	**5**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
11	(a)	(i)		**Most** bacteria not killed/resistant to antibiotic			1	1		1
		(ii)		**Some** bacteria resistant to antibiotic/**most** are killed			1	1		1
		(iii)		**None** are resistant to antibiotic/ **all** are killed			1	1		1
	(b)			Same Petri dish and agar **and** Same size bacteria culture (1) No antibiotic (1)			2	2		2
	(c)			They are now resistant to antibiotic B **and** One has mutated to become resistant to antibiotic C			1	1		
				Question 11 total	**0**	**0**	**6**	**6**	**0**	**5**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
12	(a)	(i)		As a control/for comparison/to see the effect of removal of starfish	1			1		1
		(ii)		Equal size of area studied/same method of sampling/ same area studied		1		1		1
	(b)			More competition for food for limpets/ Barnacles and mussels increased because of less predation (1)			1	1		
	(c)			Barnacles, sea anemones, mussels compete for food with sponges (1) Sponges decrease (1) Less food for sea slugs (1)		1 1	 1	3		
				Question 12 total	**1**	**3**	**2**	**6**	**0**	**2**

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
13	(a)	(i)		$\frac{34}{800}$ (1) 0.0425 mm (1)		2		2	2	
		(ii)		radius = $\frac{0.0425}{2}$ = 0.02125 area = π x 0.02125^2 (1) = 0.00141881 = 0.0014 mm^2 (1)		2		2	2	
	(b)			A = transport (1) pits enable water (and ions) to leave xylem and pass into surrounding tissues (1) B = support (1) rings of lignin strengthen xylem vessel walls (1)	4			4		
	(c)	(i)		water moves into root cells by osmosis down a water concentration gradient (1) if plugged water cannot move up xylem and water concentration increases in root tissues (1) water concentration gradient between soil and root tissues reduced so less uptake of water (1)		3		3		
		(ii)		leaves no longer produce sugars (1) roots no longer receive sugars for respiration and die (1)			2	2		
	(d)	(i)		biological control involves using one organism to control the population of another (1) *P. pupurogenum* causes 100% death of *M.laxa* (1)	1		1	2		

Question				Marking details	Marks Available					
					AO1	AO2	AO3	Total	Maths	Prac
		(ii)		**laboratory** enzymes are specific so experiments needed to confirm that enzymes produced by *P.purpurogenum* will break down / digest the cell wall of the fungus that causes Ash Dieback Disease (1) **field trials** need to make sure that *P.purpurogenum* will only act against target species / does not affect useful species of fungus can itself be controlled in the wild (1)	1	1		2		2
				Question 13 total	**6**	**8**	**3**	**17**	**4**	**2**

Question				Marking details	Marks available					
					AO1	AO2	AO3	Total	Maths	Prac
14	*(a)*			On the mainland there is a large population of butterflies that can breed over a large area due to not having to cross large expanses of water. (AO2) Only small numbers colonised each island. (AO3) Probably separate colonisation events as butterflies [won't cross open water]. (AO3) Butterflies colonising islands may have had non-standard distribution of spots (AO2) so some spot numbers became more common as they were more likely to reproduce. (AO3) Each island may have had different plant species so different selection pressures in place on each island.(AO2) Different numbers of spots may give better camouflage to adults under different conditions.(AO2) **5-6 Marks** Clear understanding that mainland butterflies have no / few barriers to breeding but island populations can only breed amongst themselves due to the sea forming a barrier between the islands. Explains that original populations blown to the islands may have had a different distribution of spots to normal and so more genes present for more / less spots. Also suggests that plants present could act as selection pressures on caterpillars or adults leading to greater survival of some butterflies than others, hence, the change in the spot numbers. *There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The information included in the response is relevant to the argument.*		**3**	**3**	**6**		

				3-4 Marks: Understands that different selection pressures could be acting on the caterpillars and adults on the islands compared to the mainland. That these pressures could result in the greater survival of some spot numbers than others and hence the change in spot number distribution. Some attempt is made to explain that the original populations may not have had the normal distribution of spot numbers seen on the mainland but does not clearly relate this to different gene distributions or to island populations not being able to interbreed. *Mainly relevant information is included in the response but there may be some minor errors or the inclusion of some information not relevant to the argument.* **1-2 Marks** Explains different distributions in terms of mutation, variation, advantage and survival. Does not relate distributions to different plants present and therefore different survival rates and has no understanding of colonising populations having different spot distributions to the normal seen on the mainland. *There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure*. *There may be significant errors or the inclusion of information not relevant to the argument.* **0 marks:** *No attempt made or no response worthy of credit.*						
				Question 14 total	**0**	**3**	**3**	**6**	**0**	**0**