

BIOLOGY

Unit 4

Trial Examination

SOLUTIONS BOOK

Use this page as an overlay for marking the multiple choice answer sheets. Simply photocopy the page onto an overhead projector sheet. The correct answers are open boxes below. Students should have marked their answers with a cross. Therefore, any open box with a cross inside it is correct and scores 1 mark.

1.	A	B		D
2.	A	B		D
3.	A		C	D
4.		B	C	D
5.	A		C	D
6.		B	C	D
7.	A	B		D
8.	A	B		D
9.	A	B	C	
10.		B	C	D
11.	A		C	D
12.	A	B	C	
13.	A		C	D

14.		B	C	D
15.		B	C	D
16.	A	B	C	
17.	A	B	C	
18.	A		C	D
19.		B	C	D
20.	A	B	C	
21.	A	B		D
22.	A	B		D
23.	A		C	D
24.		B	C	D
25.		B	C	D

TEACHERS, PLEASE NOTE:

In marking the Exam, teachers should keep in mind that the language used in the suggested answers is sometimes more sophisticated than a student would offer since these answers are written for teachers' information in their correction of the Exam.

*The answers suggested here might not be the only correct responses possible. Teachers must use their professional judgement in awarding marks for other answers offered. However, in accordance with the VCAA practice, students who give a correct response, and then offer a contradictory incorrect response within the same part of the question, should **not** be awarded any marks for the correct part of the response. Also in accordance with the VCAA practice, no half marks should be given.*

SECTION A - MULTIPLE CHOICE QUESTIONS (1 mark each: 25 marks)

1	C	16	D
2	C	17	D
3	B	18	B
4	A	19	A
5	B	20	D
6	A	21	C
7	C	22	C
8	C	23	B
9	D	24	A
10	A	25	A
11	B		
12	D		
13	B		
14	A		
15	A		

SECTION B - WRITTEN RESPONSES**Question 1**

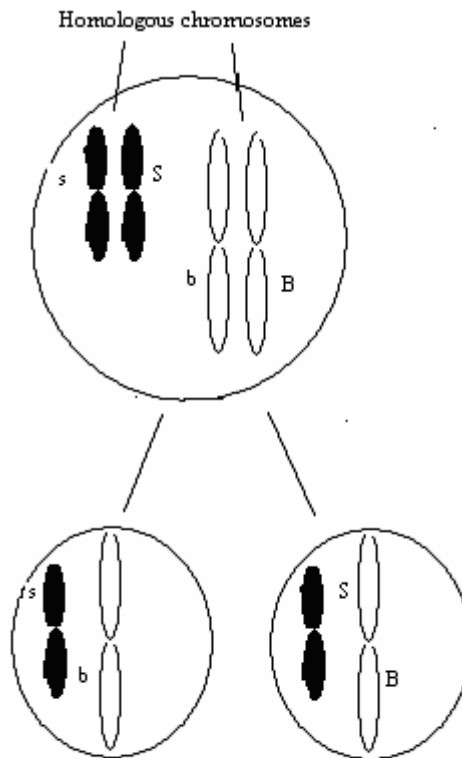
- a Recessive 1 mark
- b In generation I the parents have had a son with the condition when they do not have the condition. (Or any other situation on the pedigree that has the same result). 1 mark
- c This is a point mutation when one nucleotide is replaced with another. 1 mark
- d Normal haemoglobin – proline, tryptophane, threonine, glutamine, arginine, phenylalanine stop.
Beta thalassaemia – proline, tryptophane, threonine stop. 2 marks
- e At codon 39, the mutation results in a stop codon (1) therefore the polypeptide formed is very small and probably unable to form a functional protein (1). This would result in a more severe form of Beta thalassaemia. 2 marks

Total Question 1: 7 marks

Question 2

- a *Independent assortment means that the segregation of one pair of homologous chromosomes and its alleles during the first stage of meiosis does not influence the segregation of other homologous pairs of chromosome.*

1 mark



This could have been *s* with *B* and *S* with *b*.

1 mark for labeling a pair of homologous chromosomes and 1 mark for showing their separation into different cells.

2 marks

- b *Genotype of mother – bbSs*

Genotype of father – BbSs

2 marks

The mother is red therefore must be homozygous as this is recessive (1). Some of the pups are red therefore the father must be heterozygous for colour (1). Both parents are solid in colour which is dominant, but they have offspring that are spotted therefore they both must be heterozygous for patterning (1).

3 marks

- c *Pup no. 6 (1)*

Pup 6 is red and spotted. Both these traits are recessive (1) therefore the pup has to be homozygous for both traits and therefore the genotype is known.

2 marks

- d *6 – bbss*

1 mark

Total Question 2: 11 marks

Question 3

- a Incomplete dominance (1) because the heterozygous condition CC^r is different from the homozygous states CC and C^rC^r in the phenotype displayed (1). 2 marks
- b To breed true means that the individual is homozygous for that gene and all gametes produced will have the same alleles for that gene. 1 mark
- c Parents $CC^r \times CC^r$

	C	C^r
C	CC	CC^r
C^r	CC^r	C^rC^r

(1 mark for correct working)

F_1 $\frac{1}{4} CC + \frac{1}{2} CC^r + \frac{1}{4} C^rC^r$

$\frac{1}{4}$ reddish brown, $\frac{1}{2}$ golden, $\frac{1}{4}$ nearly white (1 mark for correct ratios of phenotypes.)

- d 50% CC and C^rC^r 1 mark
- e Reddish brown CC crossed with cremello C^rC^r will produce all palominos every time (1) as the C allele is inherited from one parent and C^r allele from the other giving CC^r resulting in palomino (1). 2 marks

Total Question 3: 8 marks

Question 4

- a Restriction enzymes come from bacteria. 1 mark
- b Different restriction enzymes cut the DNA at a particular base sequence and hence will be specific for that base sequence. 1 mark
- c A DNA probe is a single strand sequence of DNA (1) that has a base sequence complementary to the target DNA being investigated (1). 2 marks
- d It would appear that the fourth child is probably not the child of the parents (1) as he does not have a VNTR region that corresponds to either parent (1). 2 marks

Total Question 4: 6 marks

Question 5

- a These countries were once joined together in one large land mass (Gondwana) (1) and these fish must have evolved from an earlier lineage before the land mass broke up and the countries separated (1). 2 marks
- b By carrying their eggs and fry in their mouths their offspring are protected against predation and therefore these fish can have fewer offspring than other fish. 1 mark
- c Convergent evolution. 1 mark
- d Genetic drift is the change in allele frequencies in a population due to chance. 1 mark
- e The cichlids that survived would have been the ancestors of the populations of cichlids in the lakes. 1 mark
- f Founder effect or principle. (Could also accept population bottleneck) 1 mark
- g
- The populations had become isolated from each other in the small pockets of water.
 - These populations would have undergone mutations.
 - Those mutations that were favourable would have been selected in the different environments.
 - When the populations came back together in the one lake they were sufficiently different enough to be reproductively isolated and therefore different species.

4 marks

Total Question 5: 11 marks

Question 6

- a Mitochondrial DNA is a circular DNA molecule found as multiple copies in mitochondria which are organelles in the cytoplasm of the cell. 1 mark*
- b Nuclear DNA is subjected to more shuffling due to sexual reproduction than mitochondrial DNA (1) and mitochondrial DNA evolves more rapidly than nuclear DNA and is therefore convenient for studying the closeness of species (1). 2 marks*
- c The older the mitochondrial DNA is, the more mutations it will show compared to modern mitochondrial DNA and hence the human mitochondrial DNA has been slowly diverging from the mitochondrial DNA of previous generations. The amount of variation or mutations is roughly equal to the amount of time that has past. 1 mark*
- d To amplify and extract many short strands of mitochondrial DNA from the sample. 1 mark*
- e There is no discernable difference in the mitochondrial DNA of Cro Magon man and modern man whereas there is a difference between modern man and Neanderthal man (1). This would suggest that Cro Magon man is a direct ancestor of Modern man and therefore Neanderthal man and Cro Magon did not interbreed (1). 2 marks*

Total Question 6: 7 marks

Total Section B: 50 marks

Total examination: 75 marks

END OF SUGGESTED SOLUTIONS