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BIOLOGY
Unit 4
Trial Examination

SOLUTIONS BOOK

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

SECTION B - WRITTEN RESPONSES

48 marks – omit 5C (1mark)
CHANGES: Q6ci – 1mark. ~~6ci – 2 marks~~

Question 1

a *The type of cell division is the first stage of meiosis (metaphase I) (1). There has been crossing over that does not occur in mitosis and pairs of chromosomes are separating (1).* *2 marks*

GE; HF / ge; hf

GgEe HhFf *1 mark*

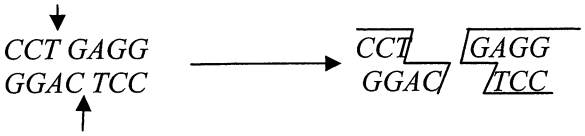
c *Any two of: GeHF, GehF, GeHf, Gehf, geHF, gehF, geHf, gehf, gEHF, gEhF, gEHf, gEhf, GEHF, GEhF, GEHf, GEhf.* *2 marks*

Total Question 1: 5 marks

Question 2

a *Point mutation /substitution* *1 mark*

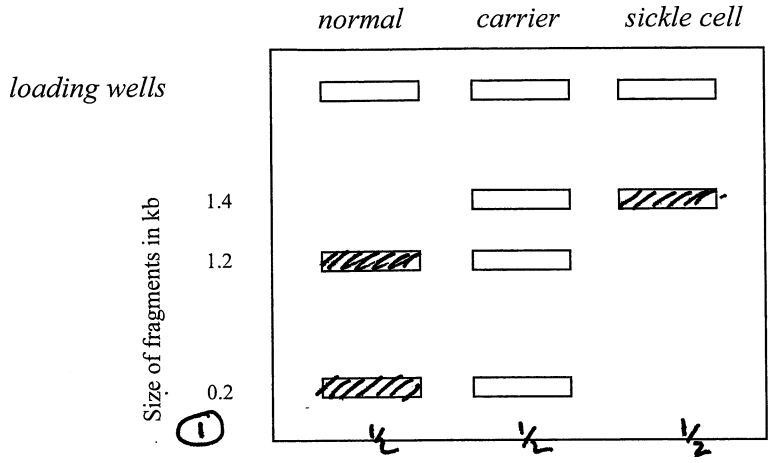
b



1 mark

c *The change of nucleotide A to T in sickle cell anaemia (1) results in a loss of recognition site for MstII and therefore will not be cut at that site (1).* *2 marks*

d



All 3 correct for 3 marks (1 mark per column) *3 marks*

Total Question 2: ***7 marks***

Question 3

a *On the circular DNA chromosome in the cytoplasm.* *1 mark*

b *Organisms need to regulate the expression of their genes so that energy and materials are not wasted.* *1 mark*

c *Molecule X is the enzyme RNA polymerase.* *1 mark*

d *Transcription.* *1 mark*

e
- *When lactose binds to the repressor protein it changes its shape so that it can no longer bind to the DNA (1).*
- *RNA polymerase will be able to bind to the DNA and move along to transcribe mRNA (1).*
- *The mRNA will be able to be translated to form the enzymes necessary for lactose metabolism so the bacteria can use lactose as a substrate (1).*

3 marks

Total Question 3: ***7 marks***

Question 4

a *A small circular piece of DNA separate from the main chromosome.* / capable of independent replication. *1 mark*

b
- *Cut the plasmid with a particular restriction enzyme, creating sticky ends and cut the herbicide resistant gene using the same restriction enzyme (1).*
- *Mix the herbicide resistant gene and the cut plasmids with the enzyme DNA ligase so that their sticky ends join (1).*
- *The plasmids, containing the herbicide resistant gene, are then reinserted into the bacteria Agrobacterium and these bacteria are then used to infect crop plants (1).*

Clear

3 marks

• Selection of modified cells (crop)

Total Question 4: ***4 marks***

Question 5

a *Diatoms live in water and this provides a low oxygen environment that favours fossilisation (1).*
Diatoms have a hard silica skeleton that is hard to breakdown so is easily fossilised (1). *2 marks*

b *Scientists can count the ribs/spines/pores (any one for one mark).* *1 mark*

Omit c

c *Phyletic evolution is where one ancestral species changes over time and is ultimately recognised as a new species.* *1 mark*

d *A transitional fossil will share characteristics of the two different species Stephanodiscus niagare-like ancestor and Stephanodiscus yellowstonesis.* *1 mark*

Darin.

e *As the temperature of the environment changed (1) those diatoms showing a slight favourable adaptation would have been selected for. This would have been repeated until a complete new species evolved (1).* *2 marks*

f. *The difference between Stephanodiscus niagare and Stephanodiscus yellowstonesis is so great and with no current intermediates that they can be assumed to be a separate species.* *1 mark*

Total Question 5: 8 marks

Question 6

a *Genetic diversity is the genetic variation within a population of a species.* *1 mark*

b *The numbers of cheetahs in the past dropped and as a result have gone through a genetic bottleneck.* *1 mark*

(1) c i *When conditions are favourable the population is able to increase rapidly due to low numbers and less competition for food and mates (1).*

ii *The graph indicates that genetic variation does not rebound from a decrease as quickly as population size because genetic variation will only slowly be restored as it relies on the accumulation of mutations over many generations (1).* *3 marks*

Dean d *The cheetahs with their low genetic variation would mean that none of the cheetahs had the right immune system gene variants to fend off the disease, whereas the lions with greater genetic variation were able to survive the virus.* compare. 1 mark

Ron. e *Genetic drift is the change in the relative frequency in an allele that occurs in a population due to chance events.* *1 mark*

Total Question 6: 7 marks

Question 7

a *Skull number one (1). The heavier eyebrow ridges/ the smaller brain case/ the more powerful jawbone (any one for one mark).* *2 marks*

Ariel b *As Homo neanderthalensis existed part of the time with Homo sapiens they would not be the ancestors of Homo sapiens but would have had a common ancestor.* *1 mark*

c *Homo neanderthalensis is better adapted to the cold than Homo sapiens (1). The body of Homo neanderthalensis has a smaller surface to volume ratio being short and stocky compared to Homo sapiens, so would lose less heat to cold surroundings (1).* *2 marks*

d *This would suggest that they shared a common culture as shown by the same artefacts, indicating communication and exchange of ideas between the groups.* *1 mark*

e *A larger brain, giving them the ability to communicate, problem solve and share a culture could have enabled Homo sapiens groups to band together (1). This could have resulted in Homo neanderthalensis not being able to compete for resources as well and being pushed out into more inhospitable terrain leading to their extinction (1).* *2 marks*

f *Mt DNA does not undergo recombination like nuclear DNA but is inherited down the female line (1). There is a high copy number in cells (1).* *2 marks*

g *The mtDNA difference between the Denisova hominin and Homo sapiens is greater than between Homo sapiens and Homo neanderthalensis (1) and this would tend to indicate that the Denisova hominin left Africa before Homo neanderthalensis and after Homo erectus (1).* *2 marks*

Total Question 7: 12 marks

The Denisova hominin is less related to Homo sapiens than H. neanderthal - ***Total Section B: 50 marks***

∴ between H. neand & H. erectos. ensis. ***Total examination: 75 marks***

END OF SUGGESTED SOLUTIONS