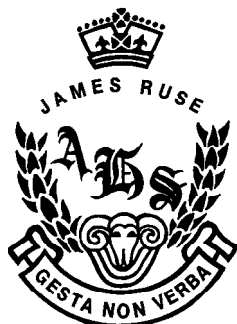


James Ruse Agricultural High School



HIGHER SCHOOL CERTIFICATE COURSE

2008 TERM 1 ASSESSMENT TASK – THEORY EXAMINATION

BIOLOGY

General Instructions

- Reading time – 5 minutes
- Working time – 35 minutes
- Write using black or blue pen
- Draw diagrams using pencil
- Write your Student Number on the top of the Part A and Part B Answer Booklet

Total marks for this paper: 26

This paper has two parts, Part A and Part B

Part A

Total marks (5)

- Attempt all questions
- Allow about 6 minutes for this part

Part B

Total marks (21)

- Attempt all questions
- Allow about 29 minutes for this part

Part A**Total marks (5)****Attempt all questions****Each question is worth one mark****Allow about 6 minutes for this part**

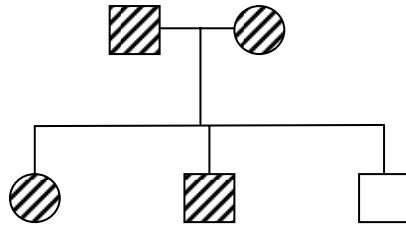
Select the alternative A, B, C or D that best answers the question and, using ink, place an X in the corresponding space in the table on your answer book

- A dominant allele is responsible for the human ability to taste a bitter chemical, phenylthiocarbamide (PTC). A heterozygous male for the condition marries a non-taster female. What is the chance of this couple having a non-taster child?
 - 0%
 - 50%
 - 75%
 - 100%
- Which adaptations are suitable for the survival of bony fish in marine water environments?

	function of special gland cells in gills	ingestion of water	urine composition
(A)	excrete salt	ingests (swallows)	concentrated
(B)	salt-absorbing	does not ingest	dilute
(C)	excrete salt	does not ingest	concentrated
(D)	salt-absorbing	ingests (swallows)	dilute

- Who was the scientist who proposed that the alleles of genes occurred on homologous chromosomes?
 - George Beadle
 - Gregor Mendel
 - Thomas Morgan
 - William Sutton

4. The pedigree shows the inheritance for a particular condition in a population of sexually reproducing organisms.



Key



affected male



normal male



affected female



normal female

What type of inheritance is exhibited by the condition?

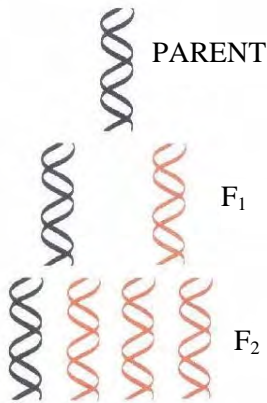
- (A) co-dominance
- (B) recessive
- (C) sex-linked dominant
- (D) sex-linked recessive

5. A piece of DNA is represented by the following diagram.

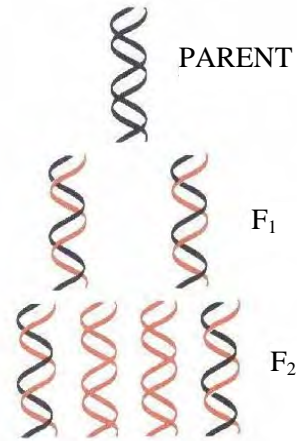


Which outcome of DNA replication would Watson and Crick predict for the F₁ and the F₂?

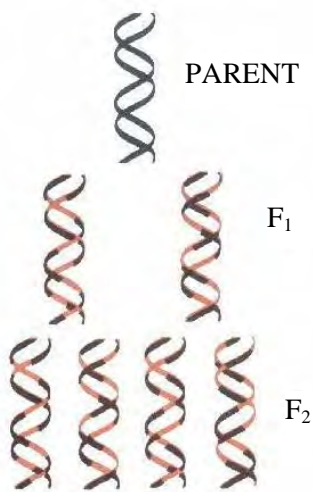
(A)



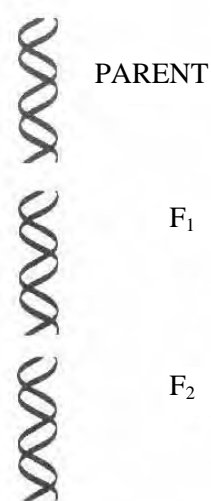
(B)



(C)



(D)



Part A and Part B Answer Booklet

Student Number	
Mark / 26	

Write your Student Number at the top of this page.

Part A

Total marks (5)

There are 5 questions in this part. Attempt all questions.

Each question is worth 1 mark.

Allow about 6 minutes for this part.

Select the alternative A, B, C or D that best answers the question and, using ink, place an X in the corresponding space in the table below.

	1	2	3	4	5
(A)					
(B)					
(C)					
(D)					

Part B

Total marks (21)

There are 5 questions in this part. Attempt all questions.

Marks vary for each question.

Answer the questions in the spaces provided.

Allow about 29 minutes for this part.

Question 1 (4 marks)

(a) Identify two different plants that inhabit saline environments. (2 marks)

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.....

(b) Describe one salt regulation process used by one of the plants you gave in (a). (2 marks)

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Question 2 (4 marks)

(a) Name two processes that create genetic variation in sexually reproducing organisms during meiosis (excluding mutation). (2 marks)

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Question 2 *Continued*

(b) Describe how variation is caused by each process you identified in (a). (2 marks)

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Question 3 (3 marks)

Using an example, explain how advances in technology have altered the scientific thinking about evolutionary relationships.

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Questions continue over page →

Question 4 (4 marks)

Assess the impact of hybridisation on the evolution of organisms.

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Questions continue over page →

Question 5 (6 marks)

(a) Using the genetic code provided on the next page, state a DNA base sequence that would code for the polypeptide segment: - tyrosine – cysteine – tryptophan – (Read left to right; state your answer left to right.) (1 mark)

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(b) State the mRNA base sequence that would be synthesised from the DNA base sequence you gave in (a). (Read left to right; state your answer left to right.) (1 mark)

.....

(c) Name the organelle the mRNA segment attaches to in the cytoplasm. (1 mark)

.....

(d) State the tRNA anticodons for the mRNA codons you gave in (b). (Read left to right; state your answer left to right.) (1 mark)

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(e) Describe the role of tRNA in forming the polypeptide segment. (1 mark)

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(f) Describe the role of the peptide bond in forming the polypeptide segment. (1 mark)

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The genetic code

<i>First position</i>	<i>Second position</i>	<i>Third position</i>
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	U	C	A	G	
U	Phe	Ser	Tyr	Cys	U
	Phe	Ser	Tyr	Cys	C
	Leu	Ser	Stop	Stop	A
	Leu	Ser	Stop	Trp	G
C	Leu	Pro	His	Arg	U
	Leu	Pro	His	Arg	C
	Leu	Pro	Gln	Arg	A
	Leu	Pro	Gln	Arg	G
A	Ile	Thr	Asn	Ser	U
	Ile	Thr	Asn	Ser	C
	Ile	Thr	Lys	Arg	A
	Met	Thr	Lys	Arg	G
G	Val	Ala	Asp	Gly	U
	Val	Ala	Asp	Gly	C
	Val	Ala	Glu	Gly	A
	Val	Ala	Glu	Gly	G

abbreviated names of amino acids are as follows

ala = alanine	arg = arginine	asn = asparagine	asp = aspartic acid
cys = cysteine	gln = glutamine	glu = glutamic acid	gly = glycine
his = histidine	ileu = isoleucine	leu = leucine	lys = lysine
met = methionine	phe = phenylalanine	pro = proline	ser = serine
thr = threonine	try = tryptophan	tyr = tyrosine	val = valine

End of paper

Part A and Part B Answer Booklet

Student Number	
Mark / 26	

Write your Student Number at the top of this page.

Part A

Total marks (5)

There are 5 questions in this part. Attempt all questions.

Each question is worth 1 mark.

Allow about 5 minutes for this part.

Select the alternative A, B, C or D that best answers the question and, using ink, place an X in the corresponding space in the table below.

	1	2	3	4	5
(A)		X			
(B)	X				X
(C)				X	
(D)			X		

Part B**Total marks (21)****There are 5 questions in this part. Attempt all questions.****Marks vary for each question.****Answer the questions in the spaces provided.****Allow about 30 minutes for this part.****Question 1 (4 marks)**

(a) Identify two different plants that inhabit saline environments. (2 marks)

Saltbush, mangroves

Outcome criteria	Marks
two saline plants stated	2
one saline plant stated	1

(b) Describe one salt regulation process used by one of the plants you gave in (a). (2 marks)

Saltbush: contains trichomes which contain a bladder cell that accumulates salt and bursts expelling salt when full. Accepted: gland.

Outcome criteria	Marks
Salt regulation structural feature stated + a description of salt excretion given	2
Salt regulation structural feature stated OR description of salt excretion given	1

Question 2 (4 marks)

(a) Name two processes that create genetic variation in sexually reproducing organisms during meiosis (excluding mutation). (2 marks)

Crossing over; random segregation of chromosomes.

Outcome criteria	Marks
Two processes that cause genetic variation stated.	2
One process that causes genetic variation stated.	1

(b) Describe how variation is caused by each process you have named in (a). (2 marks)

Crossing over produces different combinations of genetic material on chromosomes that are homologous.

Random segregation causes different sets of chromosomes to be inherited in different ways in forming the gametes.

Outcome criteria	Marks
Descriptions provided for each of the named processes, showing how genetic variation may occur.	2
One description provided for one of the named processes, showing how genetic variation may occur.	1

Question 3 (3 marks)

Using an example, explain how advances in technology have altered the scientific thinking about evolutionary relationships. (3 marks)

Humans and apes: Fossil-based evidence pointed to gorillas and chimpanzees being more closely related than with humans; they evolved much later than humans who split from the ape lines about 15 million years ago. However, DNA and protein studies have shown that humans are more closely related to chimpanzees and gorillas than that proposed by the fossil evidence. According to protein studies, humans split from the ape lines about 5 million years ago. Amino acid sequencing of universal proteins such as cytochrome C and haemoglobin are analysed and compared between different groups of organisms. The number of different amino acids between organisms is related to the time since separation of the groups during their evolutionary history.

Outcome criteria	Marks
example of technology stated + organisms involved + relationship (R) + differences (D)	3
example of technology stated + organisms involved + relationship OR differences (R: relationship; D: difference between old and new views)	2
example of technology stated (T)	1

Question 4 (4 marks)

Assess the impact of hybridisation on the evolution of organisms.

Hybridisation refers to the breeding of two parents, usually of different species. Hybrids may be sterile because the chromosomes from the hybrid's parents cannot pair up at meiosis. In this case, the evolution of the organisms involved will be detrimentally affected since the hybrid is unable to pass any adaptations to its offspring. On the other hand, hybrids that are fertile (e.g., some plants such as triticale) will inherit characteristics from both parents and thus will introduce greater variation to the organisms involved; this may result in the formation of organisms with suitable environmental adaptations which can be inherited by the offspring. In this case, evolution will continue to occur for the organisms.

Outcome criteria	Marks
description of hybridisation (H) + two explanations of how hybridisation affects evolution (E, E) + one judgement statement (J)	4
description of hybridisation + one explanation of how hybridisation affects evolution + one judgement statement	3
description of hybridisation + one explanation of how hybridisation affects evolution	2
description of hybridisation (H)	1

Question 5 (6 marks)

- (a) Using the genetic code provided on the next page, state a DNA base sequence that would code for the polypeptide segment: - tyrosine – cysteine – tryptophan – (Read left to right; state your answer left to right.) (1 mark)

DNA strand: tyrosine (ATA or ATG) - cysteine (ACA or ACG) - tryptophan (ACC)

- (b) State the mRNA base sequence that would be synthesised from the DNA base sequence you gave in (a). (Read left to right; state your answer left to right.) (1 mark)

mRNA strand: tyrosine (UAU or UAC) - cysteine (UGU or UGC) - tryptophan (UGG)

- (c) Name the organelle the mRNA segment attaches to in the cytoplasm. (1 mark)

Ribosome

- (d) State the tRNA anticodons for the mRNA codons you gave in (b). (Read left to right; state your answer left to right.) (1 mark)

tRNA: AUA or AUG – ACA or ACG - ACC

- (e) Describe the role of tRNA in forming the polypeptide segment. (1 mark)

Anticodon of tRNA binds to codon of mRNA; tRNA carries a specific amino acid:

- (f) Describe the role of the peptide bond in forming the polypeptide segment. (1 mark)

The amino acids on adjacent tRNA molecules bound to mRNA codons will connect via a *peptide bond*; the tRNA breaks away once this bond is established.

End of paper