James Ruse Agricultural High School

HIGHER SCHOOL CERTIFICATE COURSE

2004 TERM 1
ASSESSMENT TASK – THEORY EXAMINATION

BIOLOGY

General Instructions

- Reading time – 5 minutes
- Working time – 30 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: 23
This paper has two parts, Part A and Part B

Part A
Total marks (6)
- Attempt all questions
- Allow about 8 minutes for this part

Part B
Total marks (17)
- Attempt all questions
- Allow about 22 minutes for this part

Part A
Total marks (6)

Attempt all questions

Each question is worth one mark

Allow about 8 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

1. The gene for freckled skin in humans is dominant over the gene for no freckles. A woman with non-freckled skin marries a man who has freckled skin. The man's father was not freckled but his mother had freckles. What is the chance of this couple having a freckled child?

   (A) 25%

   (B) 50%

   (C) 75%

   (D) 100%

2. The colour of the petals of snapdragon flowers exhibits co-dominance: the gene for red flower colour being co-dominant with the gene for white flower colour. The heterozygote is pink. What would be the phenotypic ratios when a pink flowered snapdragon is crossed with a white snapdragon?

   (A) 1 pink: 1 white

   (B) 1 red: 1 pink

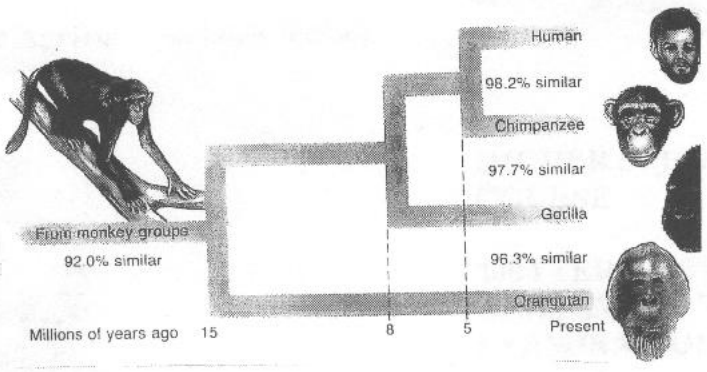
   (C) 1 white: 1 red

   (D) 1 white: 1 red: 1 pink

3. Which organism would exhibit convergent evolution and which organism would exhibit divergent evolution with a bird?

	convergent evolution with a bird	divergent evolution with a bird
(A)	fish	bear
(B)	moth	a different species of bird
(C)	a different species of bird	butterfly
(D)	mammal	reptile

4. The diagram depicts the evolutionary relationships between humans and members of the monkey groups.



What type of study has enabled these evolutionary relationships to be deduced?

(A) Measurements of head size.
(B) Comparing lengths of forearms and hands.
(C) Comparing sizes of embryos.
(D) Comparing DNA base sequences of genes controlling similar or the same traits.

5. What roles did T. H. Boveri and W. S. Sutton play in developing our understanding of inheritance?

	Boveri suggested that	Sutton suggested that
(A)	sex-limited trait genes are found on the X chromosomes.	chromosomes contain genes.
(B)	hereditary factors can transfer from one chromosome to another.	chromosomes contain genes.
(C)	chromosomes contain genes.	sex-limited trait genes are found on the X chromosomes.
(D)	chromosomes contain genes.	hereditary factors can transfer from one chromosome to another.

6. Members of the *Drosophila* genus, a fruit fly, when raised at normal temperatures of about 20°C, have tiny stumps for wings. When raised at 31°C, these flies have wings that are almost of normal length. What is responsible for this type of growth pattern in fruit fly wings?

(A) the genes for wing type only are responsible.

(B) the temperature the flies are grown at only are responsible.

(C) Both the temperature the flies are grown at and the genes for wing type are responsible.

(D) Both the alleles and genes for wing type are responsible for the development of wings.

Part A and Part B Answer Booklet

Student Number	
Mark / 23	

Write your Student Number at the top of this page.

Part A

Total marks (6)

There are 6 questions in this part. Attempt all questions.

Each question is worth 1 mark.

Allow about 8 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	6
(A)						
(B)						
(C)						
(D)						

Part B

Total marks (17)

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

Marks vary for each question.

Answer the questions in the spaces provided.

Allow about 22 minutes for this part.

Question 1 (6 marks)

(a) Draw a labelled diagram of a segment of DNA showing 6 base pairs.

(b) Using your drawing in (a) as a template, outline the process of DNA replication.

(c) Explain the significance of DNA replication in a cell.

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Questions continue over page →

Question 2 (2 marks)

Describe two aspects of the experimental techniques used by Gregor Mendel that led him to discover the basic patterns of heredity.

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Question 3 (3 marks)

Discuss the importance of the process of enantiostasis in estuarine organisms with regard to maintaining appropriate salt concentrations.

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Questions continue over page →

Question 4 (2 marks)

In humans, red-green colour blindness is a sex-linked recessive trait.

Using the symbols provided in the key, construct a pedigree for the inheritance of colour blindness in the Jones family described.

Red-green colour blindness in the Jones family

Mrs Jones is a normal female married to Mr Jones, a normal male. They have two children, a male (Jack) who suffers red-green colour blindness and a female (Jill) who is normal. Jack marries a normal female and they have three normal female children. Jill marries a male that suffers red-green colour blindness and they have three children, two males and a female. One of the males suffers red-green colour blindness; the other male is normal as is the female.

Key

 red-green colour blind male

 normal male

 red-green colour blind female

 normal female

(b) What is the genotype of Jill Jones?

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Questions continue over page →

Question 5 (4 marks)

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

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

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End of paper

Part A and Part B Answer Booklet

Student Number	Term 1 2004 HSC Biology Assessment Task
Mark / 23	Marking guidelines

Write your Student Number at the top of this page.

Part A

Total marks (6)

There are 6 questions in this part. Attempt all questions.

Each question is worth 1 mark.

Allow about 8 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	6
(A)		X				
(B)	X		X		X	
(C)						X
(D)				X		

Part B

Total marks (17)

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

Marks vary for each question.

Answer the questions in the spaces provided.

Allow about 22 minutes for this part.

Question 1 (6 marks)

(a) Draw a labelled diagram of a segment of DNA showing 6 base pairs.

(1): correct pairing of bases (6 base pairs essential); (1): nucleotides shown – sugar, phosphate and nitrogenous base; (1): double stranded structure.

(b) Using your drawing in (a) as a template, outline the process of DNA replication.

(1): showing DNA unzipped (splitting of double helix); (1): construction of complimentary DNA strands (two pieces of DNA result).

(c) Explain the significance of DNA replication in a cell.

(1): *Passing on of hereditary information so that identical daughter cells are formed.*

Question 2 (2 marks)

Describe two aspects of the experimental techniques used by Gregor Mendel that led him to discover the basic pattern of hereditary.

(1): *He planned experiments that focused on only one or two characteristics at a time; he did not study all the characteristics at once. This enabled him to get clear-cut results and hence measurable hereditary differences.*
(1): *Mendel counted the offspring and then analysed the results mathematically. He did this in two ways; he analysed his data arithmetically, and so was able to discover definite ratios of characteristics among the offspring; then, by using algebra, hew as able to show patterns in heredity that could account for these ratios.*

Question 3 (3 marks)

Discuss the importance of the process of enantiostasis in estuarine organisms with regards to maintaining appropriate salt concentrations.

(1): *enantiostasis is taken to mean the adjustment of the internal environment to optimise functional capacity in the face of external alterations.* (1)*: Some crustaceans (e.g. crabs) use intracellular osmotic regulation, moving free amino acids in and out of cells to equalise osmotic concentration. Sharks can do the same.* (1): *These adjustments to the levels of amino acids or salts in the cells enables the organism to obtain the appropriate water balance in the vary salt water environment of an estuary.*

Question 4 (2 marks)

(a) In humans, red-green colour blindness is a sex-linked recessive trait. Using the symbols provided in the key, construct a pedigree for the inheritance of colour blindness in the Jones family described.

Red-green colour blindness in the Jones family

Mrs Jones is a normal female married to Mr Jones, a normal male. They have two children, a male (Jack) who suffers red-green colour blindness and a female (Jill) who is normal. Jack marries a normal female and they have three normal female children. Jill marries a male that suffers red-green colour blindness and they have three children, two males and a female. One of the males suffers red-green colour blindness; the other male is normal as is the female.

Key

 red-green colour blind male

 normal male

 red-green colour blind female

 normal female

(b) What is the genotype of Jill Jones?

(1): X^RX^r

Question 5 (4 marks)

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

(1): *crossing over*; (1): *random segregation of chromosomes.*

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

(1): *crossing over produces different combinations of genetic material on chromosomes that are homologous.* (1): *random segregation causes different sets of chromosomes to be inherited in different ways in forming the gametes.*