

JAMES RUSE AGRICULTURAL HIGH SCHOOL



BIOLOGY

HIGHER SCHOOL CERTIFICATE COURSE 2005 TERM 1 ASSESSMENT TASK – THEORY EXAMINATION

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: 20

This paper has two parts, Part A and Part B

Part A

Total marks (5)

- Attempt all questions
- Allow about 8 minutes for this part

Part B

Total marks (15)

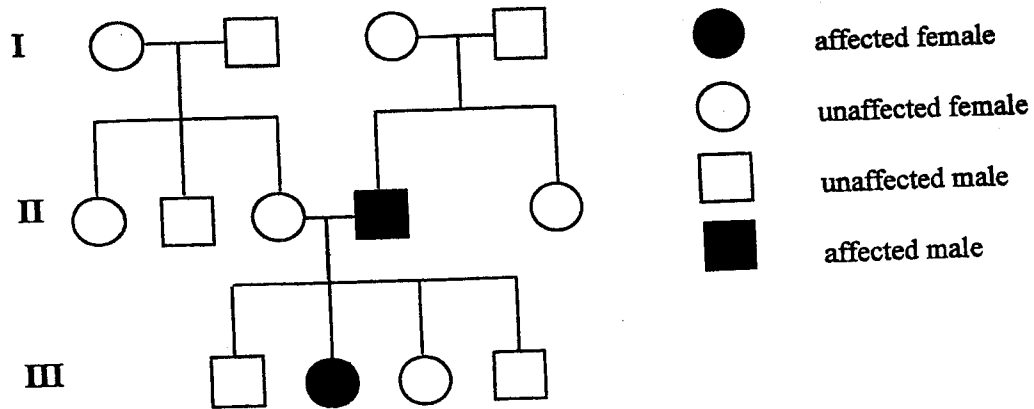
- Attempt all questions
- Allow about 22 minutes for this part

Part A
Total marks: (5)

Attempt all questions

Each question is worth one mark

1. A family tree is illustrated below:



Which statement can be made about the trait followed in this family?

- (A) It is a dominant trait
 - (B) It is a recessive trait
 - (C) It is a sex linked trait
 - (D) It is a recessive and sex linked trait
2. One sort of blood typing is described as 'MN typing'. It is based on proteins found on the surface of red blood cells. A person with type M type blood has one protein type present and someone with N type blood has another protein present. If a person has a mother with M type blood and a father with N type blood their blood type will be MN. The blood of people with type MN have the characteristics of both parents' types.

What type of inheritance does this example illustrate?

- (A) Codominance
- (B) Dominant and recessive inheritance
- (C) Mendelian inheritance
- (D) Sex linked inheritance

3. A section of DNA from an animal cell undergoing meiosis is shown below:

A	G	C	T	A	C	G	T
T	C	G	A	T	G	C	A

Following meiosis, and assuming no crossing over occurred, the only possible section that could appear in any given gamete would be:

- (A) G C G A T G C A
- (B) A G C T A C G T
- (C) A G C T A C G T
| | | | | | | |
T C G A T G C A
- (D) U C G A U G C A
4. Which of the following statements most accurately describes Beadle and Tatum's 'one gene – one enzyme' hypothesis?
- (A) There is only one type of gene in cells that codes for enzymes
- (B) There exists a one-to-one relationship between a gene and the enzyme produced by that gene
- (C) Enzymes only act when stimulated by their corresponding gene
- (D) If a gene is changed by radiation, the enzyme produced by that gene can still be produced
5. A photo micrograph of a dividing cell from a mouse showed 19 homologous pairs of chromosomes. How many chromosomes would the haploid gametes produced by this mouse contain?
- (A) 38 chromosomes
- (B) 76 chromosomes
- (C) 19 chromosomes
- (D) 10 chromosomes in the male gamete and 9 chromosomes in the female gamete

Student Number.....

PART A Answer Sheet

Total Marks (5)

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

Each question is worth one mark.

Write your Student Number at the top of this Part A Answer Sheet

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
(A)					
(B)					
(C)					
(D)					

Rough work area

Part B

Total marks (15)

There are 5 questions in this part. Attempt all questions

Marks vary for each question

Answer the questions in the spaces provided

Question 6 (4 marks)

Mendel crossed pea plants that produced axial (side) flowers with pea plants that produced terminal (top) flowers. In the first generation, only axial flowering pea plants were produced, and no terminal flowering pea plants. He then crossed the first generation with one another and in the second generation most plants produced axial flowers and some plants produced terminal flowers. The ratio was close to 3:1, axial: terminal.

Use these observations in your explanation of the following genetic terms that are now used in the study of inheritance.

(a) heterozygous and homozygous genotypes

1

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(b) pure breeding and hybrid

1

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(c) gene and allele

1

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(d) dominant and recessive alleles

1

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Question 7 (3 marks)

In humans, the inheritance of colour blindness is sex-linked.

1

(a) Define the term sex-linkage

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(b) A colour blind female and a non-colour blind male have a son and a daughter. Using appropriate symbols, show the genetic possibilities for all four of these individuals.

2

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Question 8 (3 marks)

Discuss the accuracy of this statement:

3

“genotype determines phenotype”

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Question 9 (3 marks)

Both the Kiwi and the recently extinct Moa of New Zealand are examples of flightless Birds called ratites.

3

For many years, comparative anatomy studies suggested that the two groups were quite closely related. Recently, however, biochemical analysis of the DNA of the two groups suggest that they are not as closely related as first thought, and that the Kiwi is actually more closely related to the Emu of Australia.

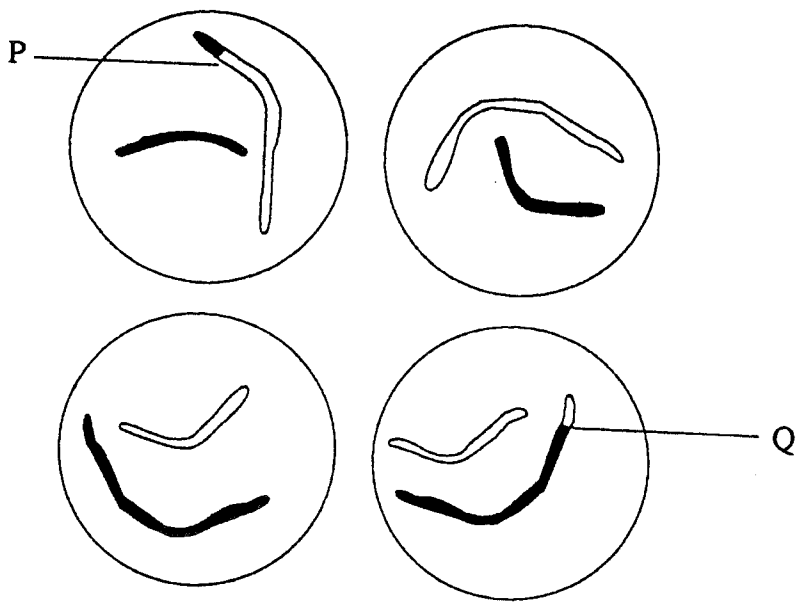
Explain how DNA analysis of the Moa and the Kiwi can be used to show evolutionary relationships between them and other ratites.

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Question 10 (2 marks)

Shown below are four gametes which were formed from the division of a single parent cell. Draw the parent cell showing the correct number and structure of the chromosomes at the time the process which produced P & Q had just occurred.

2



PART A Answer Sheet

Total Marks (5)

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

Each question is worth one mark.

Write your Student Number at the top of this Part A Answer Sheet

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
(A)		X			
(B)	X			X	
(C)			X		X
(D)					

Rough work area

Part B

Total marks (15)

There are 5 questions in this part. Attempt all questions

Marks vary for each question

Answer the questions in the spaces provided

Question 6 (4 marks)

Mendel crossed pea plants that produced axial (side) flowers with pea plants that produced terminal (top) flowers. In the first generation, only axial flowering pea plants were produced, and no terminal flowering pea plants. He then crossed the first generation with one another and in the second generation most plants produced axial flowers and some plants produced terminal flowers. The ratio was close to 3:1, axial: terminal.

Use these observations in your explanation of the following genetic terms that are now used in the study of inheritance.

- (a) heterozygous and homozygous genotypes 1
heterozygous genotype - contains different alleles eg all the F_1 (Aa)
homozygous genotype - contains the same alleles eg the parents that produced the F_1 (AA, aa)
- (b) pure breeding and hybrid 1
pure breeding: bred true for a particular characteristic eg the parents that produced the F_1 (AA, aa)
hybrid - contains both ^(different) alleles for a particular characteristic eg the F_1 (Aa)
- (c) gene and allele 1
gene: - a section of DNA that codes for a single polypeptide eg the gene for position of flowers in pea plants
allele - the alternatives for a particular characteristic or gene eg A or a

(d) dominant and recessive alleles

1

dominant alleles - mask the affect of recessive alleles eg axial is dominant over terminal flowers

recessive alleles - needs out of sight for a generation eg terminal flowers -

Question 7 (3 marks)

In humans, the inheritance of colour blindness is sex-linked. (4 recessive)

1

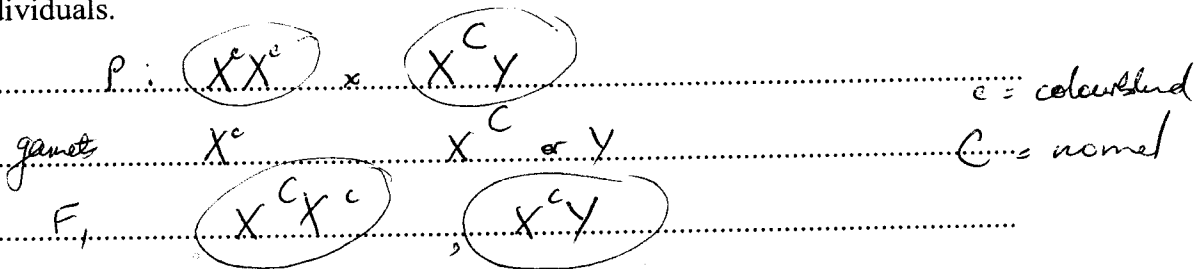
(a) Define the term sex-linkage

a characteristic carried on the sex chromosome

eg the X chromosome, no corresponding allele on Y ch.

(b) A colour blind female and a non-colour blind male have a son and a daughter. Using appropriate symbols, show the genetic possibilities for all four of these individuals.

2



Question 8 (3 marks)

Discuss the accuracy of this statement:

3

"genotype determines phenotype"

genotype is not the only factor that determines phenotype,

1 the environment may also affect the expression of a gene in an individual i.e the phenotype (appearance for organism)

1 eg identical twins are genetically the same but they develop differences in appearance eg different birth weights due to differences in the position in the uterus. eg plants such as hydrangeas, grow in

1 acid soil produce blue flowers, in alkaline soil produce pink flowers.

(see previous page) -

Question 9 (3 marks)

Both the Kiwi and the recently extinct Moa of New Zealand are examples of flightless Birds called ratites. 3

For many years, comparative anatomy studies suggested that the two groups were quite closely related. Recently, however, biochemical analysis of the DNA of the two groups suggest that they are not as closely related as first thought, and that the Kiwi is actually more closely related to the Emu of Australia.

Explain how DNA analysis of the Moa and the Kiwi can be used to show evolutionary relationships between them and other ratites.

DNA analysis of biochemical studies can show the degree of similarity of their DNA base sequences - the greater the similarity (less differences), the more close their relationship & they would share a more recent common ancestor. DNA-DNA hybridisation of the Moa & Kiwi would show more mismatches in the base pairs than the Kiwi & Emu from the information above. * must relate to the birds

Question 10 (2 marks)

Shown below are four gametes which were formed from the division of a single parent cell. Draw the parent cell showing the correct number and structure of the chromosomes at the time the process which produced P & Q had just occurred. 2

