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MAIN EXAMINATION

JANUARY – APRIL 2015 TRIMESTER

FACULTY OF SCIENCE

DEPARTMENT OF NATURAL SCIENCES (BIOLOGY)

SCHOOL FOCUSED PROGRAMME

BIO 200: GENERAL GENETICS

Date: April 2015	**Duration: 2 Hours**
Instructions: Answer Question ONE and any other TWO Questions.	

Q1. a) Give THREE reasons why a person may require genetic counseling. **(3 marks)**

b) i) State the Mendel's Principle **(3 marks)**

ii) Give one exception from Mendel's principles in genetics. **(2 marks)**

c) Outline the characteristics of an autosomal dominant inherited trait. **(5 marks)**

d) Giving examples, briefly explain the various sex determination mechanisms. **(10 marks)**

e) Maria and James are planning on having children. Each has a sister with sickle cell disease. Neither Maria nor James nor any of their parents have the disease, and non of them has been tested to see if they have the sickle cell trait.

i) Draw a pedigree representing this family. Be sure to clearly label Maria and James. **(4 marks)**

ii) Based on this information, calculate the probability that if this couple has a child, the child will have sickle cell disease. Explain your answer. **(4 marks)**

Q2. a) Differentiate between the following terms

i) Dominance and epistasis
ii) Intra-allelic and inter-allelic gene interacting
iii) Dominant epistasis and recessive epistasis.
iv) Penetrance and expressivity
v) Epistasis and hypostasis **(10 marks)**

b) Describe cases of gene lethality in snapdragons and chicken. In each case, show the relevant test crosses and summarize the resultant phenotypic and genetypic ratios.

(10 marks)

Q3. a) Within a population of butterflies, the colour brown (B) is dominant over the colour white (b). And 40% of all butterflies are white. Given this information calculate the following;

i) The percentage of butterflies in the population that are heterozygous.

(5 marks)

ii) The frequency of homozygous dominant individuals.

(5 marks)

b) Explain how the following forces can change the gene pool in a population.

i) Migration **(3 marks)**
ii) Natural selection **(4 marks)**
iii) Mutation **(3 marks)**

Q4. Joe is colour blind. His mother and father have normal vision, but his mother's father (Joe's maternal grandfather) is colour blind. All Joe's other grand parents have normal colour vision. Joe has three sisters – Patty, Betty, and Lora, all with normal colour vision. Joe's older sister, Patty, is married to a man with normal colour vision; they have two children; a girl with normal vision and a boy who is colour – blind.

a) Using correct symbols and labels, draw a pedigree of Joe's family. Ensure you labeled the three sisters of Joe.

(10 marks)

b) What is the most likely mode of inheritance for colour blindness in Joe's family? Explain your answers.

(4 marks)

c) If Joe Marries a woman who has no family history of colour blindness what is the probability that their first child will be a colour blind boy?

(2 marks)

d) If Joe Marries a woman who is a carrier of the colour blind, allele, what is the probability that their first child will be a colour-blind boy?

(4 marks)

Q5. Describe the steps involved during DNA replication.

(20 marks)

END