

BOWEN UNIVERSITY, IWO
DEPARTMENT OF BIOLOGICAL SCIENCES

2009/2010 FIRST SEMESTER EXAMINATION
BLY 303: GENETICS AND EVOLUTION

Question 1 is compulsory. Answer one question from each of sections B & C.

Time: 2hrs 20 mins

SECTION A

1. (a) Suppose in a population of young children born in a village, the number of sicklers is 16 out of 10,000. What will be the expected number of individuals with sickling traits?
- (b) Define the following terms.
- i. Karyotype
 - ii. Polyploidy
 - iii. Aneuploidy
 - iv. Basic chromosome number.
- (c) What term is used to describe the separation of sister chromatids at the centromere during anaphase?
- (d) Several black guinea pigs of the same genotype were mated and produced 29 black and 9 white offspring. What would you predict the genotype of the parents to be?
- (e) How would linkage affect the Mendelian ratios for a digenic cross?
- (f) What are multiple alleles? Give two examples you know.
- (g) You are given two indistinguishable stocks of wild type *Drosophila*. One stock is homozygous, while the other is heterozygous. How would you distinguish between the two?
- (h) What does the term true breeding mean?
- (i) What are the building units of a DNA strand? Draw the chemical diagram of deoxyribocytidylic acid (dCMP) to show the base, deoxyribose sugar and phosphate.
- (j) What property of DNA makes it stand out as a unique molecule?

(30 marks)

SECTION B

2. (a) If four babies are born at a given hospital on the same day:
- i. What is the chance that two will be boys and two girls?
 - ii. What is the chance that all four will be girls?
- (b) Using charts only, explain the term variation. (20 marks)
3. (a) Mendel self-fertilized pea plants with round and yellow peas. In the next generation, he recorded the following numbers of peas:
- | | |
|---------------------|-----|
| Round and Yellow | 315 |
| Round and Green | 108 |
| Wrinkled and Yellow | 101 |
| Wrinkled and Green | 32 |
- i. What is your hypothesis about the genetic control of the phenotype?
 - ii. Do the data support your hypothesis?
- (b) Discuss, briefly, in term of morphology, the various types of chromosomes. (20 marks)

10

SECTION C

4. A kidney-bean shaped eye is produced by a recessive gene *K* on the third chromosome of *Drosophila*. Orange eye colour, called "cardinal" is produced by the recessive gene *cd* on the same chromosome. Between these two loci is a third locus with recessive allele *e* producing ebony body colour. Homozygous kidney, cardinal females are mated to homozygous ebony males. The hybrid F1 females are then testcrossed to produce the F2. Among 4000 F2 progeny are the following:

| | |
|---------------------------|--------------------|
| 1761 Kidney, cardinal | 8 wild type |
| 128 kidney ebony | 89 ebony, cardinal |
| 97 kidney | 1773 ebony |
| 6 kidney, ebony, cardinal | 138 cardinal |

Determine the relationships between the three genes and draw their genetic map.
Show all workings. (20 Marks)