Dr Sukhvir Kaur

COURSE CODE: 18B11BT311

MAX. MARKS: 35

COURSE NAME: Genetics

COURSE CREDITS: 03

MAX. TIME: 2 Hours

Note: All questions are compulsory. Carrying of mobile phone during examinations will be treated as case of unfair means. Calculator is allowed.

Q1: a) Assume that the heights of a plant are determined by two unlinked polygenes. Each dominant allele contributes 6 cm to a base height of 6 cm. If a cross is made between two genotypes: AABb X aaBb.   i) Determine the height of each parent ii) Determine the height of F1 individuals (no environmental factors are operating).

b) If both husband and wife are known to be carriers of the allele for albinism, what is the chance of the following combinations in a family of six children:- a) three unaffected and three affected.

c) Why are double cross over events expected less frequently than single cross over events?   [2+2=1]

Q2: a) The map distance between A____B = 15 and B____C = 20 map units and the observed double cross over in a test cross experiment = 1.6%. Calculate the strength of interference.

b) What is the significance of crossing over frequency in the study of gene mapping?

c) What are Frameshift mutations? Give example.   [2+2=1]

Q3: a) Differentiate between the following giving examples:- i) Incomplete and complete linkage ii) Penetrance and Expressivity

b) Why does Muscular Dystrophy is more prevalent in males compared to females? Depict giving an example.

c) What is the frequency of heterozygotes Tt in a randomly mating population if the frequency of recessive phenotype is (tt) 0.05.   [2+2=1]

Q4: a) How conditional mutations are useful for organisms? Explain.

b) The ability to roll your tongue is determined by the dominant gene (T). In the following pedigree, affected individual can roll their tongue. Based on the pedigree, determine the genotype for each individual.
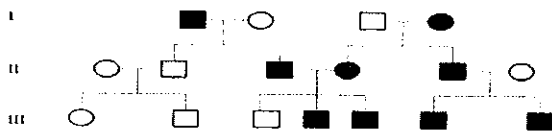
Using the forked line diagram, find out the phenotype resulting from a cross of AaBb X AaBb.   [2+2=1]

Q5: a) A couple has six children. Unfortunately, both parents are heterozygous for cystic fibrosis. What is the chance that all of the children would be normal? Show your work.

b) The frequency of children homozygous for recessive lethal gene is about 2 in 40000. What is frequency of dominant allele?

c) What is sex influence inheritance? Explain.   [2+2=1]

Q6: a) What are the assumptions of Hardy-Weinberg law.

b) What is Bombay Phenotype? Explain.

c) What are the basis of continuous variations. Explain.   [2+2=1]

Q7: a) What is the relationship among Linkage, crossing over , recombination frequency and map distance of genes.

b) A sex-linked recessive gene produces colour-blindness in man. A normal woman has a colour-blind father and marries a colour-blind man.   i) What are the chances that the first child from this marriage will be a colour-blind boy? ii) What percentage of daughters from this marriage is expected to be colour-blind?

c) Why Drosophila is a good model organism?   [2+2=1]