GUJARAT NATIONAL LAW UNIVERSITY
GANDHINAGAR
Course: Cytology and Genetics
Semester-I (Batch: 2020-25)

End Semester Online Examination: February 2021

Date: 10th February, 2021
Duration: 8 hours **Max. Marks: 40**

Instructions:

- The respective marks for each question are indicated in-line.
- Indicate correct question numbers in front of the answer.
- No questions or clarification can be sought during the exam period, answer as it is, giving reason, if any.
- Answer the question in 500-600 words
- Make Punnett square wherever necessary.

Marks

Q.1 What are the possible blood types *of a* child whose both parents are AB Rh+ (heterozygous). (8)

Q.2 Is height in humans inherited in the same way as in pea plant? Explain. (8)

Q.3 In February 2018, the Delhi High Court (in the case of M/S United India Insurance Company Limited v. Jai Parkash Tayal) ruled against discrimination in health insurance by United India Insurance Company involving a person with a heart condition which was perceived to be a genetic disorder. The court held, "Discrimination in health insurance against individuals based on their genetic disposition or genetic heritage, in the absence of appropriate genetic testing and laying down of intelligible differentia is unconstitutional." (This was partially stayed by the Supreme Court). In the light of above answer the following: (8)

a) Is it fair for Insurance companies to differentiate between persons who have a condition with a known genetic basis and those with a medical condition not identified as genetic?
b) What all are included in genetic test?
c) What all are covered under genetic information?
d) What all are not covered under genetic information?
e) Do you think India needs a law that prevents genetic discrimination considering the fact that genetic test is available at costs starting at Rs 3,000/-.
f) What if employers use the genetic data to hire and fire employees?
g) Which federal law protects people from genetic discrimination?
h) What according to you are the other agencies that can misuse the genetic information?

Q.4 Tay-Sachs disease is a rare, neurodegenerative disorder in which deficiency of an enzyme (hexosaminidase A) results in excessive accumulation of certain fats (lipids) known as

gangliosides in the brain and nerve cells. Children with Tay-Sachs rarely live beyond 4 years of age. If 4 in 10,000 newborn babies have the disease,

a) What are the expected frequencies of the three genotypes in newborns, assuming the population is at Hardy Weinberg equilibrium? (3 marks)
b) Why is this assumption not strictly correct? (1 mark)
c) What are the conditions necessary for the maintenance of Hardy-Weinberg equilibrium in a population? (4 marks)

Q.5 Mary was nervous about going to the human genetics unit at the hospital. Her physician referred her because she was unexpectedly pregnant at the age of 41, and at that age she was at higher risk for having a child with a chromosomal abnormality, especially Down's syndrome. She was 18 weeks pregnant, which would not leave much time if she wanted to have an abortion, considering it takes 7-14 days to get the results of an amniocentesis procedure. Mary previously had two normal pregnancies; her children are now 13 and 17. (8)

The genetic counselor, Dr. Smith, suggested that Mary should go for amniocentesis to examine the fetal chromosomes.

In discussing the results of the test, Dr. Smith said that the fetus did not have an extra copy of chromosome 21 and therefore did not have Down's syndrome. But the analysis did show the presence of an extra Y chromosome (XYY instead of XY). This condition is fairly common; each day in the United States, five to ten boys are born with an XYY set of chromosomes.

a) What are the reasons for this kind of chromosomal aberrations?
b) What are typical phenotypic characteristics of an XYY male?
c) Do you believe the XYY karyotype should be used as a legal defense in a criminal trial? Why/ Why not
d) What is amniocentesis? How is it different from Chorionic villus sampling?
e) Do you think it is a good idea to screen all newborn boys for XYY syndrome? Why/Why not?

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