Indian Association for the Cultivation of Science

(Deemed to be University under *de novo* Category)

Integrated Bachelor's and Master's Program
End-Semester Examination (Semester II-2020)

Subject: Biology II ***Subject Code(s): BIS 1201***

Full Marks: 50 ***Time Allotted: 3 h***

Group A 20 marks

1. A) In a population that is in Hardy-Weinberg equilibrium, 38 % of the individuals are recessive homozygotes for a certain trait. In a population of 14,500, calculate the percentage of homozygous dominant individuals and heterozygous individuals.

   B) Calculating Genotype Frequencies for Multiple Alleles in a Hardy– Weinberg Population Where the Frequency of Allele *IA* = 0.38, Allele *IB* = 0.11, and Allele *io* = 0.51

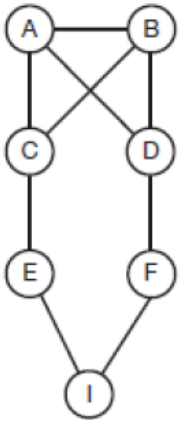
   (2+3)=5

2. **A)** Fruit color of a wild fruit is controlled by two alleles of a gene (A and a). The frequency of A p=0.8 and a q=0.2. In a field tetraploid genotype of that plant was found. On clinical examination 5 distinct genotypes were identified. These genotypes are **AAAA, aaaa, AAaa, Aaaa, AAAa**. If the population with **1000 plant** follows H-W equilibrium, what would be the **approximate number** of individual with this 5 distinct genotype?

   B) In a large experimental *Drosophila* population, the relative fitness of a recessive phenotype is calculated to be 0.90, and the mutation rate to the recessive allele is $5 \times 10{-}5$. If the population is allowed to come to equilibrium, what allele frequencies can be predicted?

   (3+2)=5

3. **A)** Find the inbreeding co-efficient of I of the following pedigree.



B) Sparrows with average-sized wings survive severe storms better than those with longer or shorter wings, illustrating
a. the bottleneck effect.
b. disruptive selection.
c. frequency-dependent selection.
d. neutral variation.
e. stabilizing selection

C) In a population of 50,000 diploid individuals, what is the probability that a new neutral mutation will ultimately reach fixation? What is the probability that it will ultimately be lost from the population?

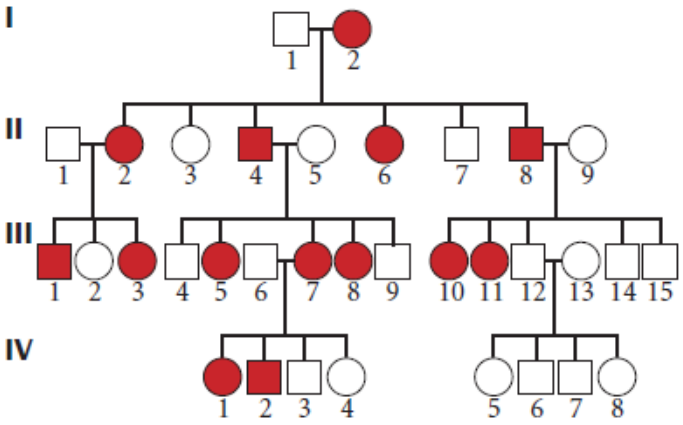
D) Each generation, 10 random individuals migrate from population PI to population PII. What will happen to allelic frequency *q* as a result of migration when *q* is equal in populations A and B?

(2+1+1+1)=5

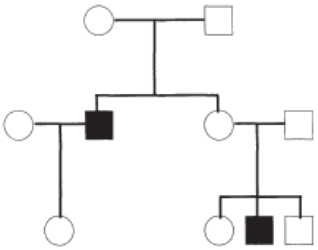
4. A) Calculate the relative fitnesses of females having these genotypes

Genotype	Mean number of offspring
Adh^F/Adh^F	120
Adh^F/Adh^S	60
Adh^S/Adh^S	30

B) What is the most likely mode of inheritance of the following pedigree?



C) What is the most likely mode of inheritance of the following pedigree? As far as possible, determine the genotype of each person represented in the pedigree shown below.



D) A trait determined by an X-linked dominant allele shows 100 percent penetrance and is expressed in 36 percent of the females in a population. Assuming that the population is in Hardy–Weinberg equilibrium, what proportion of the males in this population expresses the trait?

(1+1+2+1)=5

Group B 30 marks

5. What are the major biological roles of fatty acids? **2**
6. What is Arachidonate? Name few products obtained from Arachidonate? What Aspirin does? **1+2+2**
7. Where Fatty acids activation and break down are taken place? **2**
8. linoleate and linolenate are considered as the essential fatty acids for mammals explain. **2**
9. linoleate and linolenate are considered as the essential fatty acids for mammals explain. **2**
10. Name the biological molecules for which cholesterols are used as precursors.**2**

Answer any 5 **5X3**

11. How fatty acids transport from cytosol to mitochondria inner matrix? **3**
12. Why beta oxidation is called beta oxidation? Explain **3**
13. Provide the full reaction of Beta oxidation and calculate the ATP yield from the complete oxidation of palmitate? **3**
14. What are the differences in fate of the acetyl CoA produced in the beta oxidation in animal and plant cells? **3**
15. What are the differences between the beta oxidation of saturated and unsaturated fatty acids? **3**
16. What are the key differences between fatty acid synthesis and breakdown?**3**
17. How acetyl CoA transport from the mitochondrial matrix into the cytosol? **3**
18. How acetyl- and malonyl-acyl carrier protein are synthesized from acetyl CoA? **3**
19. Write down the energetic require for palmitate synthesis. **3**
20. What are Bile salts and why it is required? **3**
21. What are the lipoproteins? Name the subclasses for lipoprotein with their functions. **3**
22. Write short notes on Atherosclerosis, **3**