

**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI**

**First Semester 2016 – 2017**

**Integrated Biology (BIO F214)**

**Mid Semester Exam (Closed Book)**

**Date: 7.10.2016**

**M.M.: 50**

**Dur: 90 min**

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**Note: All questions are compulsory. Justify your answers wherever necessary.  
Attempt the questions of individual parts together.**

**PART-A (22M)**

Q1. Analyze briefly the correctness or incorrectness of each of the following statements.

- (i) Pesticides cause pesticide resistance in insects.
- (ii) In contrast to the gradualism model, the punctuated equilibrium model better accounts for the relative rarity of the transitional fossils linking newer species to older ones.

**5M**

Q2. Each speciation episode in the evolution of bread wheat is an example of \_\_\_\_\_ speciation, which is the origin of a new species without geographic isolation from the parent species. Fill in the blank, and then comment briefly on the mechanisms involved in bringing about this kind of speciation, in general. **5M**

Q3. Examine briefly how the initial degree of reproductive isolation affects the probability that reinforcement will occur when two populations come into sympatry. Cite relevant example(s). **5M**

Q4. Explain briefly in each case how the variation in the gene structure and/or function contributes to inter-species differences. **2.5M+2.5M**

- (i) CFTR gene
- (ii) FOXP2 gene

Q5. Diagrammatically depict how a transposon may affect gene structure. **2M**

**PART-B (28M)**

Q6. What is polarity assignment? What importance is carried in taxonomy? Explain with example. **3M**

Q7. After graduation, you and your friends (8 people total) build a raft, sail to a deserted island, and start a new population, totally isolated from the world. One of your friends carry (i.e. is heterozygous for) the recessive cf allele, which in homozygotes causes

cystic fibrosis. Assuming that the frequency of this allele does not change as the population grows, what will be the frequency of cystic fibrosis (HOMOZYGOTES) on your island? Assume random mating.

**3M**

Q8. If the flowers of a species are presently of only one color and the pollinator prefers this color, is stabilizing selection happening. Explain. **2M**

Q9. Is the genetic code a homologous trait for the clade of birds? Is the genetic code a synapomorphy for the clade of birds? Explain. **3M**

Q10. How can natural selection maintain harmful alleles in a population? **2M**

Q11. How did the homoplastic features help in resolving disputed taxonomic position of organisms? Explain with example. **3M**

Q12. Genetic drift will have more effect on allele frequency in which population: a large population or a small population. Explain your answer. **2M**

Q13. Differentiate between the two giving proper examples: **4M**

- a) Phylogenetic species concept and Biological species concept
- b) Founder effect and Bottleneck effect

Q14. Comment on the given statements. Support your answer with suitable examples **6M**

- a) Darwinism violates the second law of thermodynamics
- b) Genetic interaction affects the fitness of alleles
- c) Natural selection always results in perfect design.