

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

**Integrated Biology (BIO F214)**

**First Semester 2015-16**

**Comprehensive Examination (Part I - Closed Book)**

Date: 3/12/2015

Duration: 90 min

Max Marks: 40 (20% weightage).

---

**Note1:** Write crisp and to-the-point answers and elaborate only when required by the question.

**Note2:** Answer subparts of a question together; do not jumble.

**Q1.** [4x1M + 2x2M=8M]

- (i) Mention in brief the medical uses of drugs such as morphine and cannabis.
- (ii) What makes plants produce such molecules?
- (iii) Besides plants, which other organisms could be expected to produce similar kinds of molecules? Why?
- (iv) Name the molecules (similar to morphine and cannabis) produced by our body.
- (v) Why do people resort to such addictive drugs even though similar molecules are produced by our own body? Discuss the biochemistry involved.
- (vi) How did the study of ancient Chinese literature help the team of Youyou Tu (one of the Nobel Prize Winners – Physiology/ Medicine - in 2015) in experimentally isolating an anti-malarial drug from plants? Mention briefly.

**Q2.** [5X2M =10M ]

- (i) What is oscillating selection? Discuss with the help of Galapagos medium ground finches as an example.
- (ii) Discuss briefly how the phenomenon of ‘artificial selection of dogs’ could rescue Darwinism from the criticism it has attracted from some groups, including Creationists.
- (iii) Discuss briefly in what way disruptive selection could lead to sympatric speciation.
- (iv) What is the role of Homeobox (*Hox*) genes in the development of an organism? Mention briefly how *Hox* gene products act during the organism’s development.
- (v) What is cephalization? In what type of animals is cephalization seen? How does it help the animal?

-PTO-

**Q3.** [4M]

(i) *Flying insects, birds and bats have all evolved the capacity of flight independently.*  
Expand this statement into a 150-200 word paragraph, using *and* clearly bringing out the meaning of the following terms in your writeup: convergent evolution, analogous structures, homoplasy.

(ii) How does the principle of parsimony help in the cladistic analysis of such cases?

**Q4.** Discuss briefly the specific evolutionary innovations leading to the success of ferns *over* bryophytes, gymnosperms *over* ferns and angiosperms *over* gymnosperms. [6M]

**Q5.** [8x1.5M = 12M]

(i) Why are sponges not considered as true animals?

(ii) Why were gastric brooding frogs considered important by the medical world?

(iii) How do pathogenic worms such as Schistosomes become immunologically invisible?

(iv) Why is the evolution of body cavity considered a key innovation in coelomates?

(v) What necessitates stepwise growth in ecdysozoans when compared to continuous growth in humans?

(vi) Protista is not considered a proper kingdom by taxonomists as they fall short on many parameters required of members of a true kingdom. Mention briefly what these parameters are.

(vii) How was the evolution of diploid generation an advantage to the plants making a move from water to land?

(viii) Mention the two key innovations in primates over other mammals. Also mention how these were advantageous to the primates.

\*\*\*\*\***All the best!**\*\*\*\*\*