

KATHMANDU UNIVERSITY  
End Semester Examination  
February, 2025

Marks Scored:

Level : B.Sc.

Year : II

Exam Roll No. :

Time: 30 mins.

Registration No.:

Course : BINF 206

Semester : II

F. M. : 20

Date : 16 FEB 2025

SECTION "A"

[20 Q. × 1 = 20 marks]

Select the encircle the most appropriate answer.

1. Modern evolutionary biology united Darwin's ideas with \_\_\_\_\_.  
a. molecular genetics  
b. Mendelian genetics  
c. evolutionary synthesis  
d. evolutionary genomics
2. Fly *eyeless* and mouse *Pax6* genes have descended from a common ancestor in the distant past, hence these genes are:  
a. analogs  
b. paralogs  
c. heterologs  
d. homologs
3. Which of the following statements is NOT true?  
a. Genetic variation arises by random mutation.  
b. Different populations of a species may experience different genetic changes and ultimately become distinct species.  
c. Anagenesis is the branching of a lineage into two or more descendant lineages.  
d. The eyes of vertebrates and octopuses are an example of convergence.
4. \_\_\_\_\_ seems to have been the first distinctively human trait to have evolved.  
a. The enormous brain  
b. Synapsid skull  
c. Bipedalism  
d. Non-opposable toe
5. A paraphyletic taxon includes:  
a. species that do not exclusively share a common ancestor.  
b. species related by paralogous genes in a common ancestor.  
c. some, but not all, of the descendants from a particular ancestor.  
d. all the named descendants of a particular common ancestor.
6. Which of the following statements is NOT true?  
a. Crocodiles are more closely related to birds than they are to lizards.  
b. The pentadactyl state is homologous in humans and crocodiles.  
c. Pterosaurs are the largest flying dinosaurs known.  
d. Every species is a combination of plesiomorphic (ancestral) and apomorphic (derived) characters.

7. A feature that performs a function but that did not arise through natural selection for its current use is called:
- adaptation
  - exaptation
  - facultative trait
  - phenotypic polymorphism
8. \_\_\_\_\_ is a situation in which a single gene influences more than one trait or has more than one phenotypic effect.
- Phytotropy
  - Phylotropy
  - Polytropy
  - Pleiotropy
9. Which of the following statements is **NOT** true?
- Saltation refers to the origin of a new species or a higher taxon in essentially a single evolutionary step due to a major mutation.
  - Divergent evolution of numerous related lineages within a relatively short time is called evolutionary radiation.
  - When a single ancestral lineage gives rise to two daughter lineages, the daughter lineages are called sibling groups.
  - A node is a point on a phylogeny where a single ancestral lineage breaks into two or more descendent lineages.
10. Coelacanths are:
- cartilaginous fish
  - lobe-finned fish
  - ray-finned fish
  - jawless fish
11. In eukaryotes, recombination takes place during \_\_\_\_\_.
- prophase I
  - prophase II
  - pro-metaphase I
  - pro-metaphase II
12. Which of the following statements is **NOT** true?
- Avoidance of extinction is not a cause of the evolution of the coloration in guppies.
  - The sutures in the skulls of young mammals are a beautiful adaptation for aiding parturition.
  - In some cases, it appears that adaptations have not evolved because of a shortage of suitable mutations.
  - Natural selection is the basis of adaptive radiations and adaptive diversity.
13. Sponges are:
- plants
  - animals
  - fungi
  - protists
14. After stabilizing selection acts, the phenotypic variance \_\_\_\_\_.
- increases
  - decreases
  - can increase or decrease
  - remains virtually unchanged
15. Which of the following statements is **NOT** true?
- Viruses have been known to insert the gene from the previous host into the DNA of the new host.
  - When a species evolves by natural selection, the genetic changes involve coding DNA only.
  - The haploid chromosome number in a jack jumper ant is 1.
  - Homeotic mutation is a type of mutation that transforms one body part into another.

6 FEB 2025

16. A group of organisms that is about to become a separate species from other related individuals is called:
- a. incipient species
  - b. parapatric species
  - c. sibling species
  - d. primordial species
17. Random genetic drift causes \_\_\_\_\_ to be lost.
- a. adaptation
  - b. mutation load
  - c. genetic variation
  - d. single nucleotide polymorphism (SNP)
18. Which of the following statements is **NOT** true?
- a. Mutations in coding regions are nonsynonymous as well as conservative if they change the amino acid sequence.
  - b. Dispersal can cause evolutionary change with or without the help of natural selection.
  - c. Speciation can be defined as the evolution of biological barriers to gene flow.
  - d. An inability to form hybrid offspring is not an essential criterion of species.
19. The first *Homo sapiens* are known from about:
- a. 100,000 years ago
  - b. 200,000 years ago
  - c. 300,000 years ago
  - d. 400,000 years ago
20. An aspect of a lineage's genetic makeup that prevents the lineage from reaching a particular, potentially advantageous evolutionary outcome is \_\_\_\_\_.
- a. trade-off
  - b. restraint
  - c. repression
  - d. constraint



KATHMANDU UNIVERSITY  
End Semester Examination  
February, 2025

Level : B.Sc.  
Year : II  
Time : 2 hrs. 30 mins.

Course : BINF 206  
Semester : II  
F.M. : 55

16 FEB 2025

SECTION "B"  
[5 Q. × 3 = 15 marks]

Attempt *ANY FIVE* questions.

1. Natural selection continues to act on modern Homo sapiens and to shape the evolution of our species. Elaborate on this statement with an example.
2. Write a short note on the evolution of eukaryotes.
3. What are the major causes for the incompleteness of the fossil record?
4. Some species go extinct, but others do not. What might be the reasons?
5. What is subduction and what are its effects?
6. Define adaptation. Provide an example in which adaptation has been observed in real time.
7. Write a short note on the evolution of Neanderthals and Denisovans.

SECTION "C"  
[5 Q × 5 = 25 marks]

Attempt *ANY FIVE* questions.

8. Do you agree with the following statement: Understanding the processes of evolution is highly relevant to human health. Defend your answer with examples.
9. Describe molecular clocks and the neutral theory of molecular evolution.
10. Define sexual selection. Provide at least two examples in which sexual selection decreases survival but increases male reproductive success.
11. What are the fundamental principles of biological evolution?
12. Elaborate on the evolution of tetrapods from lobe-finned fish.
13. Do you believe in evolution? If so, provide evidence.
14. Briefly discuss different causes of evolution.

P.T.O.

SECTION "D"

[2 Q × 7.5 = 15 marks]

Attempt *ANY TWO* questions.

15. Define life? Explain in detail the emergence of life on Earth.
16. What are the different patterns of evolution? Discuss with examples.
17. Elaborate on the evolutionary history of *Homo sapiens*.