EVOLUTION DISCUSSION QUESTIONS

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1. (a) What are **endangered species**? (**01mark**)

(b) Describe how organisms become endangered. (**06marks**)

(c) How would you ensure that organisms that are endangered get conserved? (**08marks**)

(d) Explain why large mammals are more prone to extinction than small mammals. (**05marks**)

2. (a) Define the term **natural selection**. (**02 marks**)

(b) Distinguish between **natural** and **artificial selection**. (**03 marks**)

(c) Using the knowledge of the peppered moth, explain how changes in intensity of selection pressure can lead to speciation. (**09 marks**)

(d) Explain the post zygotic isolating mechanisms that act on population to cause speciation. (**06 marks**)

3. (a) Derive the **Hardy-Weinberg** equation from first principles. (**10 marks**)

(b) What are conditions that favour Hardy-Weinberg equation to occur? (**10 marks**)

(c) Describe how;

(i) Random mating

(ii) Genetic drift, affect the allele frequency of a sexually reproducing population. (**10 marks**)

4. Explain the role of each of the following in evolution.

(a) Mutation. (**07 marks**)

(b) Punctuated equilibria. (**06 marks**)

(c) Predation. (**07 marks**)

5. (a) Explain how the following factors influence the process of speciation.

(i) Types of pollination. (**04 marks**)

(ii) Species richness. (**02 marks**)

(iii) Artificial selection. (**03 marks**)

(b) Account for the process of evolution by the following.

(i) Resistance of bacteria to antibiotics. (**05 marks**)

(ii) Prevalence of sickle cell trait in tropics. (**12 marks**)

6. (a) Outline the different selection pressures that may limit a population of a species. (**05 marks**)

(b) Discuss how each of the following types of selection acts on a population of species and in each case, state the evolutionary significance of the type of selection. (**15 marks**)

(i) Stabilizing selection

(ii) Directional selection

(iii) Disruptive selection

Turn Over

7. With examples, discuss each of the following as they relate to speciation.

(a) Geographical barriers **(06 marks)**

(b) Adaptive radiation **(05 marks)**

(c) Polyploidy **(05 marks)**

(d) Sexual selection **(04 marks)**

8. (a) Explain how the gene frequency of a population may be altered. **(12 marks)**

(b) The frequency of cystic fibrosis in the human population is approximately I birth in 2000. Cystic fibrosis is caused by a recessive allele. Using Hardy-Weinberg formula, determine the percentage of the population who are;

(i) Heterozygous for the dominant allele. **(05 marks)**

(ii) Homozygous for the dominant allele. **(03 marks)**

9. (a) Explain the modern concept of evolution by natural selection. **(10 marks)**

(b) Explain how fossils and possession of vestigial organs support organic evolution. **(10 marks)**

10. (a) Compare **directional** and **disruptive** selection. **(08 marks)**

(b) Explain how the following provide evidence that support organic evolution. **(12 marks)**

(i) Comparative biochemistry

(ii) Comparative anatomy

(iii) Comparative embryology

11. (a) Define the following terms

(i) A deme. **(03 marks)**

(ii) Genetic equilibrium. **(02 marks)**

(iii) Reproductive isolation. **(03 marks)**

(b) Describe how genetic equilibrium can be upset in a population. **(07 marks)**

(c) Give an account of how reproductive isolation is brought about in a population. **(05 marks)**

12. (a) What is **microevolution**? **(02 marks)**

(b) Explain how microevolution of antibiotic resistant bacteria occurs. **(10 marks)**

13. (a) What is **natural selection** and what role does it play in evolution? **(08 marks)**

(b) How does the existence of homologous structures among present day vertebrates support the theory of evolution? **(09 marks)**

(c) State any **three** examples to show that evolution is still taking place.

14. (a) Distinguish between the following pairs of terms as used in evolution.

(i) **Convergent** and **divergent** evolution. (**02 marks**)

(ii) **Parallel** evolution and **coevolution.** **(02 marks)**

(ii) **Homologous** and **analogous** structures. (**02 marks**)

(b) Explain how each of the following is able to provide evidence for evolution.

(i) Homologous structures. (**05 marks**)

(ii) Analogous structures. (**05 marks**)

15.(a) What is meant by the term **variation**? (**02 marks**)

(b) Apart from mutation, explain how genetic variation arises in sexually reproducing species. (**10 marks**)

(c) How does polyploidy lead to variation in species? (**08 marks**)

16. Table below shows the presence of **M** and **N** antigens in blood of population of 416 individuals.

Antigen(s) present	**Number of individuals**
M	238
N	26
Both	152

(a) Assuming that the presence of MN antigens is the result of the inheritance of one pair of alleles, calculate the frequencies of the two alleles and expected Hardy-Weinberg genotypic ratios. (**08 marks**)

(b) Is the population in Hardy-Weinberg equilibrium? Show your working. (**04 marks**)

17. (a) What is meant by **organic evolution**? (**02 marks**)

(b) Briefly describe the use of the following for dating fossils and in each case comment on its reliability.

(i) evidence from sedimentary rocks. (**04 marks**)

(ii) radioactive decay. (**03 marks**)

(c) How might each of the following be used as support for the theory of evolution?

(i) Human beings possess an appendix which seems to have no function. (**03 marks**)

(ii) Both marine sharks and Fresh-water sharks retain urea in their blood maintaining their osmotic pressure close to that of their surrounding. (**03 marks**)

(iii) Viral DNA has the same basic structure as human DNA. (**02 marks**)

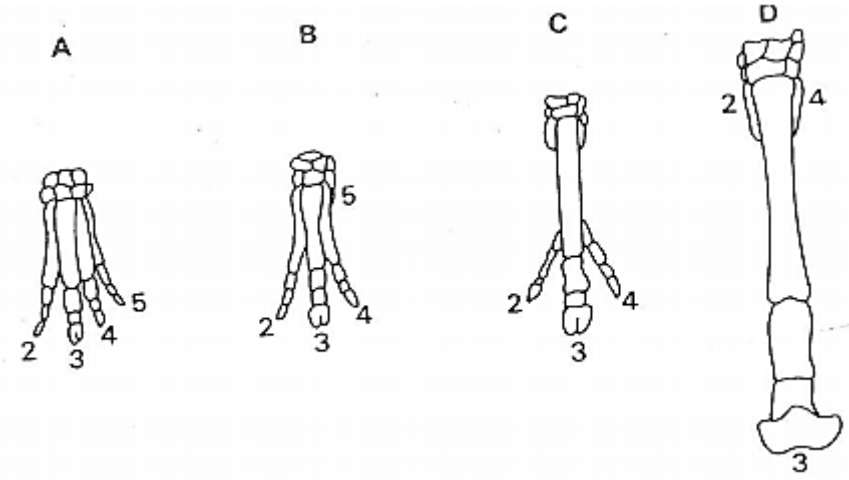
18. (a) Explain the genetic basis and evolutionary significance of the following.

(i) formation of new species by allopolyploidy. (**04 marks**)

(ii) heavy-metal tolerance. (**03 marks**)

(iii) sickle cell anaemia. **(04 marks)**

(b) Figure below shows the chronological sequence from A to D of fossils of the fore limb skeletons of four related mammals.



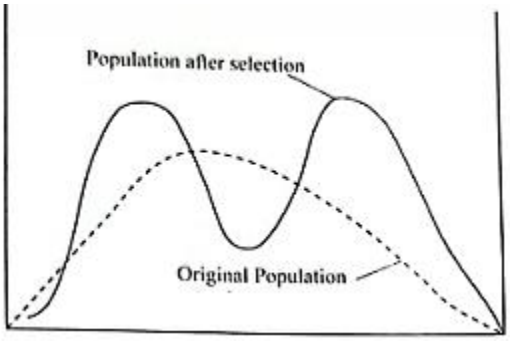
(i) State the

- type of evolution that results into changes shown. **(01 mark)**
- term used to refer to such structures. **(01 mark)**

(ii) Describe briefly the structural changes seen in the fossil sequence. **(04 marks)**

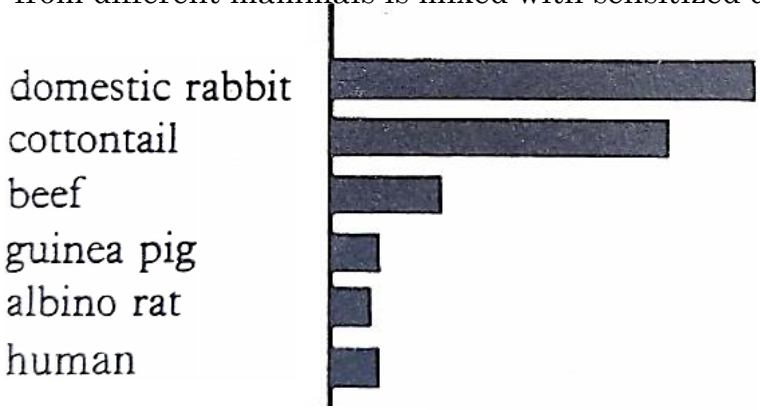
(iii) What were the possible adaptive advantages of these structural changes? **(04 marks)**

19. Graph in figure below shows a form of selection in a population.



(a) Identify the type of selection shown. **(01 mark)**
(b) Explain how the selection shown increases the rate of evolution. **(04 marks)**
(c) Explain how increased population size may lead to evolution of a new species. **(05 marks)**

20. Graph in figure below shows the extent of precipitation that occurs when serum from different mammals is mixed with sensitized domestic rabbit serum.



(a) Describe the trend of precipitation of serum. **(01 mark)**
(b) Explain how precipitates are formed when sensitized rabbit serum is mixed with any mammal's serum. **(04 marks)**
(c) Explain the difference in the level of precipitation between beef and human. **(04 marks)**
(d) State **one** evolutionary conclusion between beef and cottontail.