VARIATION AND EVOLUTION

1. (a). Define the term variation. (02 marks)
   (b). Distinguish between continuous and discontinuous variation. (05 marks)
   (c). Explain the effect of the environment on genetic variations. (13 marks)

2. (a). What is meant by the term **gene reshuffling** (02 marks)
   (b). Outline the different forms of gene reshuffling (03 marks)
   (c). Explain how each of the above mentioned forms of gene reshuffling leads variation in populations. (15 marks)

3. (a). Explain what is meant by the term mutations. (05 marks)
   (b). State the main features of mutations. (05 marks)
   (c). Explain how mutation contributes to variation. (10 marks)

4. (a). What is meant by the term polyploidy? (02 marks)
   (b). Describe the different forms of polyploidy. (08 marks)
   (c). Explain why polyploidy is
      (i). More common in plants than animals. (06 marks)
      (ii). Associated with increase in size of the organism. (04 marks)

5. (a). Trisomy is an example of aneuploidy. What is;
      (i). Aneuploidy. (01 mark)
      (ii). Trisomy. (01 mark)
   (b). Give
      (i). One other example of aneuploidy apart from trisomy. (01 mark)
      (ii). Three examples of trisomy in humans. (03 marks)
   (c). Briefly describe how trisomy in humans arises. (08 marks)
   (d). Explain how polyploidy may arise in a population. (06 marks)

6. (a). What is meant by the term **chiasma**? (02 marks)
   (b). Explain the significance of the chiasma . (10 marks)
   (c). Explain the significance of variation in populations. (08 marks)

7. (a). With examples, explain the term discontinuous variation. (06 marks)
   (b). Explain how sexual reproduction causes variation in populations. (14 marks)

8. (a). Distinguish between **crossing over** and **crossover value** (03 marks)
   (b). Explain the significance of
      (i). Crossing over (03 marks)
      (ii). Crossover values. (03 marks)

9. (a). What do you understand by the **term evolution** (02 marks)
   (b). Explain how the following provide evidence for evolution
      (i). Fossils. (09 marks)
      (ii). Distribution of camels. (09 marks)

10. Explain how the following provide evidence for evolution
    (a). Darwin's finches. (10 marks)
    (b). Mammals of Australia. (10 marks)

11. (a). Distinguish between the following pairs of words as used in evolution
        (i). Convergent evolution and divergent evolution (04 marks)
        (ii). Homologous structures and analogous structures (04 marks)
    (b). Explain how each of the following provides evidence for evolution
        (i). Homologous structures. (06 marks)
        (ii). Analogous structures. (06 marks)

12. (a). What is meant by the following terms
        (i). Adaptive radiation (02 marks)
        (ii). Vestigial structures (01 mark)
    (b). Explain how each of the following provides evidence for evolution
        (i). Adaptive radiation (05 marks)
        (ii). Vestigial structures (04 marks)
        (iii). Comparative anatomy (08 marks)

13. Explain how each of the following provides evidence for evolution.
    (a). Comparative embryology (07 marks)
    (b). Comparative biochemistry (08 marks)
    (c). Comparative serology (05 marks)

14. (a). What is meant by the term **selection** as used in evolution (03 marks)
    (b). Explain the role of the following **selection processes** in evolution
        (i). Stabilizing election (06 marks)
        (ii). Disruptive selection (06 marks)
        (iii). Directional selection (05 marks)

15. (a). State Darwin's theory of **natural selection**. (03 marks)
    (b). State the three observations and two conclusions from which Darwin derived his theory (12 marks)
    (c). How does the modern view of evolution differ from Darwin's (05 marks)

16. (a). What is **natural selection**? (03 marks)
    (b). How does natural selection occur (10 marks)
    (c). What is the importance of natural selection? (07 marks)

17. Explain the role of the following in natural selection.
    (a). Environment (08 marks)
    (b). Increased selection pressure (06 marks)
    (c). Reduced selection pressure (06 marks)

18. (a). Explain how natural selection acts an agent of
        (i). Constancy within a population (07 marks)
        (ii). Change within a population (07 marks)

(b). Explain the effect of reduced genetic diversity of a given population on the survival of a species. (06 marks)

19. (a). Explain the role of heterozygosis in variation. (07 marks)
(b). Explain the low frequency of recessive alleles within a population (07 marks)
(c). Explain the conditions under which the frequency of a recessive allele in a population may increase. (06 marks)

20. (a). Explain the term **polymorphism** as used in evolution (02 marks)
(b). Distinguish between stable and unstable polymorphism. (02 marks)
(c). Describe the basis of
(i). Stable polymorphism (06 marks)
(ii). Unstable polymorphism (06 marks)

21. (a). What is meant by the term **genetic equilibrium** (02 marks)
(b). State the Hardy-Weinberg equilibrium principle (02 marks)
(c). State the conditions under which the above principle is valid. (02 marks)
(b). Explain how each of the conditions mentioned in (c) above may affect genetic equilibrium. (14 marks)

22. Explain the role of the following in evolution
(a). Genetic drift (11 marks)
(b). Gene flow (09 marks)

23. Explain the role of the following in evolution
(a). Non random breeding (12 marks)
(b). Founder effect (08 marks)

24. (a). What is meant by the term **inbreeding** (02 marks)
(b). Explain the effect of inbreeding in a population (04 marks)
(c). Describe the mechanisms which limit inbreeding in plants (10 marks)
(d). Explain why organisms show features that limit inbreeding in their populations. (04 marks)

25. (a). What is meant by the term **out breeding**? (03 marks)
(b). Distinguish between **hybrid** and **hybrid vigor** (02 marks)
(c). Explain how out breeding leads to increase in vigor (10 marks)
(d). What is the role of out breeding in evolution of new species? (05 marks)

26. Explain the role played by the following in evolution
(a). Natural selection (07 marks)
(b). Mutation (07 marks)
(c). Polyploidy (06 marks)

27. Describe the role of the following in evolution.
(a). Mutation (07 marks)
(b). Meiosis (07 marks)
(c). Fertilization (06 marks)

28. (a). What is meant by the term **speciation**? (02 marks)
(b). Describe how new species of organisms may arise. (18 marks)

29. (a). What is meant by the term
(i). Isolating mechanism (02 marks)
(ii). A deme (02 marks)
(b). Describe the role of isolating mechanisms in speciation. (16 marks)

30. (a). Explain the factors that determine the rate of spread of a mutant allele within a population (12 marks)
(b). Explain the different post-zygotic mechanisms that isolate organisms of different species (08 marks)

31. Explain the role of the following in speciation.
(a). Interpspecific hybridization (07 marks)
(b). Polyploidy (07 marks)
(c). Genetic drift (06 marks)

32. (a). Explain why reduction in selection pressure may lead to speciation. (12 marks)
(b). Describe the role of geographical isolation in formation of new species (08 marks)

33. (a). Describe how sickle cell anaemia arises in an individual. (08 marks)
(b). Explain why sickle cell anaemia is common in areas where malaria is endemic. (05 marks)
(c). Using sickle cell anaemia, explain the following terms
(i). Genetic load. (04 marks)
(ii). Heterozygous advantage. (04 marks)

34. (a). What is meant by the term **reproductive isolation**? (02 marks)
(b). Describe the different prezygotic mechanisms that act as isolating barriers between organisms of different species (11 marks)
(c). Explain how territorial behavior leads to evolution. (07 marks)

THE END; FOR NOW.