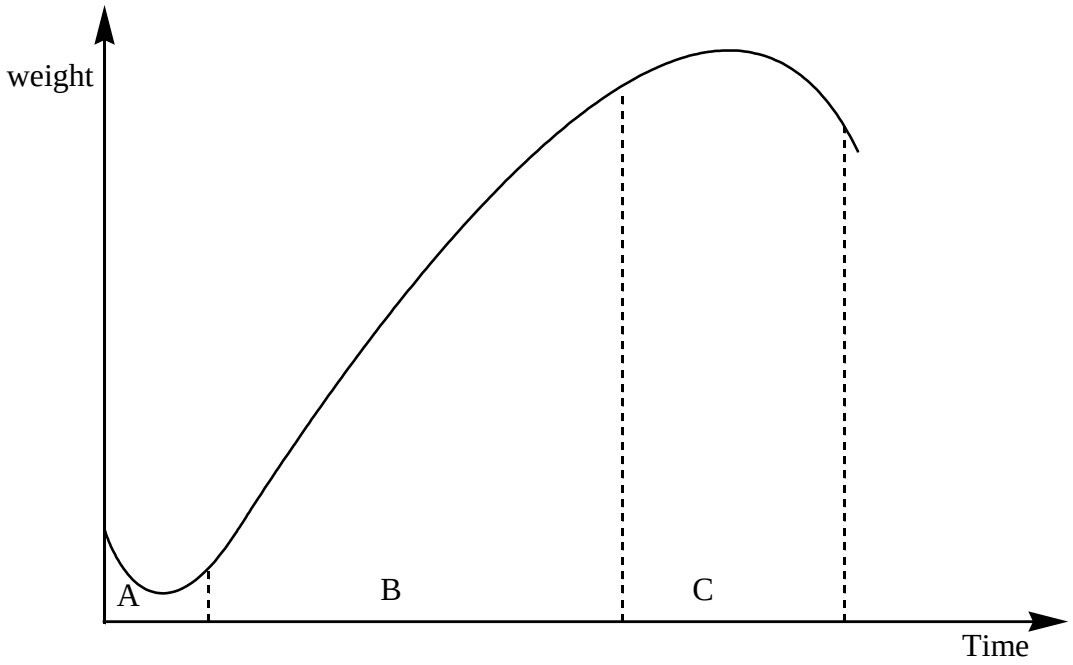
SENGEREMA SECONDARY SCHOOL

FORM SIX (VI) BIOLOGY HOME PACKAGE EXAMINATION

A. GROWTH

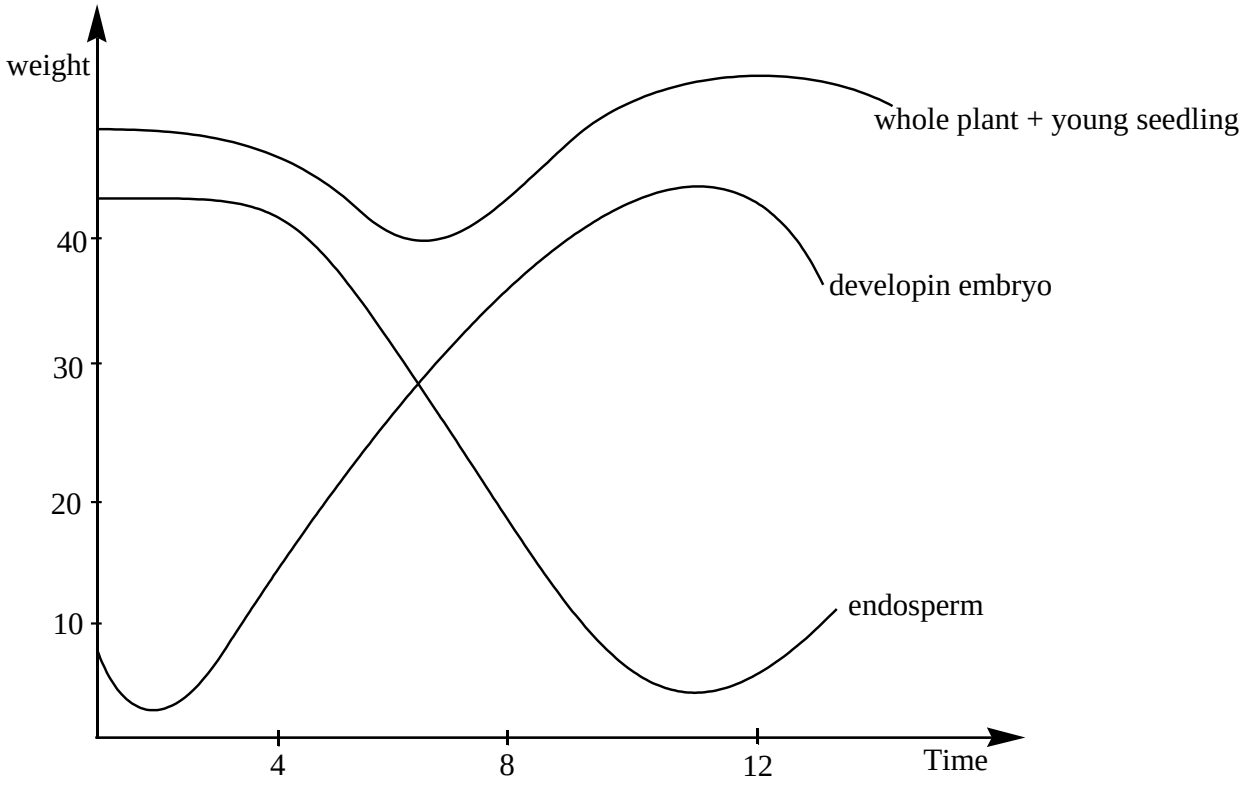
1. Draw a growth curve of a named herbaceous plant and give a full interpretation of the curve so drawn.
2. a) Draw a graph to show a growth curve of an annual plant starting with germination and ending with production.

   b) Account for the shape of growth curve.
3. The graph below represents stages in life cycle of a plant. Study the graph and answer the questions that follow:



   a) What type of a curve is represented by the graph?

   b) Give an explanation of the changes on weights at the stage indicated by A, B and C on the graph.
4. The graph below represents the chnges in dry mass of barley grain and some of its structures during the first twelve days of germination.



Study the graph carefully and interprets the information represented by the curves.

5. (a) (i) Distinguish between localized growth and diffuse growth

   (ii) State any three factors which influence growth in animals.

   (b) By means of diagram show the life cycle of a maize plant.

6. a) Discuss the physiological process which account for the opening of stomata during day and closing at night.

   b) Explain any six features or methods used by xerophytes in minimizing water loss.

7. a) The term "growth" when applied to bacteria differs from how it is applied to higher plants and animals. Briefly show this difference.

8. In a certain bacterial culture growth in closed flask with supplies induced once, that is, at the beginning of the experiment; the following observations were made through monitoring the population growth.

   Growth of the bacterial population from a single cell with the generation time of 30 minutes

Elapse time (hours)	Cell number
0.0	1
0.5	2
1.0	4

1.5	8
2.0	16
2.5	32
3.0	64
3.5	128
4.0	130
4.5	132
5.0	133

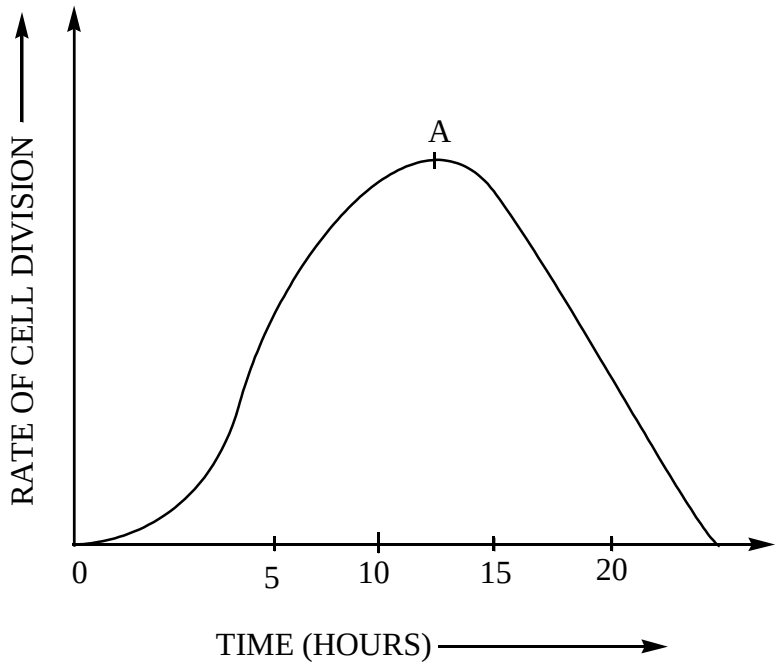
a) Make a graphical representation of the data above

b) Describe and account for the pattern of the curve observed.

c) What would you expect to observe in case the experiment was allowed to continue for 40 hours?

d) Discuss the factors which would contribute to the expected observation in (c) above

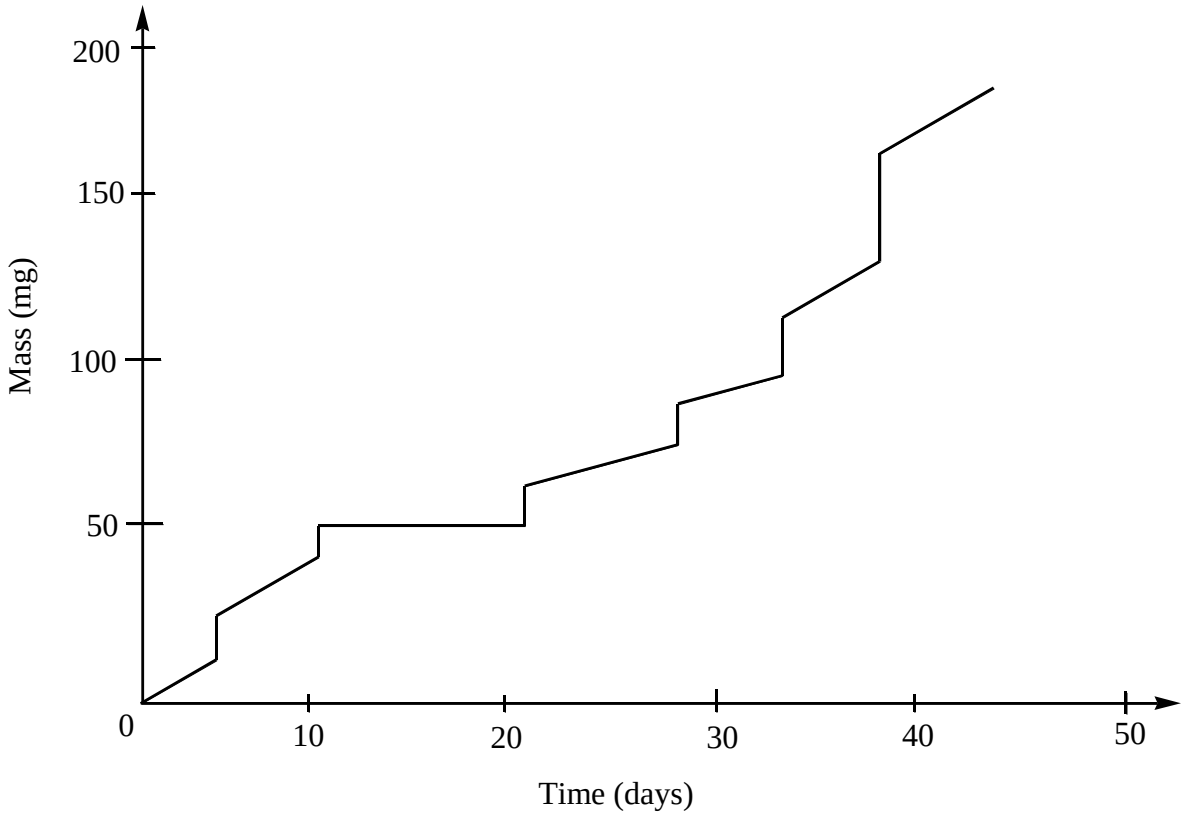
9. a) A yeast was grown in a nutrient medium for a period of 20 hours. At regular intervals of time, the cell counted and the rate of cell division determined. The results were presented graphically as shown below.



Suggest three possible reasons for the fall in growth rate after point A.

b) State two external factors which influence growth in plants and mention one effect of each.

10. a) The diagram below represents the growth curve of an arthropod. Study it and answer the questions below below it.



i. What type of growth does this curve show?

ii. Explain the cause for such type of growth curve.

b) Giving one example in each case, explain the what is meant by

i. Allometric growth

ii. Isometric growth

11. a) Distinguish complete from incomplete metamorphosis

b) Explain the hormonal control of metamorphosis (moulting) in insect

12. a) Explain figure X below and answer the questions that follow.

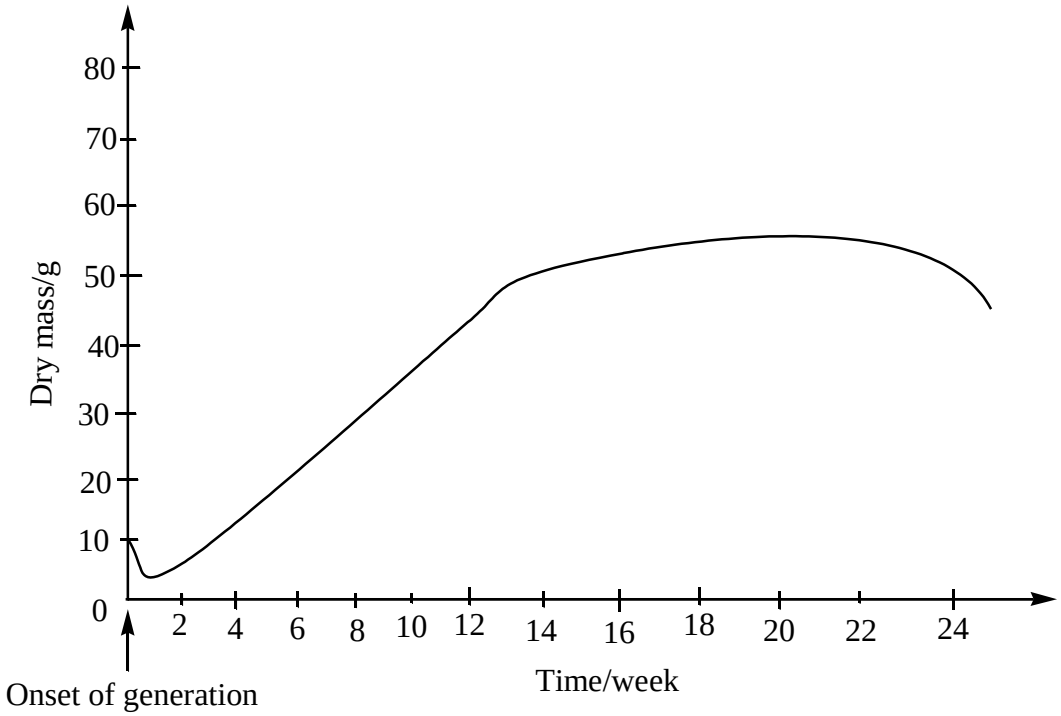


Figure X Growth curve of an annual plant

Figure X Growth curve of annual plant

i. Why is there initial decrease in weight during the germination of the seed?

ii. What will the appearance of the seedling be when positive growth occurs at P?

iii. What physiological process occurs at P to account for positive growth?

iv. Account for the sudden decrease in dry mass after 20 weeks.

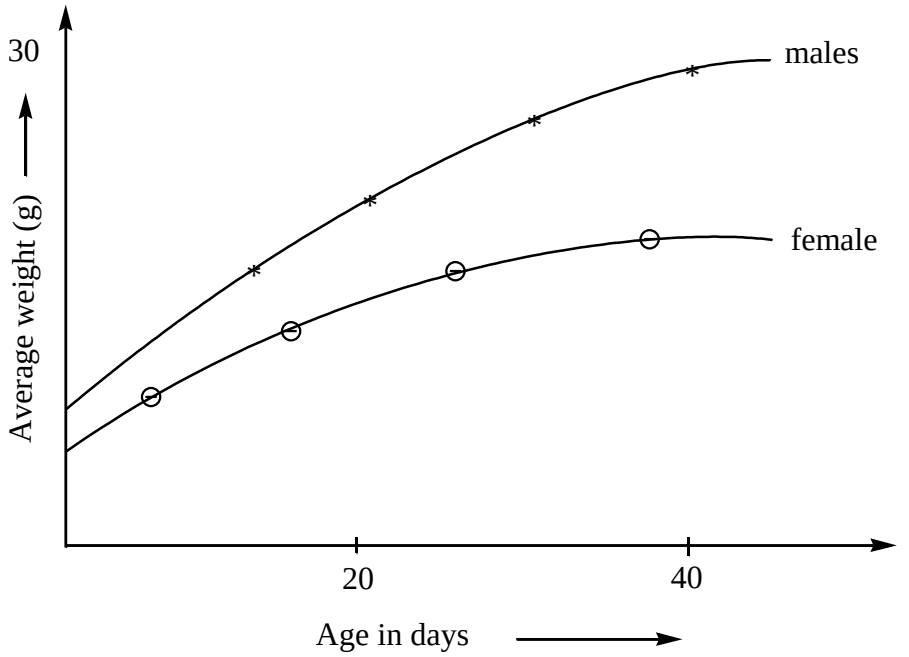
a) (i) What type of growth is exhibited in figure X?

(ii) Explain briefly what happens during this type of growth.

13. Using relevant illustrations, explain the differences between limited and unlimited growth.

14. a) What do you understand by the term growth

b) Careful examine the growth curve of mice in figure 3 below and answer the questions that follow



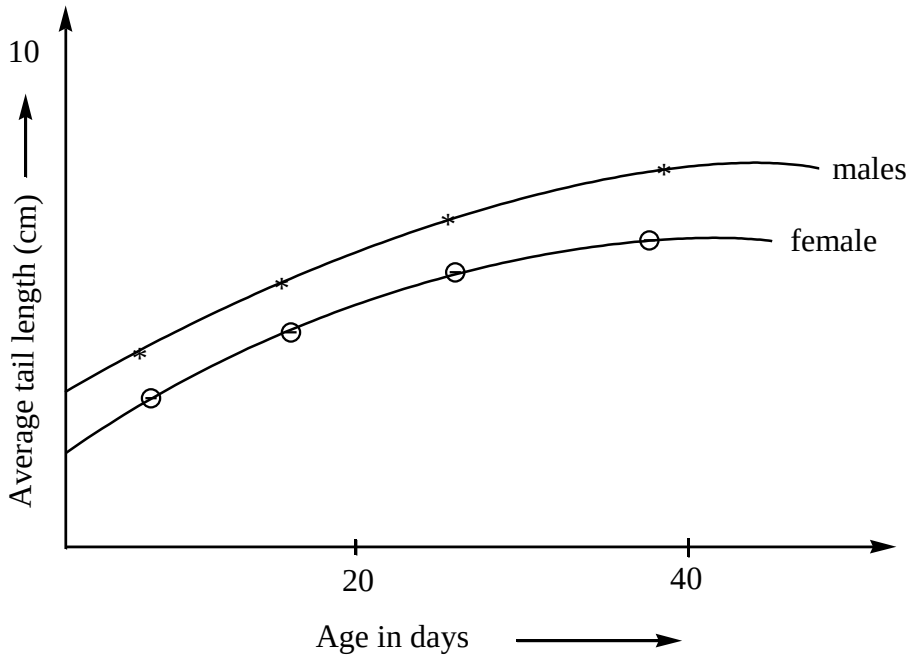


Figure 3

i. Did the mice (both female and male), increase in weight faster at any time during the four week period?

ii. What is the weight of the female and male mice after 14 days of growth?

iii. What is the relationship between the growth rate o mice tail and bodies?

iv. What conclusion can you draw from the growth rates of both sexes of mice?

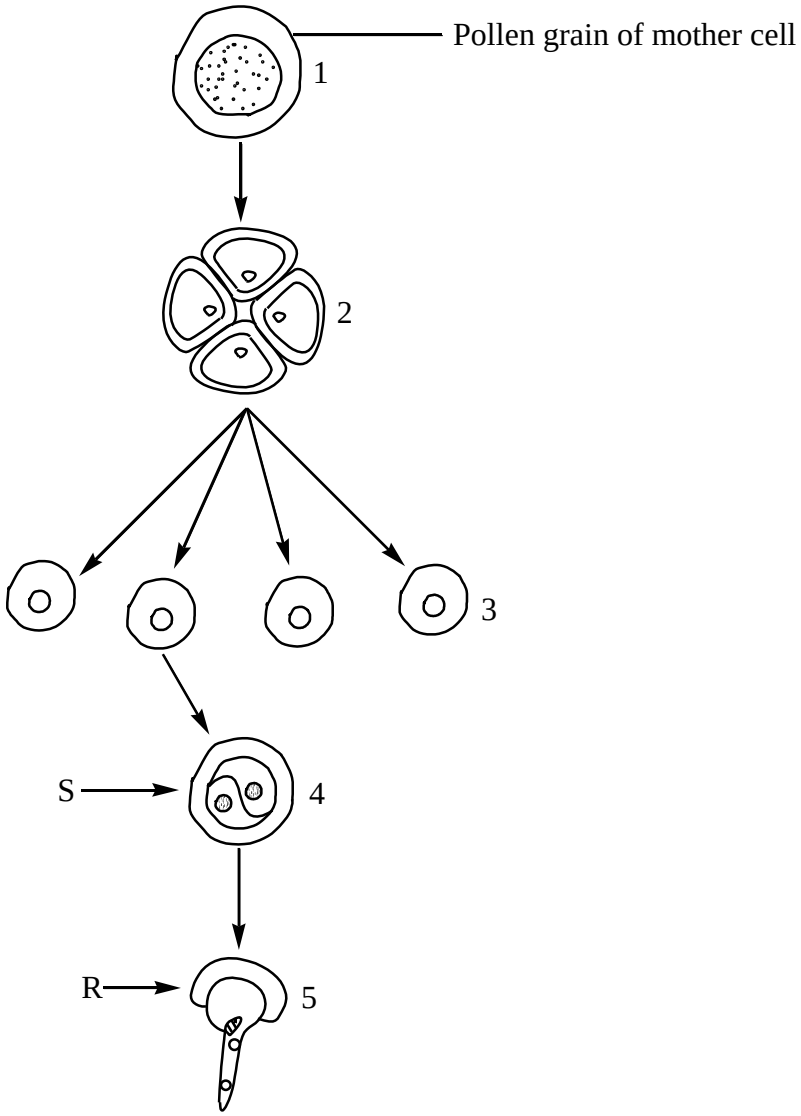
15. a) Define the term meristem.

b) Write short notes on lateral meristem with reference to location, role and effect.

16. Growth in some arthropods which undergo metamorphosis is different from other organisms. Explain.
17. a) Describe the population growth shown in a sigmoid and J – Shaped growth curves.
    b) Explain the causes of a step – like growth pattern in arthropod.
18. a) What is the meaning of meristematic tissue?
    b) Mention the types of meristematic tissue in dicot plants. Where is each located?
    c) State any four adaptations of xylem tissue to the functions it performs.
19. a) By using the relevant curve, describe the growth pattern in arthropods.
    b) Differentiate allometric growth from isometric growth. Give one example in each case.
    c) Describe the types, location, role and effects of meristematic cells.
20. a) Explain the following types of growth; give one example in each case
        i. Intermittent growth
        ii. Allometric growth
        iii. Isometric growth
        iv. Limited growth
        v. Unlimited growth
    b) State the roles of the following factors in seed germination
        i. Water
        ii. Air
        iii. Optimum temperature
21. a) Define Growth
    b) Seed which required a stimulus of light for germination are usually small. Why? Do you think this is important?
    a)

B. REPRODUCTION

22. Describe the events of prophase of meiosis I and comment on the biological consequences of chiasmata formation.
23. a) Figure below illustrate gametogenesis in flowering plant



b) What structure in the diagram corresponds to a mammalian spermatozoan?

c) Explain how structure S is formed from R

24. a) Briefly explain the significance of meiosis in sexually reproducing organs.

b) Give three differences between mitosis and meiosis

25. a) (i) Draw a large diagram of the human sperm. Label on your diagram the following parts head, neck, middle piece, main piece, flagellum, spiral mitochondria, acrosome, nucleus and centriole.

(ii) Show how the structure of the human sperm is related to its function.

b) In a certain species of flowering plants the chromosome number of each cell in radicle is 16. State the chromosome number in any four of the following:

i. Pollen tube nucleus

ii. Antipodal cell

iii. Endosperm

iv. Pollen mother cell

v. Integument cell

26. a) Draw a large diagram of unfertilized ovule of flowering plant. Label on your diagram the following parts;

    i. Micropyle

    ii. Nucellus

    iii. Integuments

    iv. Embryo sac

    v. Pollar nuclei

    vi. Female nucleus

    b) With reference to a maize plant,

    i. Describe double fertilization

    ii. Explain the importance of double fertilization.

27. With reference to maize plant discuss the mechanism of double fertilization and its importance.

28. Discuss the concept of double fertilization and its consequences.

29. a) Distinguish complete from incomplete metamorphosis

    b) Explain the hormonal control of metamorphosis (moulting) in insects.

30. Figure 2 below represents a cross section of human semniferous tubule. Study the figure and answer the questions below it

    a) Name the parts labeled A – F

    a) Which structure forms the part labeled B?

    b) Which process is involved in the transformation of structure C to D?

    c) Explain the function of the structure labeled F

    d) Define and point out the consequences of double fertilization

31. In a hypothetical plant the number of chromosomes in the palisade cell 14 Deduce the number of chromosomes in:

    i. Megaspores mother cell (14)

    ii. Pollen tube nucleus (7)

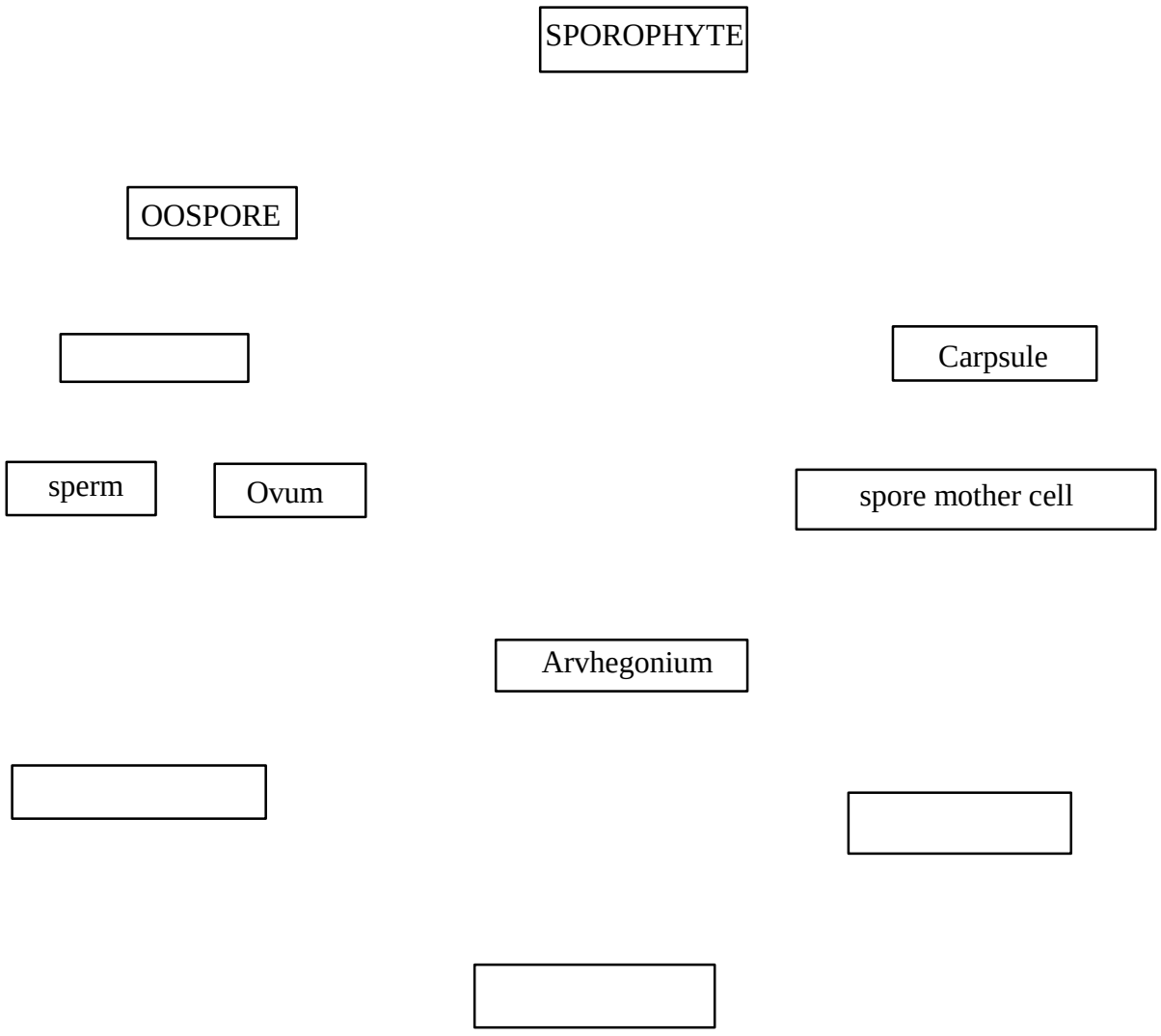
    iii. Antipodal nucleus (7)

    iv. Integuments (14)

    v. Endosperm (2)

    vi. Root hair cell (14)

32. Give an account of how the mammalian sperm and ovum are structurally adopted for their respective function in reproduction.
33. a**)** Explain why the spermatophytes are often referred to as the higher plant.
    b) What is the economic importance of gymnosperm?
34. a) i. Distinguish between localized growth and diffuse growth.
        ii. State any three factors which influence growth in animals.
    b) By means of diagram show the life cycle of a maize plant.
35. The following illustrates the life cycle of a bryophyte copy the diagram as it is and answer the following questions.



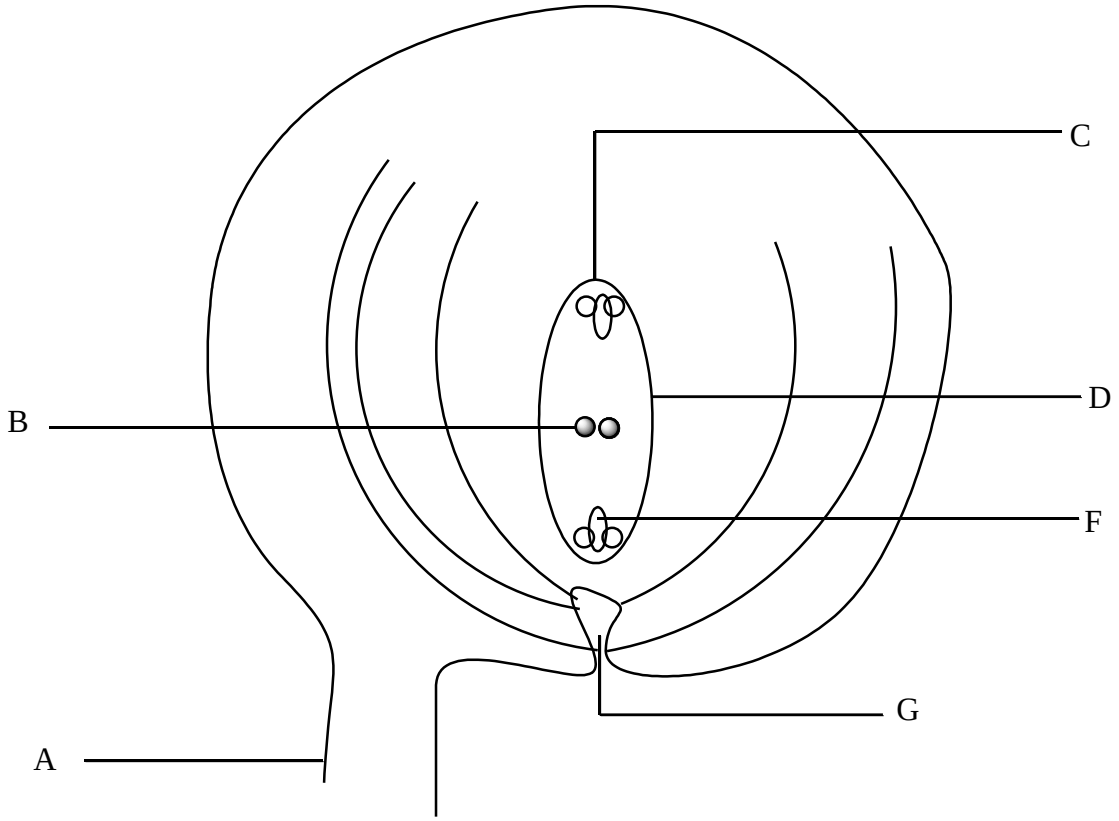
Life cycle of bryophytes

a) Fill in the names of the stages are represents by the empty boxes.

b) By means of arrow indicate the direction of the sequence of event in the life cycle.

c) Draw a line across the life cycle to separate the haploid generation from the diploid generation and label them accordingly.

36. Study the diagram below carefully and answer the question which follows.



a) Name the parts labeled A and G

b) Suppose the ovule was fertilized and develop in a seed, what part in the seed would be formed from parts B, C, E, F and G.

37. a) What is meiosis?

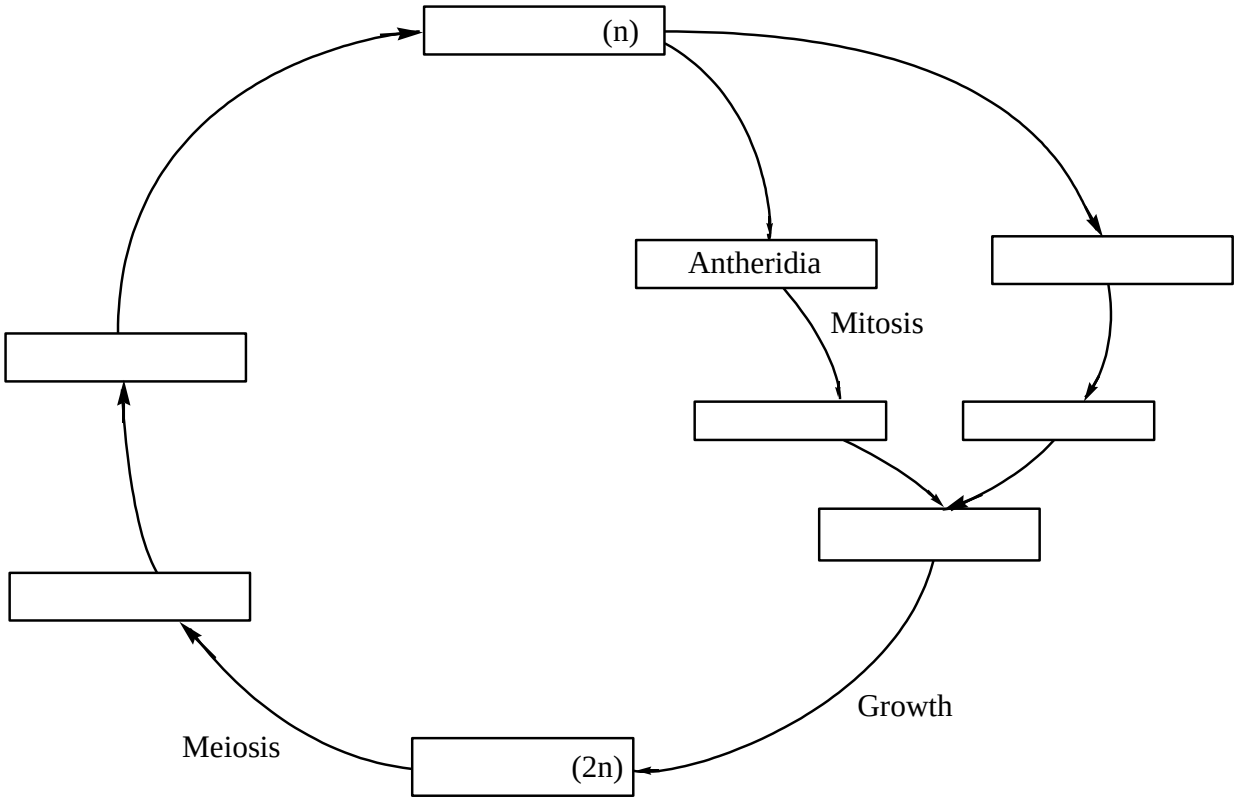
b) An animal has haploid number 4 during meiosis how many chromatids are represent in.

i) The tetrad stage?

ii) Late telophase of the first meiotic division?

iii) Metaphase of the second meiotic division?

38. (a) The diagram represent the life cycle of a moss plant. Fill in the empty boxes with appropriate terms.



(b) Suggest two reasons why water is important in this life cycle.

39. Summarize the roles of the hormone controlling the Oestrous cycle in human female.

C. TRANSPORTATION

40. a) What are the conducting of the Xylem?

    b) Describe the structure of the cells in (a) above and show how their structure are related to their function.

41. i) Describe the structure of the xylem as plant vascular tissue.

    ii) State the roles of the xylem

    iii) How is the structure the xylem related to his function?

42. (a) Define the term

    i. Capillarity

    ii. Cohesion tension theory

    (b) Give a critical analysis on the how the cohesion tension theory explains the upward movement of water through the xylem vessels.

43. a) Briefly describe how the mass flow hypothesis explain the mechanism of phloem translocation.

b) In list and briefly describe the shot comings of the mass flow hypothesis or pressure flow hypothesis)

44. a) Draw and concisely but precisely describe the much model of the Phloem translocation.

    b) Relate the above model to the actual plant body.

45. a) Identify the features which characterize circulator system in vertebrates.

    (b) By using Cell streaming theory, describe the translocation of materials in plants through the phloem. State the weaknesses of this theory.

46. (a) Figure 1 shows two solution which are separated by a partial permeable. Study it carefully and answer questions that follow.

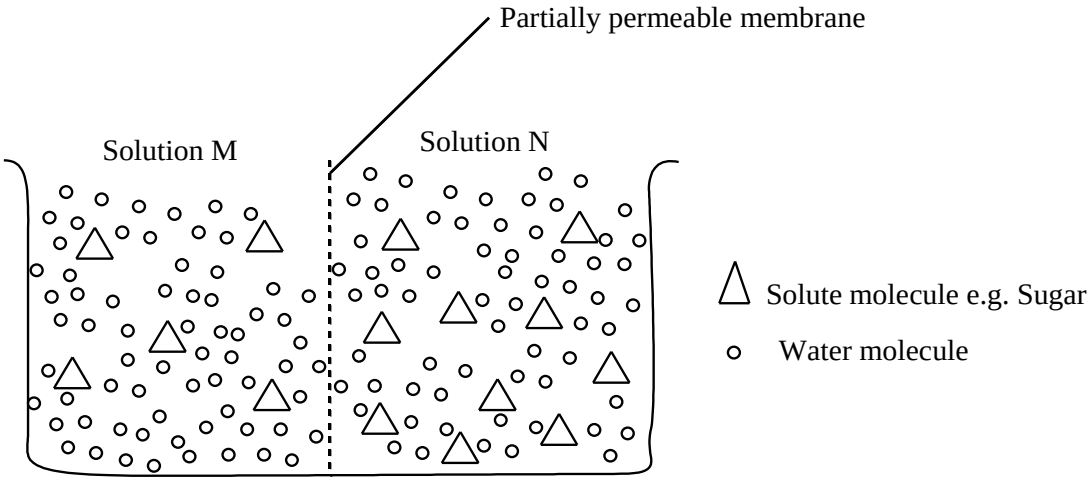


Figure 1

i. Which solution has higher water potential?
ii. Which solution has higher solute potential?
iii. In which direction will osmosis occur?

(b) State four roles of osmosis process in living organisms.

47. With the help of diagram, describe how the structure of cardiac muscle is adapted to its function.

48. (a) What do you understand by the following

    (i) Guttation
    (ii) Transpiration
    (iii) Translocation

    (a) Explain the biological significance of the properties of water

49. Outline the main adjustments that occur to the heart rate and circulatory system before, during and after the race.

50. (a) Describe the paths of water and mineral salts across the root.

(b) Distinguish between foetal and adult circulation

D. GENETICS

51. "Describe the types of the circulatory system in animals"?

(a) Describe the structure and chemical nature of DNA molecule

(b) State the properties of DNA molecule which make suitable as a material of heredity

52. (a) Describe the following conditions of chromosomal mutations :-

(i) Trisomy

(ii) Monosomy

(b) In maize, the grains are covered by tough testa , in a cross between pure line verities of maize one with black- testa covered grains, the other with white – testa covered grain, the F_1, offspring all had black- testa covered grains. Allowing the F_1, plants to fertilize by self reproduction, gave rise to an F_2 generation with phenotypes ex-pressed below;

Black – testa covered grains 836

Grey- testa covered grains 212

White- testa covered grains 72

Account for the F_2 generation results

53. A homozygous purple-flowered short-stemmed plant was crossed with a homozygous red - flowered long-stemmed plant and the **F_1** phenotypes had purple flowers and short stems. When the **F_1** was test crossed with a double homozygous recessive plant, the following progeny were produced;

52 purple flower, short stem

47 purple flower, long stem

49 red flower, short stem

45 red flower, long stem

a) Which characters were dominant and why?

b) Carry out crosses to show the formation of F_1 and F_2

54. (a)Explain the following terms as they are used in applied genetics

(i) Aneuploid

(ii) Polyploid

(b) Using appropriate genetic symbol, explain how sickle cell trait is transmitted from two heterozygous parents to their offspring.

55. (a) (i) What do you understand by the term genetic code,

(ii) Explain the properties of a genetic code.

(b) (i) By the aid of illustrations explain events which occur in DNA replication In leading and lagging strands.

(ii) State the significance of DNA replication

56. (a) Describe the advantages of applying genetic engineering in plant and animal breeding.

(b) (i) Explain why farmer are not advised to plant hybrid seeds such as tomatoes from one season to another.

(ii) With reference to the first Mendelian Law of inheritance, show how the ratio of 3:1 and 1:1 is obtained in monohybrid cross

57. (a) Write down one (1) important role of the following RNAs

(i) mRNA

(ii) tRNA

(iii) rRNA

(b) In gene interaction (collaboration), one gene **R** produces a rose comb while its recessive allele **r** produces a single comb. Another gene **P** produces a pea comb as if recessive allele P also produces a single comb. When **P** and **R** interact they collaborate to produce a walnut comb. This is a form of comb that neither P nor R produces alone.

(i) By using the information above write the possible genotypic forms for the following phenotype.

Phenotype	Possible Genotype
Rose	
Pea	
Single	
Walnut	

(ii) What phonetic ratio of (F2) which will be obtained when cross between rose and pea combed chicken.

58. (a) In the experiment conducted on pure – breading varieties of oats , one with black – hulled grains and the other with white hulled grains , the offspring (F_1) all had black hulled grains when (F_1). Generation were crossed gave F_2. Generation with the following phenotype

    (i) 418 black hulled grains

    (i) 106 grey hulled grains

    (ii) 36 white hulled grains

    Use a punnet square to show the gaments genotypes and phenotypes in each generation and Suggest the genetic ratio.

    (b) From the above 5(a), with reasons state the name given to the form of inheritance pattern shown by varieties of oats.

59. (a) Explain the evidence that prove the location of heredity material are in the cell and also found in the nucleus of the cell.

    (b) (i) Describe the structure of nucleic acid (RNA)

    (ii) Briefly explain the role of DNA

60. (c) Collaborative genes produce new phenotype different from the parent phenotype using defined symbols explain the example of collaborative gene

61. (a) What is the chemical composition of genetic material?

    (b) Write the properties which account for DNA suitability as hereditary material

    (c) What are the genetic significances of DNA replication.

62. (a) Elaborate Mendel's work in genetics by considering his success and failure.

    (b) Explain causes of variations in living organisms

63. In a white fowl, plumage colour is controlled by two set of genes, including the following:

    W (white) dominant over w (cololur)

    B (black) dominant over b (brown)

    The heterozygous **F_1** genotype WwBb is white. Account for this type of gene interaction and show the phenotypic ratio of the **F_2** generation.

64. (a) Evaluate three merits of genetic engineering in human being.

    (b) If a pure strain of mice with brown-coloured fur are allowed to breed with a pure strain of a mice with grey- coloured fur they produce offspring having brown - coloured fur. If the F] mice are allowed to interbreed they produce an F2 generation with fur colour in the proportion of three brown- coloured to one grey. Carry out genetic crosses to illustrate these results.

65. Study Figure 1 and answer the questions which follow.

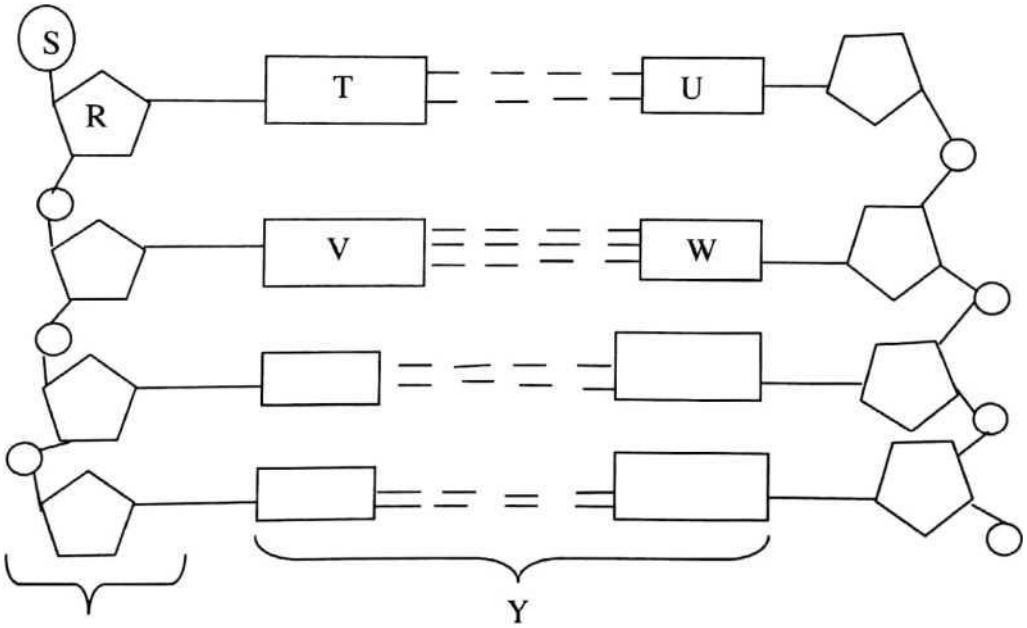


Figure 1

(a) (i) Name the structure represented by Figure 1.

(ii) Identify the structures represented by letters R, S, T, U, V, W. X and Y.

(iii) What is the name given to both structure T and U?

(iv) What is the name given to both structure V and W?

(v) Name the bonds which help in the formation of structure shown in Figure 1.

(b) Enumerate five differences between deoxyribonucleic acid and ribonucleic acid.

E. ECOLOGY

66. (a) Define the term ecological pyramids as used in ecological studies

(b) Identify and describe the three types of ecological pyramids and in each type point out the merits and demerits of using them in ecological studies

67. (a) Describe the ecological pyramids. Discuss the drawback of each of ecological pyramid.

(b) Give reasons as to why the ecologica pyramids are tapered.

68. (a)Describe the following ecological terms.

i. Ecological niche
ii. Ecosystem
iii. Population
iv. Trophic level
v. Food chain

vi. Food web

(b)Explain why energy level decrease at each Trophic level.

(c) Explain the following terms give examples

i. Environmental resistance

ii. Density independent factor

iii. Density dependent factor

(d) Ecologist wanted to know the population of lions in Manyara national Park. At first time went in the park and 2400 lions captured marked and released. After two weeks went in same park and 3000 lions captured of which 2000 lions were marked. Calculate lion population in Manyara National Park.

69. (a) Explain the different ecological pyramids which show the feeding relationships of the biotic component of the ecosystem.

(b) Explain why only a small proportion of energy taken up by each level of food chain is transferred to the next step

70. (a) Describe how the following sampling are conducted

i. Random

ii. Stratified

iii. Systematic

(b) (i) What is Biome?

(ii) Taiga is one of the terrestrial biome of the world; explain its location, its four (4) importance characteristics and four organisms which are found within it.

71. Interpret ecological pyramids and state three limitations of each.

72. (a) Define ‘’Community ecology ‘’ and mention four (4) properties of communities

(b) (i) What is the relationship between interspecific competition and the competitive exclusion principle ?

(ii) Briefly explain how Darwin conceptualized the evolution of webbed toes in ducks.

73. An ecosystem is a unit in which energy flows and nutrient circulate. Give an illustrated discussion of this definition.

74. (a) Briefly explain how each of the following human activities affects the flow of energy innthe ecosystem.

i. Poaching.

ii. Deforestation.

(b) Describe seven biotic factors which affect population distribution.

75. (a) Describe systematic and random sampling in ecology.

(a) State two (2) advantages and disadvantages of the methods mentioned in (a) above.

(c) Explain how primary and secondary ecological successions take place.

76. Clearly describe nine procedures used to estimate population for each of the following methods:

a) Quadrant method.

b) Capture-recapture method.

77. (a) (i) Define the term population explosion and explain three causes to it.

(ii) State five negative consequences of population explosion.

(b) (i) What is capture recapture method?

(ii) Outline nine procedures used to estimate population under capture-recapture method.

F. EVOLUTION

78. Discuss the theories of origin of life

79. (a) Explain the causes of reproductive isolation between organisms of the same species in a particular geographical area

(b) (i) Show clearly how does adaptive convergence from adaptive radiation with respect to the living organisms

(ii) Describe why fish and dolphins share similar organs and similar general at body shapes

(c). Explain the existence of antibiotic resistant bacteria in hospital environments though patients carrying bacteria are treated there with antibiotics.

80. (a) With specific examples describle

i. Divergence evolution

ii. Convergence evolution

(b)Citing specific (2) examples from both plants and animals, explain how comperative Embryology support the views that evolution has occurred.

81. (a) (i) What do you understand by the term organic evolution?

(ii) Justify now homologous, analogous and vestigial organs as an evidence to support organic evolution

(b) (i) Slate advantages of natural selections to organisms

82. (a) Discuss how comparative physiology supports Evolution

(b) (i) What is species?

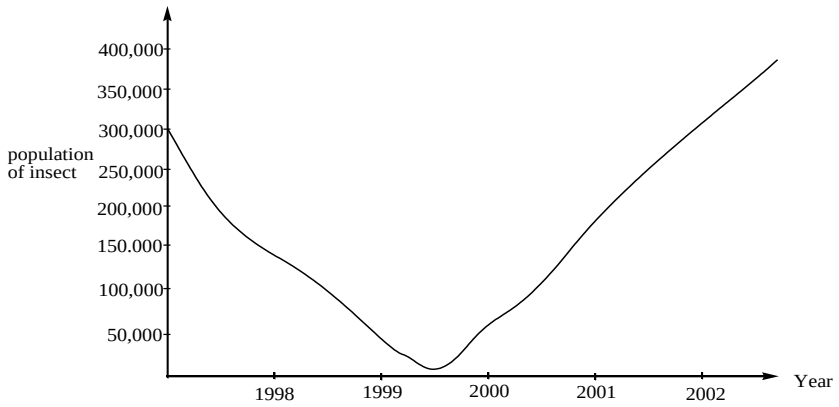
(ii) Give three factors which may lead to the formation of a new species

83. (a) State and explain any three theories of Origin of life.

(b) By using long necked giraffe as an example, explain the mechanism of organic evolution according to Lamark's theory.

84. (a) Describe the three observation and two deductions of Darwin's theory of natural selection.

(b) A researcher spread DDT regularly for several years to a population of pests. He sampled the population in every year of spraying. When the results were graphically represented the graph obtained was as shown in the figure 1 below.



Explain this observation.

85. (a) Darwin's theory of natural selection is based on number of observations and deductions. Discuss

(b) Explain strength and weakness of Darwin's theory of natural selection

86. (a) Discuss how comparative anatomy supports organic Evolution

(b) Distinguish divergent from convergent evolution and show clearly which the two terms typically support organic evolution.

87. (a) Giving examples show how the study of the following has contributed to the evidence of evolution; (a) fossil

(b)Homologous structure (d)Serology

(c)Vestigial structure

88. Describe the types of natural selection and give examples.
89. Discuss the reproductive isolation mechanism showing how they tend to the creation of new species
90. (a) Enumerate six essential features of natural selection as put forward by Charles Darwin.

    (b) Describe how geographical, reproductive and genetic isolations bring about speciation.

91. (a) Explain the mechanism of Organic evolution according to Lamark's theory and state strength and weakness of the theory.

    (b) (i) Explain how Palaentology supports the idea of evolution.

    (ii) What shortcomings that face fossil record to be not suitable evidence of evolution
92. (a) Explain Lamark's theory of evolution.

    (b) Why almost all modem biologists reject Lamarck's theory of evolution?
93. What is fossil? Describe briefly how fossils provide evidence for evolution.
94. Describe four evidence which show that evolution has taken place
95. (a) Explain why it not advisable to plant hybrid seeds from one season to another.

    (b) Discuss the strength and weakness for the theory of natural selection

96. How do the following bring about speciation?

    (a) Adaptive radiation (b) Genetic variability
97. What do you understand by the following as used in evolution?

    (a) Law of use and disuse (b) Convergent evolution
98. Explain how the following term is involved in natural selection in action

    (a) Industrial melanism

    (b) Mimicry

    (c) Sickle cell trait
99. (a) Define divergence evolution

    (b) Discuss the drawbacks of Darwin theory of organic evolution.
100. What is Variation? With reason(s) Categories the following human traits into continuous and discontinuous variation. Complexion, eye colour, intelligence, blood group, height, tongue rolling.