2013

BIOLOGY

SECTION A (40 MARKS)

1. The oxygen dissociation curves for aquatic animals are usually to the left of those of terrestrial ones because
   A. There is less oxygen in water
   B. Air is less dense than water
   C. Aquatic animals are less active
   D. Aquatic animals use less oxygen

2. Staying in a dark room for a long time increases the sensitivity of the eye to light because photochemical pigments are
   A. Not broken down
   B. Formed faster than they are broken down
   C. Destroyed
   D. Not synthesized

3. Which one of the following is correct about organisms in an ecosystem?
   A. Some organisms exist in isolation
   B. Every organism can be independent
   C. All organisms interact with each other
   D. Each organism has a different source of food

4. Figure 1 shows a glandular tissue

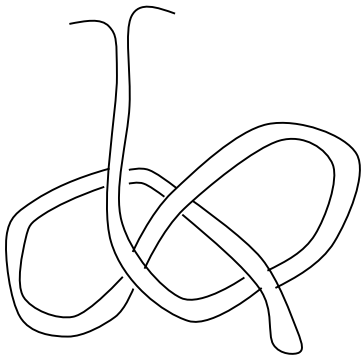


Fig. 1

In which part of the mammalian body is the tissue likely to be?

A. Ileum
B. Lungs
C. Stomach
D. Skin

5. Which one of the following changes in a cell would increase its water potential?
   A. Decrease in turgor pressure

B. Increase in solute potential
C. Decrease in osmotic potential
D. Increase in pressure potential

6. Sprinters usually take off at an angle rather than in upright position in order to increase
   A. The speed of movement
   B. The upward force
   C. Effective length of limbs
   D. Forward force

7. Table 1 shows the effect of temperature on the rates of apparent photosynthesis and respiration in a plant.

Temperature (^{0}C)	7	10	15	19	22	28
Rate of apparent photosynthesis ($mgCO_2\ g^{-1}\ h^{-1}$)	1.3	2.3	2.8	3.1	2.8	2.5
Rate of respiration ($mgCO_2\ g^{-1}\ h^{-1}$)	0.3	0.6	0.7	1.2	1.8	2.1

The temperature in ^{0}C, at which the plant is least efficient photosynthetically is

   A. 7
   B. 10
   C. 22
   D. 28

8. The hormone which enables plants to respond to drought is
   A. Gibberellins
   B. Abscisic acid
   C. Auxins
   D. Cytokinin

9. Figure 2 represents a longitudinal section through part of a striated muscle fibre.

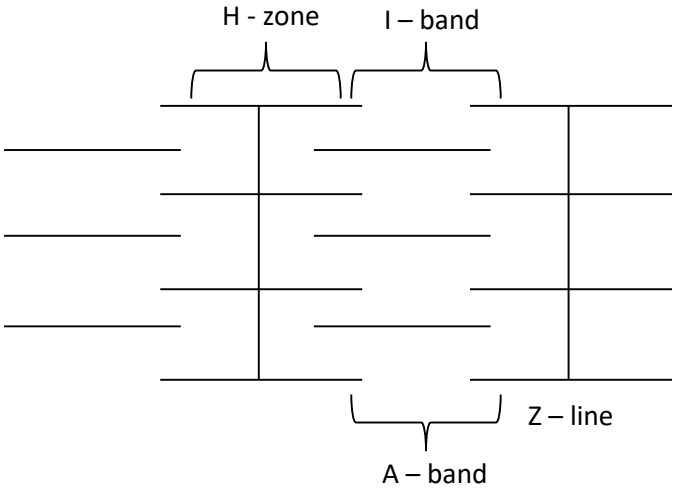


Fig. 2

Which one of the following pairs of structures shorten when the muscle fibre contracts?

A. I – band and H – Zone
B. H – Zone and A – band
C. I – band and Z – line
D. A – band and Z – line

10. Which one of the following would occur to a plant requiring at least 14 hours of dark period daily in order to flower?
    A. No flowering occurs if the dark period is interrupted with a flash of light
    B. Flowering occurs if the days are 14 hours long
    C. No flowering occurs if the dark period is more than 14 days
    D. Flowering occurs if the dark period is interrupted with a flash of light

11. Sickle cell anaemia is caused by a double recessive gene and sufferers usually die before maturity. The continued existence of the sickle cell allele among the human population demonstrates
    A. Drug resistance
    B. Heterozygous advantage
    C. In – breeding
    D. Genetic drift

12. Which one of the following consists of a pair of tissues specialized for support?
    A. Parenchyma and collenchyma
    B. Collenchyma and sclerenchyma
    C. Parenchyma and sieve tubes
    D. Xylem and phloem

13. When same response is given to same stimulus on different occasions, the behavior is said to be
    A. Instinctive
    B. Conditioned
    C. Imprinted
    D. Stereotyped

14. Which one of the following statements on reproduction is true?
    A. Asexual reproduction always results into identical offspring
    B. Gametes are always produced by meiosis
    C. Mitosis always produce diploid cells
    D. Gametes are always haploid

15. C_3 plants are less efficient than C_4 plants in fixing carbon dioxide at low carbon dioxide and high oxygen partial pressure because
    A. C_3 plants use energy
    B. In C_3 plants, energy is lost
    C. RuBP carboxylase is inactivated by the high oxygen partial pressures
    D. PEP carboxylase has a high affinity for oxygen

16. Which one of the following is the significance of etiolation in plants?
    A. Allows small – sized leaves to break through the soil
    B. Leads to rapid elongation of hypocotyl in monocotyledonous plants
    C. Allows maximum growth in length using the available food reserves
    D. Enables a plant to grow in darkness
17. Which one of the following methods of estimating population has the highest chances of error?
    A. Removal method
    B. Quadrant method
    C. Capture – recapture method
    D. Direct count method

18. Which one of the following is the correct state of structures in the mammalian eye during accommodation for far objects?

	Ciliary Muscle	**suspensory ligament**	**curvature of lens**
A.	Relaxed	taut	decreased
B.	Contracted	taut	increased
C.	Relaxed	relaxed	decreased
D.	Contracted	relaxed	increased

19. Which one of is the respiratory surface for a mammalian foetus?
    A. Alveolus
    B. Placenta
    C. Chorionic villi
    D. Amnion

20. Which one of the following is the correct order of events in the heart after the contraction of the atria?
    A. Atrio – ventricular valves open, ventricle contract, semi lunar valves close
    B. Ventricles contract, atrio – ventricular valves close, semi lunar valves open
    C. Ventricles contract, atrio – ventricular valves open, semi lunar valves open
    D. Atrio – ventricular valves open, semi lunar valves open, ventricles contract

21. Which one of the following features characterizes the omnivore gut?
    A. Large divided stomach
    B. Poorly developed appendix and ceacum
    C. Long pouched colon
    D. Short ileum and colon

22. High concentration of carbon dioxide in the tissues leads to
    A. Increase in the affinity for oxygen by haemoglobin
    B. Increase in the loading tension of haemoglobin
    C. Shifting of the dissociation curve to the left
    D. Lowering of the affinity for oxygen by haemoglobin

23. Which one of the following environmental factors has a direct effect on all organisms?
    A. Light

B. humidity
C. Temperature
D. Rainfall

24. Which one of the following factors reduces interspecific competition in a community?
A. Resource partitioning
B. High intraspecific competition
C. Large number of species
D. Similar predator – prey strategies among the species

25. Figure 3 shows an earthworm in a stationary position

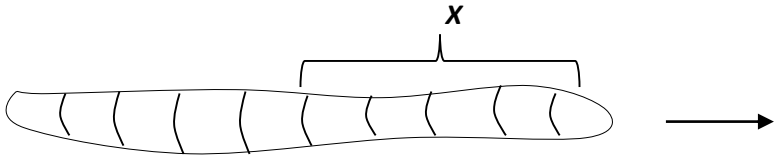


Fig. 3

For the earthworm to progress in the direction indicated by the arrow, in region X, the earthworm has to contract its
A. Circular muscles and extend the cheatae
B. Longitudinal muscles and retract the cheatae
C. Circular muscles and retract the cheatae
D. Longitudinal muscles and extend the cheatae

26. Albinism in corn plants is due to a double recessive gene which causes them to die before maturity. The trait however continues to appear in new generations because
A. Albino plants can develop chlorophyll when exposed to light
B. Normal green plants may carry recessive alleles
C. New varieties may be produced by crossing – over in albino plants
D. Mutation may occur to change albino plants to green

27. Which one of the following may cause adaptive radiation to a variety of species?
A. Stabilizing selection
B. Directional selection
C. Ceasation of selection forces
D. Disruptive selection

28. The following are adaptations for survival among animals during periods of water shortage
(i) Tolerance to water loss
(ii) Biochemical production of water
(iii) Reduction in water loss
(iv) Evasion of hot environment

Which one of the following is a correct set used by the camel?
A. (i) and (ii) only
B. (i), (ii) and (iii)

C. (i), (ii) and (iv)
D. (iii) and (iv) only

29. The equation for complete oxidation of a substance is
$2\ C_{18}\ H_{34}\ O_2 + 510_2 \rightarrow 36\ CO_2 + 34\ H_2O$

The respiratory quotient for the oxidation is
A. 0.70
B. 1.4
C. 0.9
D. 1.0

30. A likely effect of inhibiting the action of acetylcholinesterase at a synapse is
A. Ceasation of impulse transmission
B. Speeding up of impulse transmission
C. Continuous impulse transmission
D. Slowing down of impulse transmission

31. Which one of the following processes does not affect the biochemical oxygen demand in an environment?
A. Nitrification
B. Ammonification
C. Nitrogen fixation
D. Denitrification

32. At which one of the following stages of cell division does a cell have the same nucleic content as that at metaphase I?
A. Anaphase I
B. Metaphase II
C. Telophase II
D. Prophase II

33. When a lipid is combined with a phosphate group, it becomes
A. Saturated
B. A complex molecule
C. Water soluble
D. Amphoteric

34. Which of the following animal groups have body segments and closed circulatory system?
A. Crustacea
B. Platyhelminthes
C. Annelida
D. Insect

35. Which one of the following occurs in a mammal when its thermoregulatory centre detects a lower temperature of blood than normal?
A. Shivering

B. Decreased metabolic activity
C. Flattening of body hair
D. Increasing sweating

36. Which one of the following may occur to a community of organisms as a result of natural selection?
    A. Increase in the number of species
    B. Adapting to the environment by all the organisms
    C. Extinction of species
    D. Reduction in the level of mutation

37. Which one of the following parts of the nephron contributes to the production of hypertonic urine?
    A. Bowman's capsule
    B. Proximal convoluted tubule
    C. Distal convoluted tubule
    D. Loop of Henle

38. An occurrence of a phenotypic ratio 3 : 1 in a Dihybrid cross is an indication of
    A. Linked genes
    B. Crossing over chromosomes
    C. Failure of homologous chromosomes to separate
    D. Dominance

39. Which one of the following is not exhibited by a well adapted parasite?
    A. Inflicting moderate harm to its host
    B. Employing an intermediate host
    C. Killing the host
    D. Using more than one host

40. Which one of the following is not a requirement for the working of a physiological homeostatic mechanism?
    A. Receptors
    B. Skin capillaries
    C. Control mechanisms
    D. Effectors

SECTION B (60 MARKS)

Write answers in the spaces provided.

41. Figure 4 shows the effect of increasing the concentration of a substrate on the rate of an enzyme – controlled reaction in presence of inhibitors **A** and **B,** in relation to the control experiment without an inhibitor.

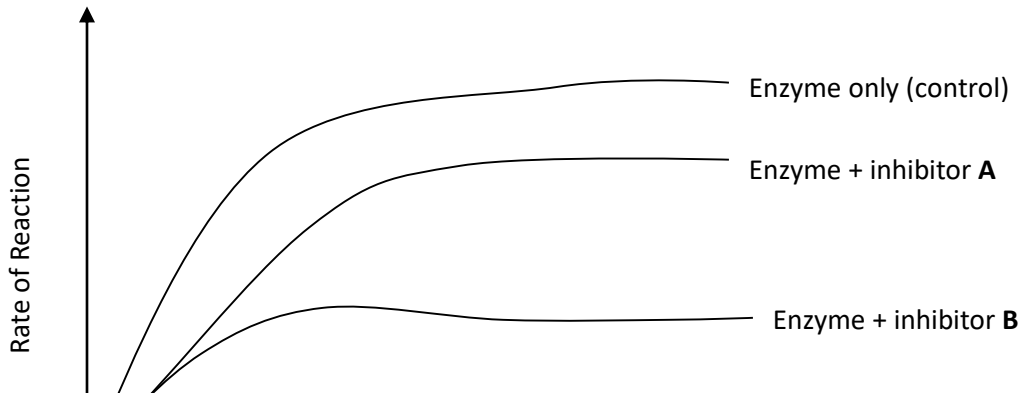


Fig. 4

(a) Describe the effect of each inhibitor on the rate of reaction.

(i) Inhibitor **A.** (02 marks)

……
……

……
……

……
……

……
……

(ii) Inhibitor **B.** (02 marks)

……
……

……
……

……
……

……
……

(b) Explain the difference in the effect of inhibitor A and B on the rate of reaction. (06 marks)

……
……

……
……

……

……

……

……

……

……

……

……

……

……

……

……

……

42. Figure 5 shows two forms of population growth curves of animals

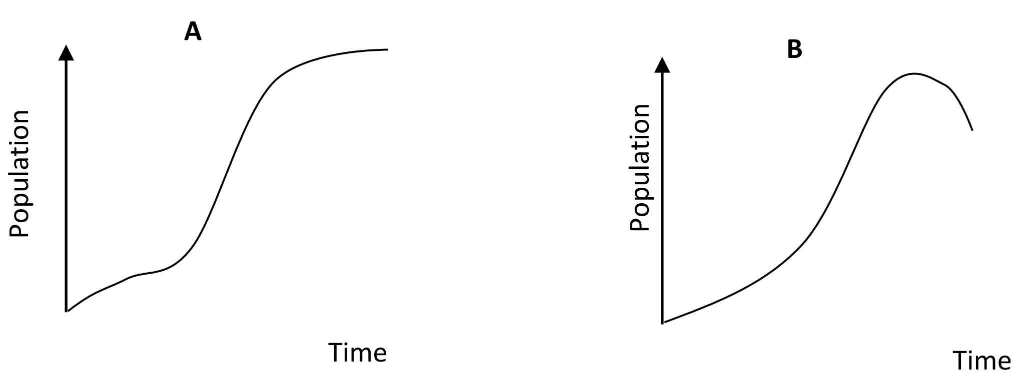


Fig. 5

(a) Indicate by drawing on curve **A** the carrying capacity of the environment. (01 mark)

……
……

……
……

(b) Compare the pattern of population change in curves **A** and **B.** (02 marks)

……
……

……
……

……
……

……
……

(c) Suggest an explanation for the population changes in curve **B.** (04 marks)

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(d) Suggest three biotic factors which can result into a change in carrying capacity, in an environment. (03 marks)

……
……

……
……
……
……

……
……

……
……

……
……

……
……

43. (a) Distinguish between **hybrid** and **hybrid vigour.** (02 marks)

……
……

……
……

……
……

……
……

(b) Explain how each of the following may alter the gene frequency.
(i) Closeness of populations. (04 marks)

……
……

……
……

……
……

……
……

……
……

……
……

(ii) Small population size. (04 marks)

……
……

……
……

……
……

……
……

……
……

……
……

……
……
……
……

44. (a) Name two areas in plants where each of the following tissues is found.
(i) Sclerenchyma (01 mark)

……
……

……
……

(ii) Collenchyma (01 mark)

……
……

……
……

(b) Give three structural adaptations of the sclerenchyma tissue for its function. (03 marks)

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(c) Explain the importance of the collenchyma tissue in leaves and young stems. (02 marks)

……
……

……
……

……
……

……
……

(d) Outline three structural differences between the collenchyma and sclerenchyma tissue. (03 marks)

……
……

……
……

……
……

……
……
……
……

45. Figure 6 shows results obtained in an investigation on maize seedlings and the dry mass of the seedlings during germination, for 12 days.

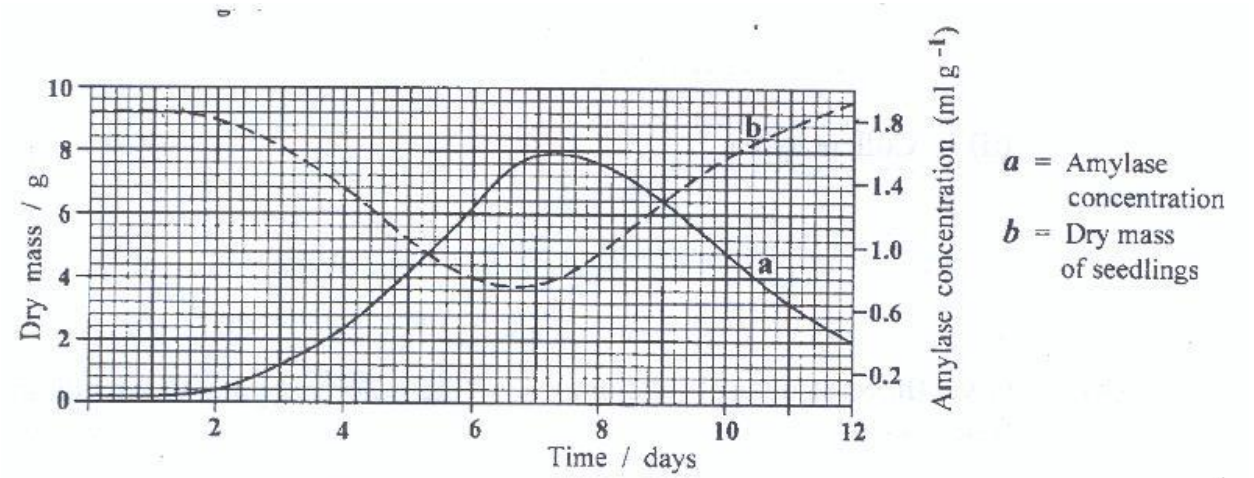


Fig. 6

(a) (i) Describe the relationship between the change in concentration of amylase and the dry mass of the seedlings in the first 2 days. (01 mark)

……
……

……
……

(ii) Explain the relationship described in (a)(i) (02 marks)

……
……

……
……

……
……

……
……

……
……

……
……

(b) Explain the change

(i) In dry mass of the seedlings during the 7th day. (03 marks)

……
……

……
……

……
……

……
……
……
……

……
……

……
……
……

(ii) In amylase concentration after the 2nd day. (04 marks)

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

46. (a) Explain the following

(i) Breathing in pure oxygen at higher pressure than atmospheric is dangerous.

(04 marks)

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(ii) Breathing in air rich in carbon dioxide is dangerous. (03 marks)

……
……

……
……

……
……

……
……
……
……

(b) outline three adaptations of animals that live in environments of low oxygen tensions.

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

END.

BIOLOGY

SECTION A (40 MARKS)

1. In the body, protein may combine with acids or bases depending on the
   A. Temperature
   B. Hydrogen ion concentration in the medium
   C. Number of solvent molecules present in the medium.
   D. Number of amino acid molecules in the protein

2. The epithelial type lining the mammalian alveoli
   A. Columnar
   B. Cuboid

C. Stratified
D. Squamous

3. Which one of the following is correct about the first division of meiosis but not that of mitosis?
   A. Nucleolus disappears
   B. Spindle is formed
   C. Centrioles move to opposite poles of the nucleus
   D. Homologous chromosomes associate to form bivalents.

4. Workers bees and the queen bee are polymorphic forms which differ in their fertility as a result of
   A. Feeding on different diets
   B. Worker's eggs not being fertilized
   C. Workers being produced parthenogenetically
   D. The queen having diploid cells while the workers have haploid cells.

5. Which of the following ions move from the plasma into the red blood cells to maintain electro-neutrality during the uptake of carbon dioxide by the blood in the tissues?
   A. Cl^-
   B. CO_3^{2-}
   C. K^+
   D. HCO_3^-

6. Which one of the following is not a correct statement about nastic response?
   A. The response may be a growth movement
   B. The direction of movement of a plant is always related to the direction of the stimulus
   C. It is a response from a non-directional stimuli
   D. The response movements are localized

7. Long-day plants may be stimulated to flower if
   A. The period of darkness is interrupted with flashes of light
   B. Provided with more than 10 hours of light
   C. Provided with 12 hours of completedarkness
   D. The light period is interrupted with short dark period

8. Wearing a coarse shirt causes unpleasant sensation at first but later the discomfort disappears because
   A. With continued stimulus, generator potential falls below threshold value
   B. The post – synaptic surfaces fail to release the transmitter substance
   C. Nervous system stops carrying sensory impulses
   D. Continued stimulation leads to fusion of generator potentials

9. Which one of the following is the correct shape, in the region of the body of an earth worm where its circular muscles are contracted?
   A. Short and thick
   B. Long and thin
   C. Short and thin

D. Long and thick

10. *Chiroleples*, the desert frog flourishes in the desert because it
    A. Has a water proof skin
    B. Is nocturnal
    C. Has few and small glomeruli
    D. Reabsorbs metabolic water

11. Which one of the following is the ultimate hydrogen acceptor during anaerobic respiration in animals?
    A. Lactic acid
    B. NAD
    C. Pyruvic acid
    D. Acetyladehyde

12. Which one of the following is unlikely to be found in the body cells of obligate anaerobes?
    A. Glycolytic enzymes
    B. ATP
    C. Mitochondria
    D. Sugars

13. Which one of the following is illustrated in Figure 1?

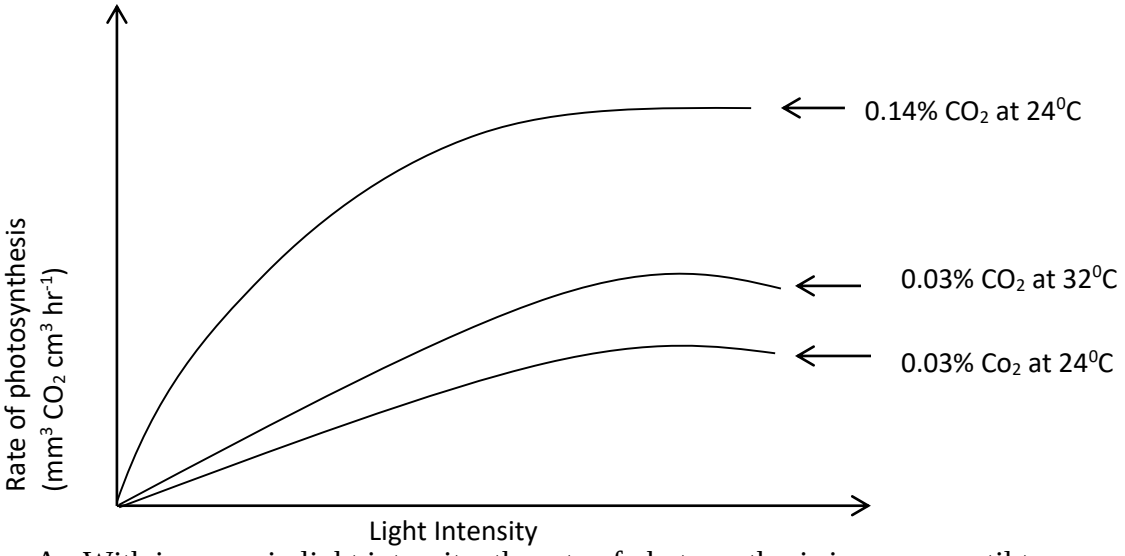


Fig.1

    A. With increase in light intensity, the rate of photosynthesis increases until temperature becomes a limiting factor.
    B. Rate of photosynthesis increases with an increase in the carbon dioxide concentration
    C. With increase in light intensity, the rate of photosynthesis increases indefinitely.
    D. Rate of photosynthesis increases with an increase in light intensity until carbon dioxide concentration becomes a limiting factor.

14. Which one of the following is not a fibrous protein?
    A. Keratin
    B. Globulin

C. Elastin
D. Collagen

15. Which one of these activities would result into a low respiratory quotient?
    A. Respiration in muscles during heavy exercise
    B. Formation of calcareous shells
    C. Fattening livestock
    D. Preparation for hibernation in a mammal

16. A probable function of the endoplasmic reticulum is to
    A. Control the entry and exit materials in cells
    B. Facilitate intracellular transport of materials
    C. Act as a template in protein synthesis
    D. Enable substance diffuse against concentration gradient

17. The rapid stomatal closure during wilting due to
    A. Increase in abscisic acid
    B. Rapid conversion of sugar to starch
    C. Rapid accumulation of carbon dioxide in the guard cells
    D. Reduction in the level of mineral ions in the guard cells

18. Cartilagenous fish retain urea in the blood in order to
    A. Avoid dehydration
    B. Reduce entry of salts into the tissue
    C. Avoid loss of excess water by excreting it
    D. Maintain an internal ionic concentration in balance with the external medium

19. Which one of the following organisms does not belong to the same phylum as the rest?
    A. Tape worm
    B. Liver fluke
    C. Planaria
    D. Leech

20. A cockroach has a respiratory system while an earthworm does not because
    A. Earthworms do not need much oxygen
    B. The surface volume ratio in a cockroach is small
    C. Earthworms can be parasitic
    D. The respiratory system provides shape in a cockroach

21. Which one of the following structures is not homologous with the rest?
    A. Bat wing
    B. Human fore arm
    C. Insect wing
    D. Bird wing

22. Which one of the following has the greatest biomass in an ecosystem?
    A. Tertiary consumers
    B. Primary producers

C. Secondary consumers
D. Primary consumers

23. Which one of the following is an effect of the luteinizing hormone?
    A. Development of the Graafian follicles
    B. ovulation
    C. Stimulation of sperm production
    D. Repair of the uterine wall

24. Which one of the following is a correct statement about a neurone membrane during resting potential?
    A. The inside of the neurone membrane is negatively charged
    B. The Na^+, K^+ and Cl^- ions are evenly distributed on either side of the membrane
    C. The concentration of K^+ ions is greater inside the membrane
    D. The concentration of K^+ ions is greater outside the membrane

25. Which one of the following statements is not correct about a test cross?
    A. It is carried out on an organism with a dominant phenotype
    B. The offspring of the cross may all have dominant phenotype
    C. The organism of the unknown genotype is crossed with a homozygous dominant individual
    D. The offspring of the cross may have the ratio of 1 dominant phenotype: 1 recessive phenotype

26. Which of the following conditions result from gene mutation?
    A. Klinefelter's syndrome
    B. Turner's syndrome
    C. Sickle cell anaemia
    D. Down's syndrome

27. If the triplet of mRNA is AAG what is the complementary triplet of the bases on the tRNA molecule?
    A. TTC
    B. UUC
    C. CCT
    D. CCU

28. Which one of the following factors does not increase the chances of fertilization in mammals?
    A. Seasonal breeding cycles
    B. Female receptiveness to the male only during ovulation
    C. Internal fertilization
    D. Development of secondary sex characteristics

29. Which one of the following is not a problem that endoparasites face in their transmission?
    A. Leaving the host
    B. Entering the host
    C. Living away from the host

D. Identifying the host

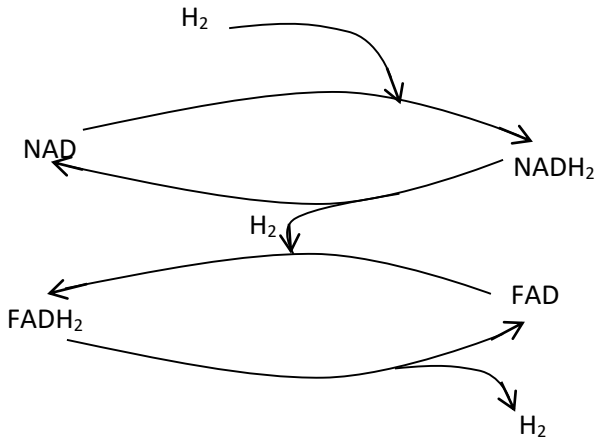
30. Which one of the following statements is correct about the exponential phase in the population growth?
    A. Death rate and birth rate are equal
    B. Numbers of individuals and rate of growth increase
    C. The numbers outstrip the supply of factors for support
    D. Slow growth of the population

31. An organism living in an oxygen deficient environment has
    A. Haemoglobin that easily picks up oxygen
    B. Its oxygen dissociation curve to the right
    C. Haemoglobin that readily releases its oxygen
    D. Haemoglobin that less readily picks up oxygen

32. Which one of the following is not a purpose for courtship behavior among animals?
    A. Ensuring that both partners are sexually mature
    B. Establishing a pair-bond
    C. Ensuring that both partners are ready for moving
    D. Establishing territories

33. Which one of the following statements is not correct about seed dormancy?
    A. It allows further development of the seed
    B. It is induced by internal factors
    C. It increases the chances of survival of the seed
    D. It is ended by external factors

34. Figure 2 shows that



    A. NAD is oxidized to $NADH_2$
    B. $NADH_2$ reduces FAD to $FADH_2$
    C. $FADH_2$ is reduced to FAD
    D. $NADH_2 + H_2 \longrightarrow$ NAD

35. The number of organisms in each trophic level reduces as one moves up a food chain because

A. Energy is lost in moving from one trophic level to another
B. Energy is lost from the top trophic levels
C. Organisms in higher trophic levels are less productive
D. Of high level of predation at the top trophic levels

36. Anaerobes thrive better than aerobic organisms in waters experiencing thermal pollution because
A. High temperature kill aerobic organisms
B. Anaerobics possess enzymes that work best at high temperatures
C. High temperatures reduce solubility of oxygen
D. High encourage multiplication of aerobes' predators

37. Which one of the following is correct about parallel flow of water across the gills?
A. Water has a higher oxygen concentration at each point of contact
B. Low blood oxygen concentration is attained
C. Diffusion occurs over the whole region of the fill filament
D. High blood oxygen concentration is achieved

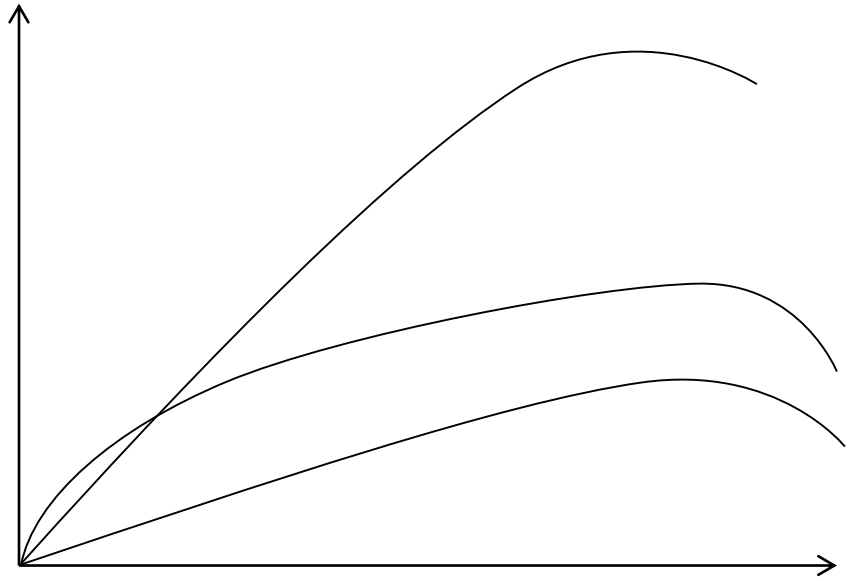
38. Which one of the following adaptations of xerophytes does not reduce transpiration?
A. Hairy leaves
B. Leaves with thick waxy cuticle
C. Small sized leaves
D. Succulent stems

39. The influx of water in fresh water bony fish is offset by possession of
A. Numerous, large glomeruli and re-absorption of salts from the renal fluid
B. Numerous, small glomeruli and extrusion of salts from the body
C. Few large glomeruli and uptake of salts
D. Many small glomeruli and uptake of salts

40. The main difference between endotherms and ectotherms is that ectotherms
A. Gain their body heat from internal sources
B. Gain less heat than endotherms
C. Gain the body heat from external sources
D. Are lower animals while endotherms are higher animals

SECTION B

41. Figure 3 shows the variation of the rate of photosynthesis with temperature in C_3 and C_4 plants, at different light intensities.



(a) Using the figure, state how differently temperature affects the rate of photosynthesis in C_3 plants from C_4 plants at high intensity. (03 marks)

……
……

……
……

……
……

……
……

……
……

(b) Explain the differences in the effect of temperatures on the rate of photosynthesis in C_3 and C_4 plants at high light intensities stated in (a) (03 marks)

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(c) Explain the pattern of curve (c) in the figure. (03 marks)

……
……

……
……

……
……

……
……

……
……

……
……

……
……

42. (a) What is meant by apical dominance? (02 marks)

……
……

……
……

……
……

……
……

(b) State the causes of each of the following

(i) Apical dominance (02 marks)

……
……

……
……

……
……

……
……

(ii) Seed dormancy (02 marks)

……
……

……
……

……
……

……
……

(c) What is the ecological importance of

(i) apical dominance? (02 marks)

……
……

……
……

……
……

(ii) seed dormancy? (02 marks)

……
……

……
……

……
……

……
……

43. (a) Explain the absence of a yolk sac in the development of a human foetus while it is an important structure in the development of birds. (04 marks)

……
……

……
……

……
……

……
……

……
……

……
……

(b) State the reproductive adaptations of birds to terrestrial life. (03 marks)

……
……

……
……

……
……

……
……

……
……

……
……

(c) Give three forms of parental care provided by mammals. (03 marks)

……
……

……
……

……
……

……
……

……
……

44. (a) What is instinctive behavior? (01 mark)

……
……

……
……

(b) State two factors that influence instinctive behavior. (02 marks)

……
……

……
……

……
……

……
……

(c) Territorial behavior is common among many animal species. Give

(i) four advantages of this behavior (04 marks)

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(ii) three disadvantages of this behavior (03 marks)

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

45. (a) Illustrating with a cell of one pair of homologous chromosomes, draw diagrams in the space below to show

(i) Mitotic metaphase (02 marks)

(ii) Meiotic metaphase I (02 marks)

(iii) Meiotic metaphase II (02 marks)

(b) Explain how meiosis contributes to genetic variation. (04 marks)

……
……

……
……

……
……

……
……

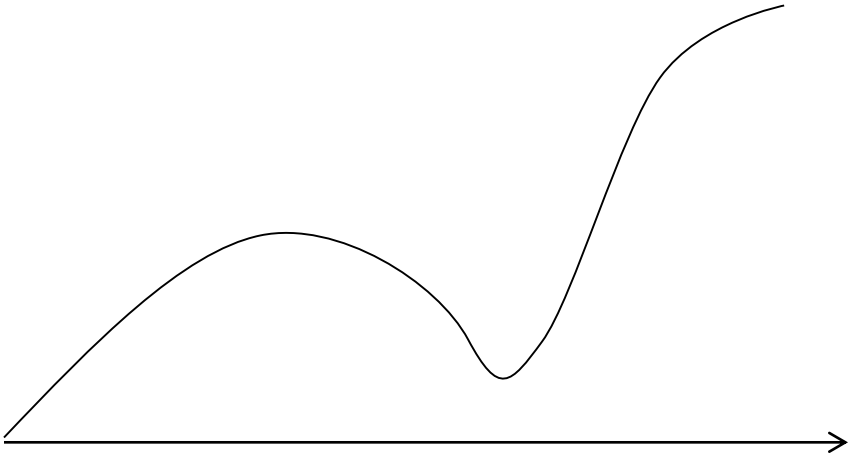
……
……

……
……

……
……

……
……

46. Figure 4 shows the immune response of a person's blood after vaccinations are given on day one and 60 days later.



(a) What is the effect of giving immunization to the individual? (02 marks)

……
……

……
……

(b) From the graph, state the type of immunity acquired by the individual, giving a reason. (02 marks)

……
……

……
……

……
……

(c) Explain the shape of the graph (04 marks)

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(d) Describe three ways in which antibodies combat antigens. (03 marks)

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

2007

SECTION A (40 MARKS)

1. Which one of the following is a simple branched tubular gland?
   A. Brunner's gland
   B. Salivary gland
   C. Sweat gland
   D. Mammary gland

2. Which one of the following activities does not contribute to global warming?

A. Use of pesticides
B. Deforestation
C. Burning fossil fuels
D. Use of CFCs.

3. The significance of etiolation to a germinating seed in the soil is that it
   A. Leads to rapid elongation of the hypocotyl in monocotyledonous plants
   B. Allows maximum growth in length with minimum use of food reserves
   C. Allows the seeding to grow in the dark
   D. Ensures that leaves remain small to break through the soil

4. Dioecious plants are rare inspite of having the advantages of cross pollination because
   A. Anthers and stigmas at different times
   B. The male and female plants are usually apart
   C. Half of the individuals do not produce seeds
   D. Only few agents of dispersals are involved

5. Which one of the following substances would be produced by plants under conditions of water stress?
   A. Indoleacetic acid
   B. Ethene
   C. Gibberellins
   D. Abscisic acid

6. Which one of the following does not lead to change in allele frequency of a population?
   A. Mutation
   B. Selection
   C. Sexual recombination
   D. Genetic drift

7. Birds learn to ignore a scare crow that is left in the same spot for a long time. This type of behavior is called
   A. Habitation
   B. Associative learning
   C. Imprinting
   D. Conditioning

8. Mendelian expected probabilities of genotypes in a cross occur when
   A. Small numbers of offspring are produced
   B. Migrations occur in a population
   C. Mutations arise
   D. Fertilization is random

9. Which one of the following is not correct about cells of a tissue? They
   A. Have similar function
   B. Are of same origin

C. Are of one type
D. have physical linkage

10. When a foetus receives antibodies from the mother through the placenta, it acquires
    A. Active immunity
    B. Long-term immunity
    C. Passive immunity
    D. Artificial immunity

11. Worker bees are
    A. Sterile females developed from fertilized eggs
    B. Fertile females developed from unfertilized eggs
    C. Sterile males developed from unfertilized eggs
    D. Fertile females developed from unfertilized eggs

12. The process of changing the information on mRNA into formation of polypeptides is known as
    A. Transcription
    B. Translation
    C. Transduction
    D. transformation

13. Which one of the following is an essential feature for successful terrestrial life flowering plants?
    A. Reduction of gametophyte to spores.
    B. Development of pollen tube to transfer male gametes
    C. Possession of well-developed vascular system
    D. Reduction of sporophyte to seeds.

14. Which one of the following movements in fish is counteracted by the vertical horizontal fins?
    A. Rolling
    B. Backward drag
    C. Pitching
    D. Yawning

15. During which transfer of energy is most energy lost in an ecosystem?
    A. Producers $\longrightarrow$ primary consumers
    B. Primary consumers $\longrightarrow$ secondary consumers
    C. Secondary consumers $\longrightarrow$ tertiary consumers
    D. Tertiary consumers $\longrightarrow$ decomposers

16. The role of Oestrogen during birth is
    A. Causing contraction of the uterine wall
    B. Increasing the sensitivity of the uterine muscles to oxytocin
    C. Inhibiting the production of progesterone
    D. Promoting milk production in the mammary glands.

17. Which one of the following does **not** contribute to the movement of water from the root system to the leaves in a flowering plant?
    A. Root pressure
    B. Cohesion forces
    C. Transpiration pull
    D. Atmospheric pressure

18. Arthropods have a lower visual acuity compared to vertebrates because
    A. The ommatidia are less sensitive than rods and cones.
    B. Compound eyes contain fewer rods and cones
    C. The ommatidia are big and only few are packed in an equal area
    D. The ommatidia contain photochemical pigments which are less readily bleached

19. High carbondioxide concentration in respiring tissues is important because it causes
    A. Local vasodilation, allowing more blood into the tissues
    B. Low pH in the tissues leading to unloading of oxygen
    C. Local vasoconstriction creating high blood pressure
    D. Increase heart beat

20. A major difference between respiration and burning is that
    A. No heat is produced during respiration
    B. Burning is a faster process
    C. Burning is a chemical process
    D. Chemical energy is stored in respiration

21. Which one of the following is the main form of the photosynthetic product transported through the phloem?
    A. Starch
    B. Amino acid
    C. Sucrose
    D. Glucose

22. Which one of the following structures supplies oxygenated blood to the foetus?
    A. Umbilical cord
    B. Umbilical vein
    C. Placenta villi
    D. Umbilical artery

23. Which one of the following best describes basal metabolic rate?
    A. Average amount of energy produced by the body
    B. Average amount of energy produced when at rest
    C. Amount of energy produced by an average body
    D. Amount of energy produced when all voluntary movements have ceased

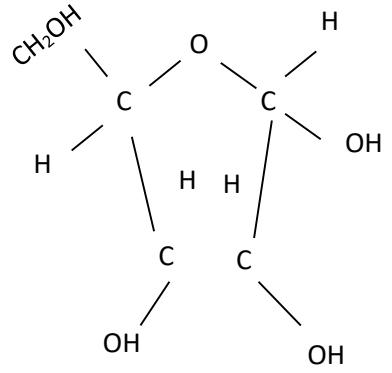
24. A property of cells in a multicellular is that they are
    A. Small sized
    B. Less functional
    C. Less specialized

D. Dependent

25. Which one of the following tissues has the least power of regeneration?
    A. Blood tissue
    B. Epithelium tissue
    C. Bone tissue
    D. Nerve tissue

26. Which one of the following is likely to occur if a photosynthesizing plant was suddenly removed from light?
    A. Reduction in PGA
    B. Accumulation of PGAL
    C. Accumulation of PGA
    D. No change in amount of PGAL

27. Which one of the following molecules is represented in figure 1?



A. Fatty acid
B. Deoxyribose
C. Glucose
D. Ribose

28. Establishing the genotype of an organism by crossing it with a homozygous recessive individual is carrying out a
    A. Test cross
    B. Dihybrid cross
    C. Back cross
    D. Monohybrid cross

29. In guinea pigs, the allele for rough coat (R) is dominant over the smooth coat (r) and that for black coat (B) is dominant over one for white coat (b). The allele for coat type and

colour are not linked. A cross between rough black guinea pig and rough white one produced 28 rough black, 31 rough white, 11 smooth black and 10 smooth white. Which one of the following could be the genotype of the parents?

A. RrBb × Rrbb
B. RRBB × RRbb
C. RRBb × Rrbb
D. RrBB × Rrbb

30. Which one of the following is the reason why insects' eggs usually hatch rapidly into larvae?

A. Eggs have little yolk.
B. Hatching is controlled by external factors
C. It is a way of avoiding predators
D. Due to excessive production of juvenile hormone

31. Higher concentrations of some ions in the cell sap of some fresh water algae compared to the external water is due to

A. Diffusion
B. Active transport
C. Pinocytosis
D. Osmosis

32. Mixing of oxygenated and deoxygenated blood in amphibians is minimized by

A. Rapid contraction of the ventricle
B. Spongy nature of heart muscles
C. Spiral valve in the trancus arteriosus
D. Columnae carnae in the ventricular walls

33. Which one of the following describes the state of the membrane during resting potential?

A. Polarized
B. Neutral
C. Depolarized
D. Discharged

34. Which one of the following tissues would be stained deepest red by a dye that stains nuclei red?

A. Sieve tube
B. Tracheid
C. Collenchyma
D. Cambium

35. In which one of the following parts of a chloroplast is water splitting enzymes mostly located?

A. Stroma
B. Intergrana
C. Cytoplasm
D. Grana

36. In which of the following may sporophytes contain haploid, diploid and triploid cells at some stage?
    A. Conifers
    B. Mosses
    C. Flowering plants
    D. Ferns

37. Compared to carbohydrates, fats have higher energy value because fats
    A. Have long chains of fatty acids
    B. Have a higher proportion of hydrogen
    C. Are more compact in structure
    D. Have a high proportion of oxygen

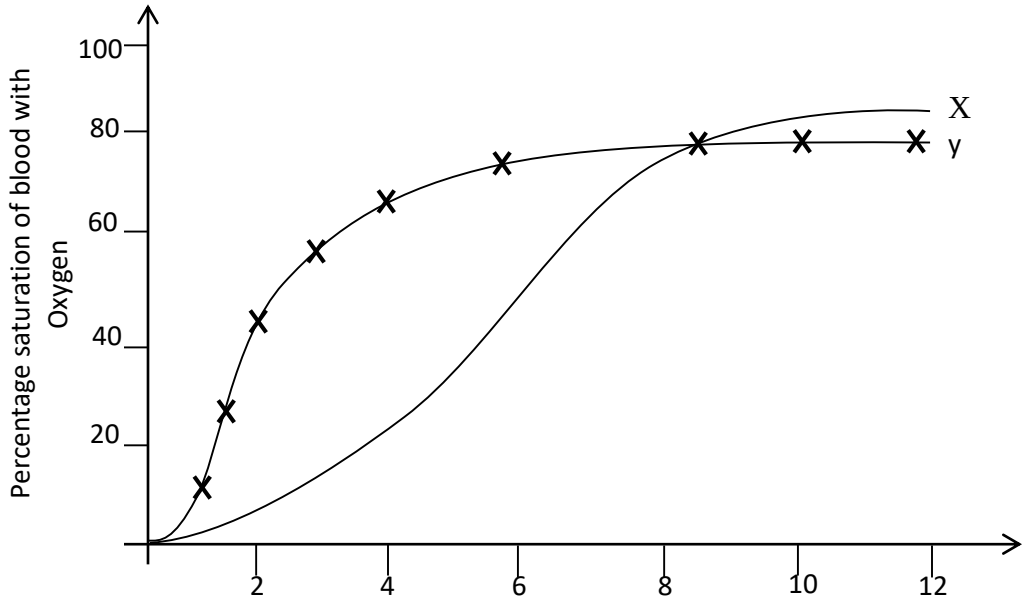
38. Which one of the following would delay flowering in a short day plant?
    A. Twelve hours of darkness
    B. More than ten hours of light
    C. Interruption of dark period with a flash of light
    D. Less than twelve hours of darkness

39. Which one of the following nitrogenous wastes is suitable for elimination by a fresh water fish?
    A. Urea
    B. Uric acid
    C. Ammonia
    D. Trimethylamine oxide

40. Which one of the following is correct about the sympathetic nervous system?
    A. Nerve endings produce nor-adrenaline
    B. Preganglionic fibres are long and post ganglionic fibres are short
    C. Nerve endings produce acetylcholine
    D. Ganglia are embedded in the walls of the effector organs

SECTION B (60 MARKS)

41. Figure 2 shows oxygen dissociation curves for Haemoglobin of two animals x and y, living in different habitats.



(a) From the figure, state three differences in the behavior of haemoglobin of the two animals. (03 marks)

……
……

……
……

……
……

……
……

……
……

……
……

(b) (i) Outline the characteristics of the haemoglobin of animal y. (03 marks)

……
……

……
……

……
……

……
……

……
……

……
……

(ii) From the characteristics in (b) (i) suggest the nature of the habitat in which animal y lives. (01 mark)

……
……

……
……

……
……

(c) Human haemoglobin has a higher affinity for carbon monoxide than oxygen. What is the effect of this fact?

……
……

……
……

……
……

……
……

……
……

42. (a) Differentiate between respiratory quotient (RQ) and basal metabolic rate (BMR).

……
……

……
……

……
……

(b) Table 1 shows the respiratory quotient in germinating seeds under different treatments.

Table 1

Treatment	RQ
(i) 4 hr soaking in water	6.0
(ii) 4 hr soaking then 4 hour exposure to air	1.8

(iii) 4 hr soaking then 24 hr exposure to air	1.0

Explain the different respiratory quotients of the germinating seeds under the different treatments. (06 marks)

……
……

……
……

……
……

……
……

……
……

……
……

(c) Explain why the BMR varies with the age of the individual (02 marks)

……
……

……
……

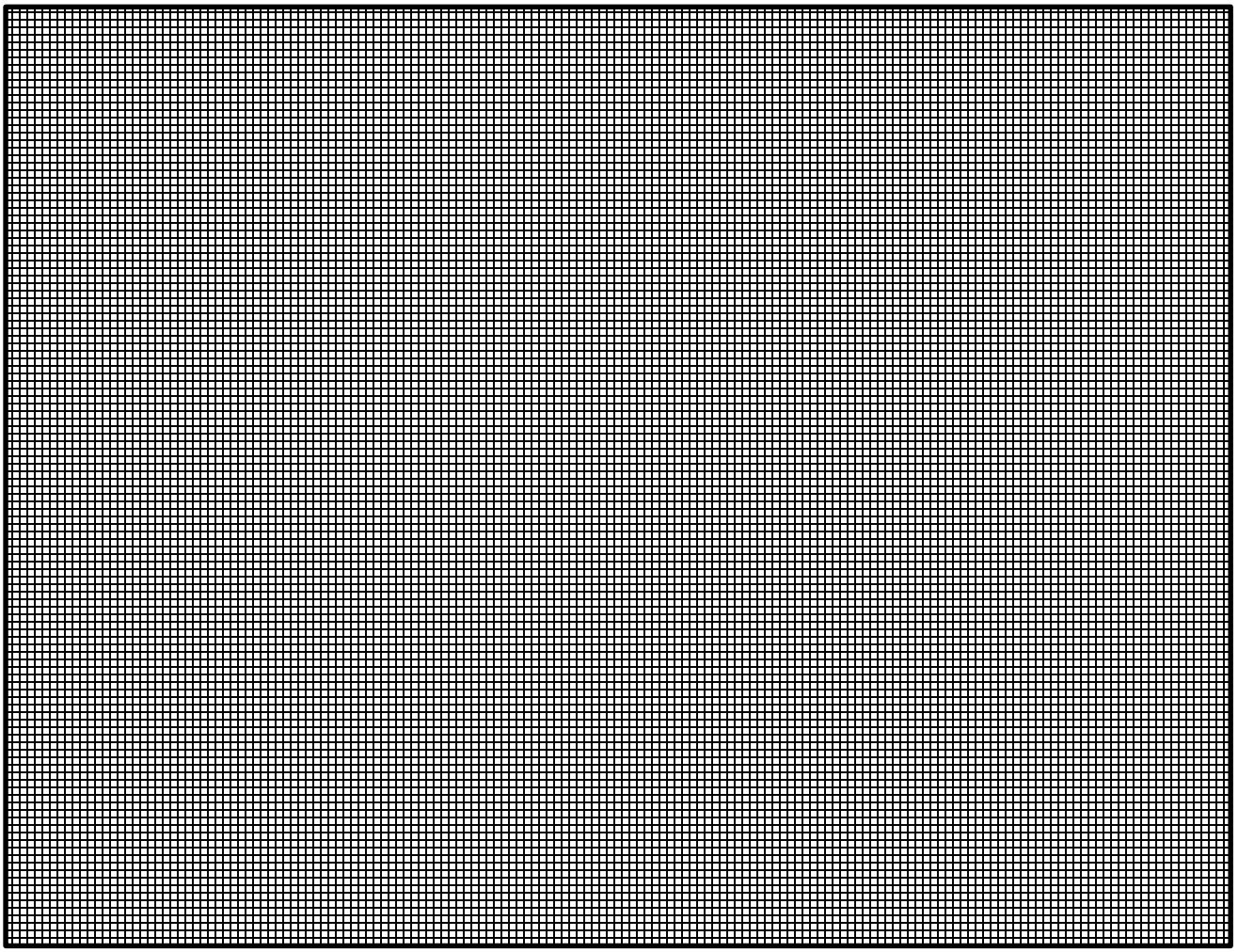
……
……

……
……

43. Table 2 shows the increase in size of a leaf of a plant with time.
Table 2

Days	Area of leaf (cm^2)	Rate of growth (cm^2)
0	0	
5	40	
10	200	
15	250	
20	250	

(a) Complete the table by working out the growth rate at 5 days intervals. (02 marks)
(b) In the space provided, plot actual growth and growth rate curves. (04 marks)x



……
……

……
……

……
……

(d) What are the limitations of measuring leaf area as a way of measuring growth in a plant?

(02 marks)

……
……

……
……

44. (a) (i) Describe how the quadrant method can be used to determine species density. (02 marks)

……
……

……
……

……
……

(ii) State the advantage and disadvantages of the method. (02 marks)

……
……

……
……

……
……

(b) (i) why is it important to estimate population size? (02 marks)

……
……

……
……

……
……

……
……

(ii) In estimate the number of fish in a small lake, 625 fish were caught, marked and released. After one week, 920 fish were caught and of these, 150 had been marked. What was the estimated sixe of fish population?
(02 marks)

……
……

……
……

……
……

……
……

(iii) In using the method in b (ii) to estimate the population size of fish, state two assumptions that were made. (02 marks)

……
……

……
……

45. (a) With reasons, give examples of animals which produce each of the following excretory products:
(i) Ammonia (02 ½ marks)

……
……

……
……

……
……

……
……

……
……

(ii) Uric acid (02 ½ marks)

……
……

……
……

……
……

……
……

……
……

(b) State

(i) Why the pH of the body fluids in a human body is kept constant. (02 marks)

……
……

……
……

……
……

……
……

……
……

(ii) three ways of keeping the pH in b(i) constant. (03 marks)

……
……

……
……

……
……

……
……

……
……

……
……

46. (a) What is **displacement activity?**

……
……

……
……

……
……

……
……

(b) State the ecological importance of each of the following forms behavior.

(i) Territorial behavior (03 marks)

……
……

……
……

……
……

……
……

……
……

(ii) Courtship behavior (03 marks)

……
……

……
……

……
……

……
……

……
……

(c) Give two ways in which animals avoid predation. (02 marks)

……
……

……
……

……
……

……
……

……
……

……
……

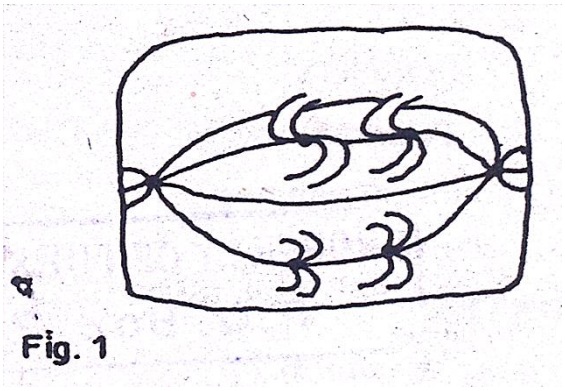
……
……

2006

Section A

1. Which one of the following does not contribute to the short reaction times in insects?
   A. Large size of omatidia
   B. High flicker fusion frequencies
   C. Rapid transmission of impulses
   D. Large coverage of head by compound eyes.

2. Figure 1 below represents a stage of cell division



Which one of the following stages is represented in the figure?

A. Metaphase of mitosis
B. Interphase
C. Anaphase of mitosis
D. Metaphase I of meiosis

3. Which of the following structures is found in both xylem and phloem tissues of higher plants?
   A. Sieved tracheids
   B. Parenchyma cells
   C. Companion cells
   D. Hollow vessels

4. Which one of the following pairs of events occur together to increase the oxygen concentration in the alveoli of the lungs?
   A. Contraction of diaphragm muscles and internal intercostal muscles
   B. Relaxation of diaphragm muscles and internal intercostal muscles
   C. Contraction of diaphragm muscles and external muscles intercostal muscles
   D. Relaxation of the diaphragm muscles and external intercostal muscles

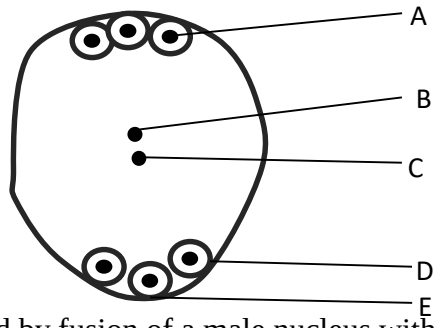
5. Loud and low pitched sound is caused by sound waves of
   A. Large amplitude and high frequency
   B. Low frequency and large amplitude
   C. High frequency and small amplitude
   D. Small quantities and low frequency
6. During flight in insects, upstroke is brought about by
   A. Contraction of direct flight muscles
   B. Relaxation of indirect flight muscles
   C. Contraction of indirect flight muscles
   D. Sudden upthrust of the body

7. The following are characteristics of amphibians
   (i) Have moist skins
   (ii) Carry out external fertilization
   (iii) Use gills at early stage for respiration
   (iv) Use lungs for respiration

Which one of the following pairs of characteristics limit them from inhabiting a totally terrestrial environment?

A. (i) and (ii)
B. (ii) and (iii)
C. (iii) and (iv)
D. (i) and (iv)

8. Figure 2 shows an ovule of a flowering plant.



A triploid nucleus is formed by fusion of a male nucleus with

A. D and C
B. B and C
C. A and B
D. D and E

9. Which one of the following is not a function of progesterone?
   A. Increasing the sensitivity of uterine muscles
   B. Inhibiting release of follicle stimulating hormone
   C. Inhibiting release of prolactin
   D. Promoting growth of mammary glands

10. Which one of following pairs of adjustments at a respiratory surface would increase its efficiency?
   A. Decreasing the rate of ventilation and increasing blood supply
   B. Increasing the rate of blood flow and the rate of ventilation
   C. Increasing the ventilation rate and the distance of diffusion of molecules
   D. Decreasing the blood supply and the distance of diffusion of molecules

11. Which of the following have a sole function of offering support to the plant?
   A. Sclerenchyma and vessel elements
   B. Vessel elements and tracheids
   C. Sclerenchyma and collenchyma
   D. Parenchyma and collenchyma

12. The bacteria which converts nitrates to nitrites during the nitrogen cycle are an example of
   A. Nitrogen fixing bacteria
   B. Nitrifying bacteria
   C. Decomposing bacteria

D. Denitrifying bacteria

13. The significance of vasularisation of the endometrium before implantation in mammals is to
    A. Ensure firm attachment of the foetus onto the uterine wall.
    B. Prevent menstruation
    C. Assist in producing hormones which maintain pregnancy
    D. Facilitate food and oxygen supply to the foetus

14. In a human with a non-functional pancrease, digestion of starch in the intestines would
    A. Be possible because of the suitable pH due to bile
    B. Not occur for absence of enzymes
    C. Would be possible because succus entericus contains the necessary enzymes
    D. Would not occur because of the acidic pH of chime.

15. Which one of the following is true about sex-linked characters in humans?
    A. Females never suffer from the trait
    B. Females do not pass on the character to their sons.
    C. Females are either normal or carriers
    D. Males are either carriers or sufferers

16. The similarities of the skeletal structures of moles, monkeys and whales lead to the conclusion that they
    A. Belong to the same class
    B. Originate from the same environment
    C. Descend from a common ancestor
    D. Evolved convergingly

17. Which one of the following sets of characteristics is a adaptations in mammals to desert conditions?
    A. Uric acid production and short loop of Henle
    B. Long Loop of Henle and urea production
    C. Ammonia production and long loops of Henle
    D. Short loop of Henle and urea production

18. Which one of the following cannot be parents of a child of blood group O?
    A. Man of blood group A and woman of blood group B.
    B. Both man and woman of blood group A
    C. Both man and woman of blood group B
    D. Man of blood group AB and woman of blood group O.

19. Which one of the following characteristics is not used in classifying amphibians and reptiles together? Possession at some stage, of
    A. Post – anal tail
    B. Two pairs of pentadactyl limbs
    C. notorchord
    D. nerve cord

20. If carbon dioxide containing radio-active carbon was added to a suspension of photosynthesizing algae, in which one of the following compounds would be radio-active carbon show first?
    A. Glucose
    B. Phosphoglyceric acid
    C. Ribulose biphosphate
    D. Triose phosphate

21. Etiolation in plants is usually a response to
    A. Insufficient nutrients
    B. Low temperatures
    C. Insufficient light
    D. Too much water

22. Figure 3 shows changes in electrical potentials in an axon membrane when an impulse is transmitted.

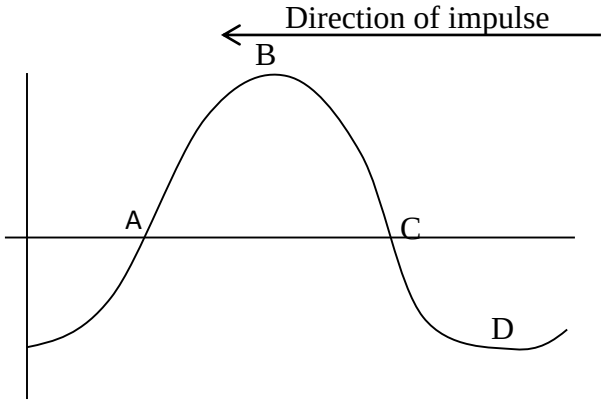


Fig. 3

At which stage of the electrical potentials marked, is the axon most permeable to sodium ions?

23. Which one of the following is a disadvantage of a tracheal system for gaseous exchange in insects?
    A. Ventilation is limited
    B. Tracheoles are impermeable
    C. Spiracles are too small
    D. The system does not supply all body parts

24. A climax community is one in which
    A. Succession is at its peak
    B. A carrying capacity has been reached
    C. Succession has ceased
    D. Death rate of organisms is at its lowest

25. Which one of the following is not a function of the skeleton in insects?
    A. Support of body
    B. Protection of delicate body parts
    C. Prevention of desiccation
    D. Secretion of wax

26. Which of the following structures is haploid?
    A. Primary oocyte
    B. Spermatogonium
    C. Secondary oocyte
    D. Germinal epithelium

27. In higher plants, the problem of obtaining oxygen for respiration is solved by leaves possessing
    A. Large intercellular spaces
    B. Compact palisade layer
    C. Thin lower epidermis
    D. Numerous stomata on lower epidermis

28. Which one of the following is a method used by marine bony fish to overcome the problem of possessing body fluids that are hypotonic to the surroundings?
    A. Increase in glomerular filtrate
    B. Extensive reabsorption of salts
    C. Retention of urea
    D. Elimination of non-toxic nitrogenous wastes

29. Good drainage and ploughing of soil reduces the process of
    A. Nitrification
    B. Decomposition
    C. Denitrification
    D. Nitrogen fixation

30. If the solute potential of the external solution is higher than that of the cell, the external is said to be
    A. Hypotonic to the cell solution
    B. Hypertonic to the cell solution
    C. Isotonic to the cell solution
    D. Of lower osmotic pressure than the cell solution

31. Which one of the parts of a mammal possesses an epithelial tissue as shown in figure 4?

    Fig 4

    A. Oviduct
    B. Ileum
    C. Respiratory
    D. Loop of Henle

32. The type of learning that involves the immediate understanding and responding is
    A. Imprinting

B. Associative learning
C. Insight learning
D. Habituation

33. Prolonged menstrual period may be caused by
    A. High levels of progesterone
    B. A decrease in production of follicle stimulating hormone
    C. High levels of luteinizing hormone
    D. A deficiency in Oestrogen

34. Auxins are often used as selective weed killers on lawns because
    A. Same dosage of Auxins affects different plant parts, differently,
    B. They can be manufactured artificially
    C. Auxins always kill dicotyledonous plants
    D. Auxins remain on the vegetarian long after application

35. The compounds which act as oxidizing agents during anaerobic respiration in plants are
    A. NAD and pyruvic acid
    B. Ethanal and NAD
    C. NAD and FAD
    D. NADP and pyruvic acid

36. In any ecosystem a continued input of energy is required because
    A. Matter is continually used in metabolic process
    B. Biological succession occurs very slowly
    C. Of the continued increase in population in the ecosystem
    D. Energy is lost each time it is transferred between organisms

37. During the heat of the day, control of stomatal movements to reduce excessive water loss is due to
    A. Active accumulation of mineral ions in the guard cells
    B. Synthesis of abscisic acid
    C. Inter-conversion of glucose and starch in the guard cells
    D. Synthesis of glucose during photosynthesis

38. Sucrose is a non-reducing sugar because it
    A. It is not fully digested
    B. Lacks reducing groups
    C. Is a disaccharide molecule
    D. Is a ketose sugar

39. Which of the following animals have the most efficient system of gaseous exchange?
    A. Insects
    B. Bony fish
    C. Mammals
    D. Amphibians

40. Which one of the activities contributes least to the green-house effect?

A. Use of CFCs
B. Deforestation
C. Excessive use of fertilizers
D. Burning of fossil fuels

SECTION B (60 MARKS)

Answer all questions in this section in the spaces provided

41. Figure 5 shows two types of arrangements, A and B of sensory cells in the mammalian eye

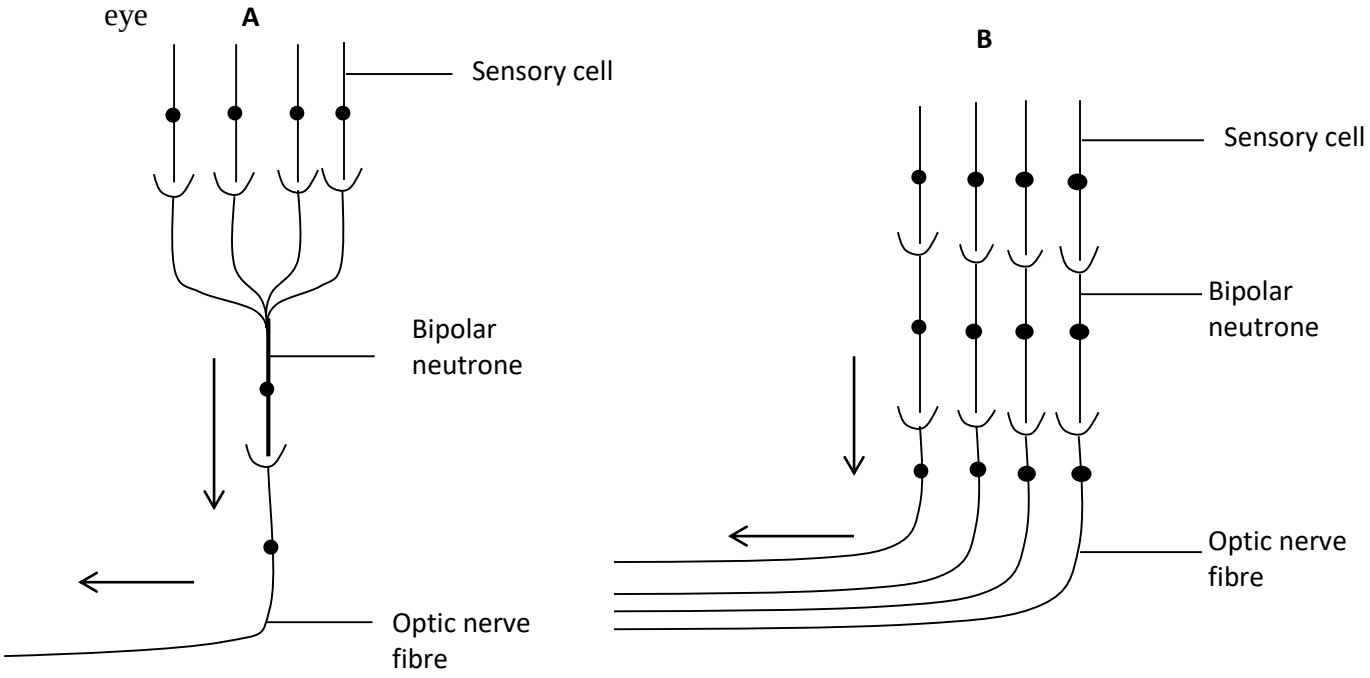


Fig 5

(a) What is the effect of each arrangement on the response of the eye?

(i) Effect of arrangement **A**. (01 mark)

.....
.....

.....
.....

.....
.....

(ii) Effect of arrangements **B.** (01 mark)

.....
.....

.....
.....

(b) Explain how the effect of each arrangement is brought about.

(i) Effect of arrangement A. (03 marks)

.....
.....

.....
.....

.....
.....

.....
.....

(ii) Effect of arrangement B. (03 marks)

.....
.....

.....
.....

.....
.....

.....
.....

(c) Under which light conditions is each arrangements most effective and why?

(i) Arrangement A. (01 mark)

.....
.....

.....
.....

.....
.....

(ii) Arrangement B. (01 mark)

.....
.....

.....
.....

.....
.....

42. (a) What is meant by water stress in relation to plants? (01 mark)

.....
.....

.....
.....

(b) What is the effect of water stress in green plants? (04 marks)

.....
.....

.....
.....

.....
.....

.....
.....

.....
.....

(c) Outline the structural adaptations of the xylem vessel for long distance transport of water and mineral salts (05 marks)

.....
.....

.....
.....

.....
.....

.....
.....

.....
.....

.....
.....

.....
.....

43. Figure 6 shows the effect of changing the osmotic pressure of the external medium (Ope), on the osmotic pressure of the blood (Opi), of sea animals A and B.

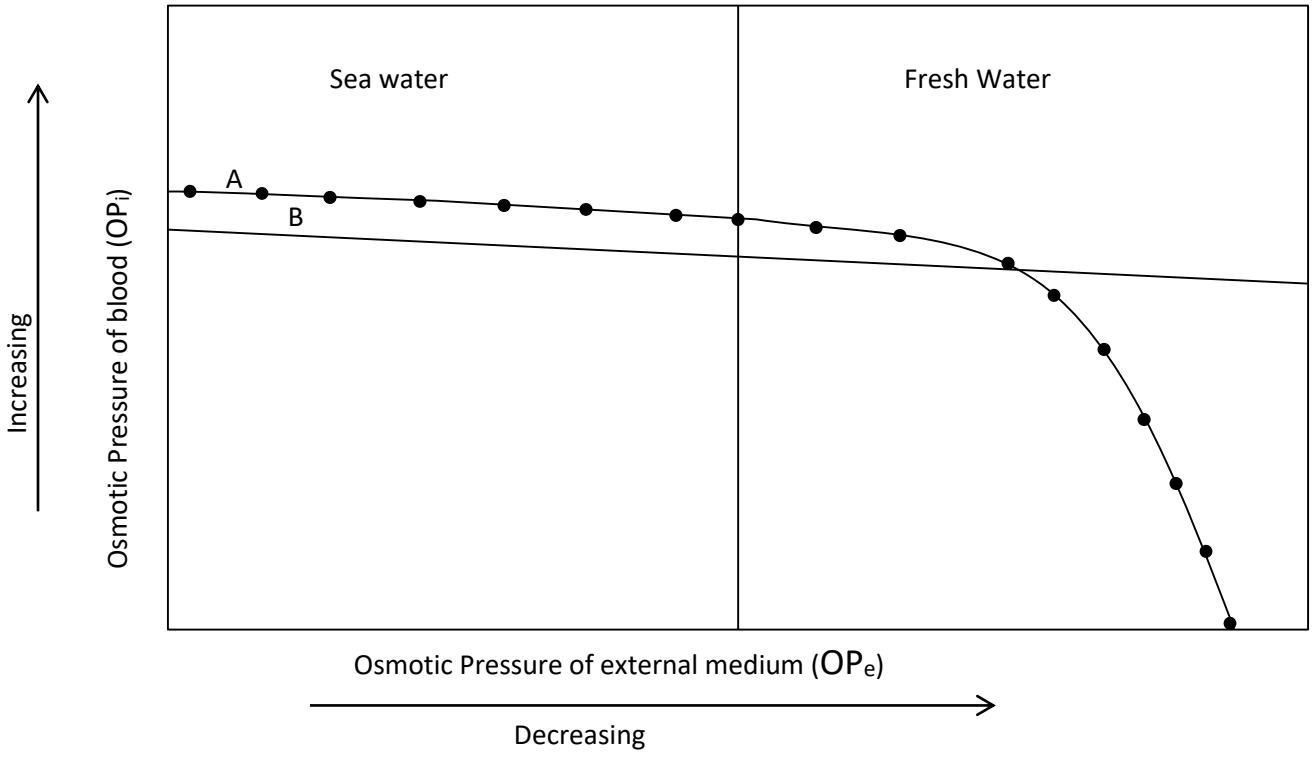


Fig 6

(a) Explain the effect of decreasing the Ope on the Opi of each animal.

(i) Animal A (03 marks)

.....
.....

.....
.....

.....
.....

.....
.....

.....
.....

(ii) Animal B (03 marks)

.....
.....

.....
.....

.....
.....

.....
.....

.....
.....

(b) Using the information provided, suggest an ecological advantage animal B has over animal A. (02 marks)

.....
.....

.....
.....

.....
.....

(c) What is the main osmotic problem faced by sea animals whose OPi is less than OPe? (02 marks)

.....
.....

.....
.....

.....
.....

44. (a) What is meant by alternation of generations? (03 marks)

.....
.....

.....
.....

.....
.....

.....
.....

(b) Ferns and mosses show alternation of generations. State the dominant stage in each case.

(i) Ferns (01 mark)

.....
.....

(ii) Mosses (01 mark)

.....
.....

(c) Give the importance of alternation of generations in the life cycle of an organism. (01 mark)

.....
.....

(d) Outline the limitations that mosses face in growing in terrestrial habitats. (04 marks)

.....
.....

.....
.....

.....
.....

.....
.....

.....
.....

45. (a) Outline the causes of gene reshuffling. (03 marks)

.....
.....

.....
.....

.....
.....

.....
.....

.....
.....

.....
.....

(b) In what way may variation resulting from gene reshuffling differ from that caused by mutation? (03 marks)

.....
.....

.....
.....

.....
.....

.....
.....

(c) What is the importance of variation in a population? (02 marks)

.....
.....

.....
.....

.....
.....

(d) Explain how constancy of species may be maintained through natural selection. (03 marks)

.....
.....

.....
.....

.....
.....

.....
.....

.....
.....

46. Table 1 shows the amount of DDT measured in parts per million (ppm) found in a variety of organisms associated with a fresh water lake.

Table

Where the DDT level was measured	Amount of DDT / ppm
Water	0.0003
Phytoplankton	0.006
Zooplankton	0.004
Herbivorous	0.39
Carnivorous	1.8
Fish – eating birds	14.3

(a) (i) Calculate how many times the DDT is more concentrated in carnivorous fish compared with its concentration in water.
(02 marks)

.....
.....

.....
.....

.....
.....

.....
.....

(ii) What do the results in a(i) show?

.....
.....

.....
.....

(b) Explain why the concentration of DDT changes from water to carnivorous fish.
(03 marks)

.....
.....

.....
.....

.....
.....

.....
.....

(c) State two effects of DDT to organisms. (02 marks)

.....
.....

.....
.....

.....
.....

.....
.....

(d) Explain how a pest sprayed with a pesticide may flourish afterwards. (03 marks)

.....
.....

.....
.....

.....
.....

.....
.....

.....
.....

2005

1. Which one of the following is not a reason for classifying a mouse and a frog in one phylum? Presence of
   A. Pharyngeal gill slits
   B. Post-anal tail
   C. Notochord
   D. Endoskeleton

2. In photosynthesis, the major advantage of the C4 pathway is to

A. Fix carbondioxide in the Calvin cycle
B. Concentrate carbondioxide in the cells of leaves
C. Fix carbondioxide from the atmosphere into the leaves
D. Store carbondioxide in form of organic acids

3. An athletics competition organized on high lands required participants from lowlands to report three months before the competition in order to enable them
   A. Get familiar with the place
   B. Develop strong muscles
   C. Acquire high red blood cell count
   D. Have extensive deposition of fat under their skin

4. The main distinguishing character of a eukaryotic cell is
   A. Membrane organelles
   B. Lack of nuclear membrane
   C. Presence of nucleus
   D. Presence of DNA double strands

5. Starch, glycogen and cellulose are all composed of
   A. $\alpha - glucose$
   B. $\beta - glucose$
   C. Monosaccharides
   D. Polysaccharides

6. Which of the following organelles would most likely be abundant in the tail of a tadpole at a time of its reabsorption during metamorphosis?
   A. Centrioles
   B. Lysosomes
   C. Golgi apparatus
   D. Endoplasmic reticulum

7. If the rate of transpiration lags behind that of absorption, movement of water up the plant is mainly by
   A. Root pressure
   B. Capillary
   C. Mass flow
   D. Transpiration pull

8. An impulse crosses a synapse by means of
   A. Sodium ions
   B. Potassium ions
   C. Calcium ions

D. Neurotransmitter chemical

9. Which of the following increases the rate of phosphorylation of hexose sugar during the normal respiration process?
   A. An increase in ADP concentration
   B. An increase in ATP concentration
   C. An increase in concentration of hexose sugar
   D. A decrease in concentration of phosphorylated sugar

10. Which of the following factors would contribute least to the development of new species?
   A. Gene mutation
   B. Chromosomal mutation
   C. Geographical isolation
   D. Environmental stability

11. Which one of the following explains why digestion of fats does not occur in the human stomach?
   A. Absence of fat-digesting enzymes
   B. Low pH for the fat-digesting enzymes
   C. High pH for the fat-digesting enzymes
   D. Absence of bile salts that emulsify the fats

12. Which one of the following would contribute to the greenhouse effect
   A. Use of nuclear power
   B. Use of fossil fuels
   C. Excessive use of fertilizers
   D. Accumulation of sewage in water bodies

13. The increase in supply of blood to heavily respiring tissues, is caused by high
   A. Ventilation rate
   B. Concentration of oxygen in the inhaled air
   C. Carbon dioxide concentration in the blood
   D. Carbondioxide concentration in the tissues

14. Impulse transmissions in mammals is usually faster than it is in amphibians because
   A. Axons in amphibians lack myelin sheath
   B. Mammals have axons with larger diameter
   C. Mammals usually have higher body temperature
   D. The distance between the nodes of Ranvier in mammals is shorter

15. Which one of the following would occur at the onset of an action potential in a neurone?
    A. Potassium ions enter
    B. Sodium ions enter
    C. Potassium ions leave
    D. Sodium ions enter

16. Which of the following applies to the cones of the retina? They
    A. Show visual acuity
    B. Perceive dim light
    C. Show much retinal convergence
    D. Contain rhodopsin pigment

17. The flagellum and skeletal muscle are structurally similar in that they both have
    A. Microtubules
    B. Actin and myosin tubules
    C. A pattern of 9 + 2 microtubules
    D. Light and dark bands

18. During the light stage of photosynthesis, water is an important raw material in that it
    A. Gives off oxygen
    B. Provides hydrogen that reduces NAD
    C. Reduces carbon dioxide to carbohydrates
    D. Provides electrons

19. Which one of the following activities in living organisms can result in a respiratory quotient of less than 1.0?
    A. When carbohydrates are respired
    B. During extensive laying down of fat in livestock
    C. At compensation point, during photosynthesis
    D. When the rate of exhalation equals that of inhalation

20. Which of the following is a difference between flowers of dicotyledonous plants and those of monocotyledonous plants? Flowers of dicotyledonous plant usually
    A. Lack sepals
    B. Possess superior ovaries
    C. Bear floral parts in groups of 4s and 5s.
    D. Possess fused petals

21. Deciduous plants in temperature zones shade off their leaves during winter
    A. Because of water shortage

B. To cut down the process of guttation
C. Because of too much water availability
D. To avoid freezing temperatures

22. Which of the following is true about non-competitive inhibition in enzyme catalyzed reactions?
    A. The degree of inhibition decreases with increase in substrate concentration
    B. The inhibitor has a similar structure and chemical composition with the substrate
    C. The degree of inhibition is independent of the substrate concentration
    D. The shape of the enzyme is not affected by the inhibitor

23. Which of the following is not true of conifers?
    A. Lack vessels in xylem
    B. Bear reproductive structures on leaves
    C. Bear sporangia on cones
    D. Possess unprotected ovules

24. The lack of a nucleus in the red blood cell enables it to
    A. Have a high affinity to oxygen
    B. Be more permeable to oxygen
    C. Give up oxygen more readily
    D. Contain more haemoglobin

25. Which one of the following types of behavior is least learnt?
    A. Association
    B. Instinct
    C. Imprinting
    D. Insight

26. The primary meristematic tissue in plants which gives rise to the cortex is the
    A. Ground meristem
    B. Procambium
    C. Protoderm
    D. Protoxylem

27. Which one of the following organisms does not possess simple eyes?
    A. Spider
    B. Millipede
    C. Butterfly
    D. Centipede

28. Contraction of longitudinal muscles in insects during flight, results into
    A. Flapping of wings
    B. Moving down of wings
    C. Holding wings horizontally
    D. Moving up of wings

29. During fertilization in plants, the
    A. Vegetative nucleus fuses with the pollen nucleus
    B. Generative nucleus fuses with the egg nucleus
    C. Vegetative nucleus fuses with the egg nucleus
    D. Generative nucleus fuses with the antipodal cell nucleus

30. A desert mammal's lethal temperature is higher than that of a mammal living in cold regions because a desert mammal has
    A. Small extremities
    B. Poor insulation mechanisms
    C. Thick fur
    D. Small surface area : volume ratio

31. In the energy transfer in an ecosystem, the greatest loss in energy is between
    A. Primary producers and primary consumers
    B. Primary consumers and secondary consumers
    C. Secondary consumers and tertiary consumers
    D. Tertiary consumers and decomposers

32. A rhesus positive foetus whose mother is rhesus negative may not be born alive because the
    A. Mother's body produces antigens against foetal antibodies
    B. Foetus lacks antibodies against the mothers antigens
    C. Mother's body produces antibodies against the foetal antigens
    D. Mother's red blood cells mix with the foetal blood
33. From a bush, 120 beetles were collected, marked and released back into the bush. A few days later, 120 beetles were collected from the same place, and 30 of them carried the mark. The estimated number of beetles in the bush is
    A. 240.
    B. 360
    C. 480
    D. 560

34. Insects have different mouth parts modified to suit their different modes of feeding. This shows
    A. Speciation

B. Convergent evolution
C. Divergent evolution
D. Development of analogous structures

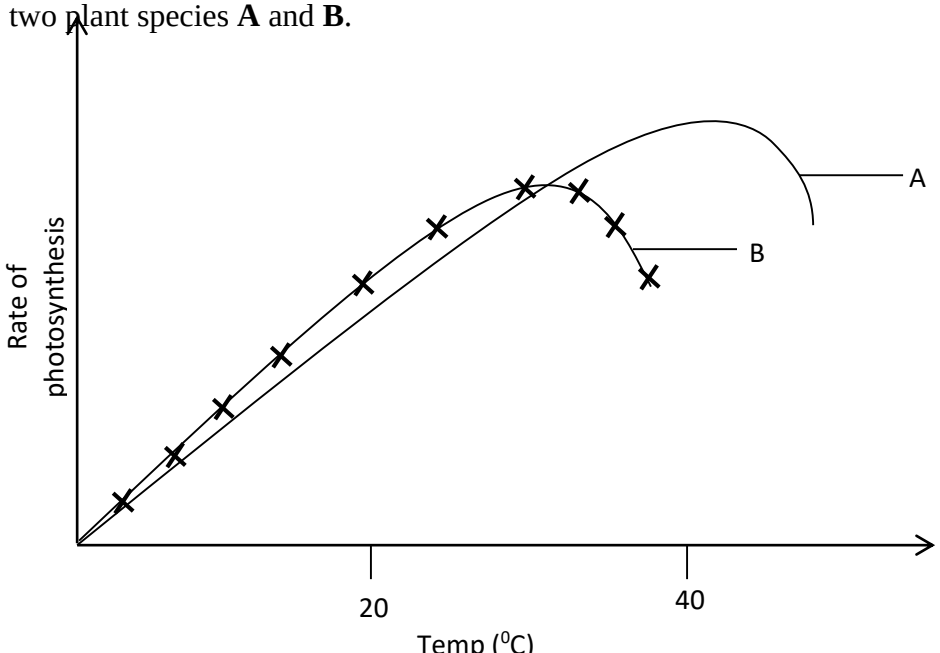
35. Which one of the following is true of linked characteristics? They
A. Are always transmitted as a single block
B. Are allelic to each other
C. Occur on non- homologous chromosomes
D. Can be transmitted independently]

36. Which one of the following may act as a respiratory surface in animals?
A. Spiracle
B. Bronchus
C. Skin
D. Trachea

37. Which one of the following pairs of responses in plants is caused by unequal distribution of Auxins?
A. Photoperiodism and phototropism
B. Geotropism and phototropism
C. Nastic movement and geotropism
D. Photoperiodism and abscission

38. The amount of progesterone in the blood increases steadily from ovulation to menstruation, then it begins to decline because
A. Luteinsing hormone inhibits its production
B. It is washed out with blood during menstruation
C. Implantation of a zygote occurs
D. Its work of repairing the uterine wall gets complete

39. Figure 1 shows the relationship between temperature and rate of photosynthesis in two plant species **A** and **B**.



Which one of the following is a correct conclusion from the results?

A. B is a shade plant while A is a sun plant.
B. A has a lower compensation point than B
C. A has a higher optimum temperature for photosynthesis than B
D. Photorespiration does not occur in A but occurs in B

40. The absorption of amino acids after eating a heavy proteineous meal is aided by
    A. Diffusion and active transport
    B. Osmosis and diffusion
    C. Diffusion and pinocytosis
    D. Active transport only

SECTION B (60 MARKS)

41. Figure 2 shows the effect of red light and far – red light interruption of night period, on flowering of a plant.

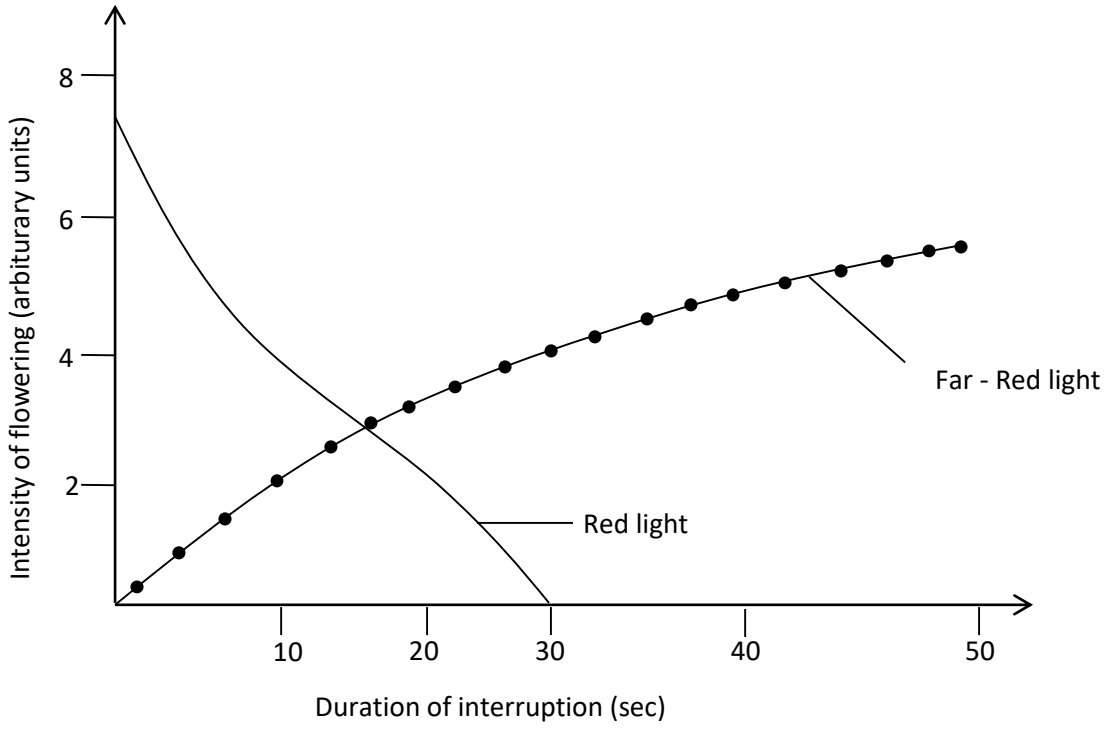


Fig 2

(a) What is the effect of interruption of the night period by each type of light?

(i) Red Light (04 marks)

……
……....

……
……....

……
……....

……
……....

……
……....

(ii) Far – red light (04 marks)

……
……....

……
……....

……
……....

……
……....

……
……....

(b) Suggest the type of plant that would exhibit responses to light treatments as shown in figure 2. (01 mark)

……
……....

(c) How can the knowledge of the effect of red light and far – red light on flowering be utilized in the commercial growing of flowers?
(01 mark)

……
……....

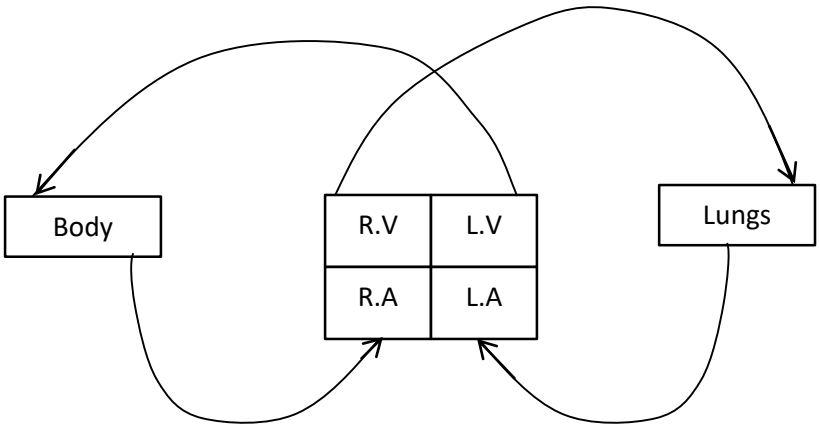
……
……....

……
……....

……
……....

42. Figure 3 shows diagrams of two types of blood circulatory systems A and B, in animals. The arrows the direction of the blood flow.

A.



B.

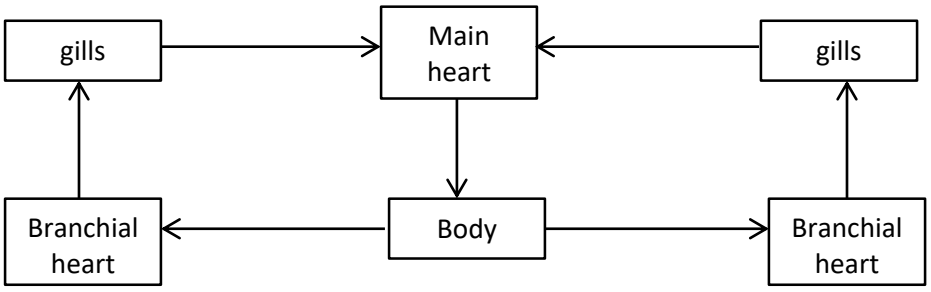


Fig 3

(a) Describe each circulatory system.

(i) A.

……
……

……
……

……
……

(02 marks)

(ii) B

……
……

……
……

……
……

(02 marks)

(b) How does each system maintain a high blood pressure?

(i) A.

……
……

……
……

……
……

(02 arks)

(ii) B

……
……

……
……

……
……

(02 marks)

(c) What is the advantage of maintaining a high blood pressure over a fluctuating pressure in a circulatory system of an animal? (02 marks)

……
……

……
……

……
……

43. (a) Give one ecological importance of each of the following structures arrangements in plants.

(i) Monoecious

……
……

……
……

(02 marks)

(ii) Dioecious

……
……

……
……

(02 marks)

(b) Explain why

(i) in Dioecious plants, male plants are usually associated with dry soils while female plants are associated with moist soils (02 marks)

……
……

……
……

……
……

……
……

(ii) nearly all Dioecious plants are wind pollinated (02 marks)

……
……

……
……

……
……

……
……

(c) Give one reason why Dioecious plants are rarer than Monoecious plants.

……
……

……
……

……
……

……
……

44. (a) State the importance of the following elements in plant metabolism
(i) Calcium (01 mark)

……
……

……
……

(ii) Magnesium (01 mark)

……
……

……
……

(b) How does water logging of soil affect its nitrate content? (03 marks)

……
……

……
……

……
……

……
……

……
……

(c) Describe three special ways of obtaining essential elements by some plants growing in soils deficient of those elements (05 marks)

(i)

……
……

……
……

……
……

(ii)

……
……

……
……

……
……

(iii)

……
……

……
……

……
……

45. (a) State two human activities that increase the levels of carbon dioxide in the atmosphere. (02 marks)

……
……

……
……

……
……

(b) What is the effect of high levels of each of the following gases in the atmosphere? (07 marks)

(i) Carbon dioxide

……
……

……
……

……
……

……
……

(ii) Sulphur dioxide

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(c) State one indicator in the environment where there is prevalence of high levels of sulphur dioxide in the atmosphere. (01 mark)

……
……

……
……

46. In Drosophila, the genes for broad abdomen and long wing are dominant over the genes for narrow abdomen and vestigial wing. Pure breeding strains of the double dominant variety were crossed with a double recessive variety and a test cross was carried out on the F_1 generation.
    (a) Using suitable symbols, work out the expected phenotype ratio of the test cross of the F_1 generation, if the genes for abdomen width and length of wing

are linked.
(07 marks)

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(b) It was however observed that when the test cross of the F_1 generation was carried out, the following results were obtained. (03 marks)

Broad abdomen, long wing	380
Narrow abdomen, vestigial wing	396
Broad abdomen, vestigial wing	14
Narrow abdomen, long wing	10

Calculate the distance in units, between the genes ,for abdomen width and length of wing.

……
……

……
……

……
……

……
……

2004

SECTION A (40 MARKS)

1. Which one of the following is a fibrous soluble protein?
   A. Myosin
   B. Collagen
   C. Myoglobin
   D. Fibrinogen

2. A muscle cell of an animal was found to contain 24 chromosomes. How many chromosomes would a germinal epithelium cell within the ovary of the animal contain?
   A. 24
   B. 12
   C. 48
   D. 36

3. A plant tissue is tubular, open-ended, with lignified and thickened walls is
   A. Tracheid
   B. Xylem vessel
   C. Parenchyma
   D. Sieve tube

4. The following are physiological conditions of living cells:-

   1) High concentration of ADP and Pi.
   2) High concentration of ATP
   3) High concentration of hydrogenase
   4) High concentration of ATPase

Which of them will increase the rate of sugar break down in a cell?

A. 1 and 2
B. 2 and 3
C. 1 only
D. 4 only

5. Which one of the following characteristics in an insect is least suitable for use in identification keys?
   A. Body colour
   B. Number of hairs on the body
   C. Shape of abdomen
   D. Length of wings

6. Which one of the following is not a form of inbreeding?

   A. Cross-breeding off springs of same parents
   B. Self-fertilization
   C. Back crossing
   D. Test crossing

7. A coffee plant known as to be heterozygous for a recessive defect which makes the plant fail to produce viable seeds, was self-pollinated and gave rise to 600 seedlings. How many of the seedlings were heterozygous?
   A. 150.
   B. 200
   C. 300
   D. 400

8. Which of the following does not play part in regulating the salt concentration of a mammalian blood?
   A. Kidney
   B. Skin
   C. Liver
   D. Pituitary gland

9. Which of the following conditions in the human blood would stimulate the highest rates of ventilation and heart beat?
   A. Little carbon dioxide
   B. Little oxygen
   C. Much carbon dioxide
   D. Much oxygen

10. Which of the following hereditary characteristics is known to be sex limited?
    A. Heamophilia
    B. Baldness
    C. Albinism
    D. Colour-blindness

11. Which one of the following shows the correct coding sequence during protein synthesis?
    A. DNA → mRNA → tRNA → rRNA → amino acids
    B. rRNA → tRNA → mRNA → polypeptide
    C. RNA → mRNA → tRNA → protein
    D. DNA → mRNA → rRNA → tRNA → amino acids

12. Which one of the following adaptations would not assist animals living in a desert?
    A. Use of metabolic water
    B. Possession of a large number of glomeruli
    C. Possession of long loop of Henle
    D. Production of non-toxic nitrogenous waste

13. During an action potential in a neuron,
    A. Potassium ions diffuse into the axon
    B. Sodium ions diffuse out of the axon
    C. Sodium ions diffuse into the axon
    D. Both the sodium and potassium ions diffuse into the axon

14. Which one of the following statements is true only of sympathetic nervous system?
    A. Nerve endings produce nor-adrenaline
    B. Preganglionic fibres are short
    C. Nerve endings produce acetylcholine
    D. Preganglionic fibres are long

15. Which one of the following statements is a method halophytes use to survive physiological drought?
    A. Reducing the number of stomata on their leaves
    B. Reversing the normal stomatal rhythm
    C. Storing water
    D. Having wax cuticle

16. Which one of the following is true of diploid parthenogenesis? The eggs are formed by
    A. Meiosis and develop without fertilization
    B. Mitosis and develop after fertilization
    C. Meiosis and develop after fertilization
    D. Mitosis and develop without fertilization

17. In the mammalian menstrual cycle, the decline in the level of progesterone is due to
    A. Successful conception
    B. Formation of corpus luteum
    C. Degeneration of corpus luteum
    D. Maturation of Graafian follicle

18. In a plant species, the allele for tallness (T) and blue flowers (B) is dominant to that for shortness (t) and white flowers (b). A tall plant with blue flowers was crossed with a short plant with white flowers. The results obtained were:

    1 Tall blue : 1 Tall white : 1 Short blue : 1 Short white

    The genotype of the tall blue flowered parent was

    A. TtBb
    B. ttBB
    C. TTBb
    D. Ttbb

19. Excellence in detection of movement at the lateral edges of the visual field is attributed to
    A. Rods and cones
    B. Rods only
    C. Cones only
    D. compound eyes

20. The differences between a green plant and the iron bacteria in the synthesis of organic compounds is that the
    A. Bacteria derive their energy for the synthesis from oxidation of inorganic compounds
    B. Source of hydrogen for the bacteria is not water
    C. Bacteria have a different kind of chlorophyll
    D. Bacteria lack enzymes for fixation of carbon dioxide

21. Viruses cannot reproduce outside a living cell because
    A. Not all of them contain DNA
    B. They are too small to reproduce
    C. They are unable to synthesis their own DNA
    D. They are unable to absorb raw materials from the surroundings

22. Which part of an Amoeba is concerned with active intake of water?
    A. Ectoplasm

B. Contractile vacuole
C. Pseudopodia
D. Cell membrane

23. Which one of the following statements is true of first division of meiosis but untrue of mitosis?
    A. The chromosomes number maintained in the daughter cells
    B. Four daughter cells are formed
    C. The chromosome number is doubled in the daughter cell
    D. Homologous chromosomes come together at the equator

24. The products of light reaction in photosynthesis are
    A. $NADH_2$, ATP and O_2
    B. NADP, ATP and O_2
    C. $NADPH_2$, ADP and O_2
    D. $NADPH_2$, ATP and O_2

25. Injection of thyroxine into a laboratory mammal would cause
    A. Oxygen consumption to increase
    B. Metabolic rate to decrease
    C. Conversion of glucose into glycogen to increase
    D. Thyroid gland to become more active

26. Figure 1 represents a tail of a fish in water.

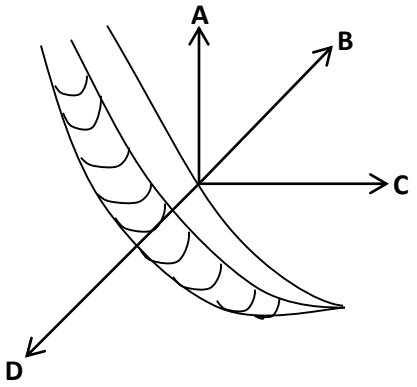


Fig.1

Which arrow represents the force applied against the water by the tail of the fish as the muscles in the shaded side contract?

27. Which one of the following water relations is not true about a plasmolysed plant cell?

A. Turgor pressure is zero
B. Pressure potential is equal to osmotic potential of sap
C. Pressure potential is zero
D. Water potential of cell is equal to osmotic potential of sap

28. Rapid transport of materials within the cytoplasm of a cell is associated with the presence of
A. Spindle fibres in the dividing cell
B. An extensive endoplasmic reticulum
C. Many plasma membrane pores
D. Extensive Golgi apparatus

29. Which of the following show divergent evolution?
A. Wings of a cockroach and a bat
B. Skeleton of a mouse and cray fish
C. Fore limbs of a pigeon and a monkey
D. Eyes of a locust and a kite

30. Which of the following ecological effects may not be caused by deforestation?
A. Species extinction
B. Reduction in soil fertility
C. Acid rain
D. Flooding and landslides

31. Under which of the following conditions would transpiration be most rapid?
A. Dark and windy
B. Light and windy
C. Dark and still
D. Light and still

32. A green plant develops yellow leaves as a result of being deficient in
A. Magnesium
B. Manganese
C. Nitrogen
D. Calcium

33. Which one of the following stages of photosynthesis uses light energy directly?
A. Regeneration of Ribulose diphosphate
B. Production of energy in the form of ATP
C. Reduction of carbon dioxide
D. Formation of Phosphoglyceric

34. Which one of the following types of epithelia lines the walls of the mammalian alveoli?
    A. Columnar epithelium
    B. Cuboidal epithelium
    C. Stratified epithelium
    D. Squamous epithelium

35. Which one of the following mineral elements is not required by plants?
    A. Copper
    B. Iodine
    C. Iron
    D. Zinc

36. Which one of the following would speed up the process of diffusion?
    A. Reducing the concentration gradient
    B. Increasing the distance across which diffusion occurs
    C. Increasing the area over which diffusion occurs
    D. Lowering the temperature of the medium

37. In order to survive in the sea, a marine bony fish
    A. Loses water by osmosis and absorbs salts
    B. Swallows water and absorbs salts
    C. Swallows water and extrudes salts
    D. Gains water by osmosis and extrudes salts

38. Figure 2 shows growth curves of rats provided with milk diet at different times

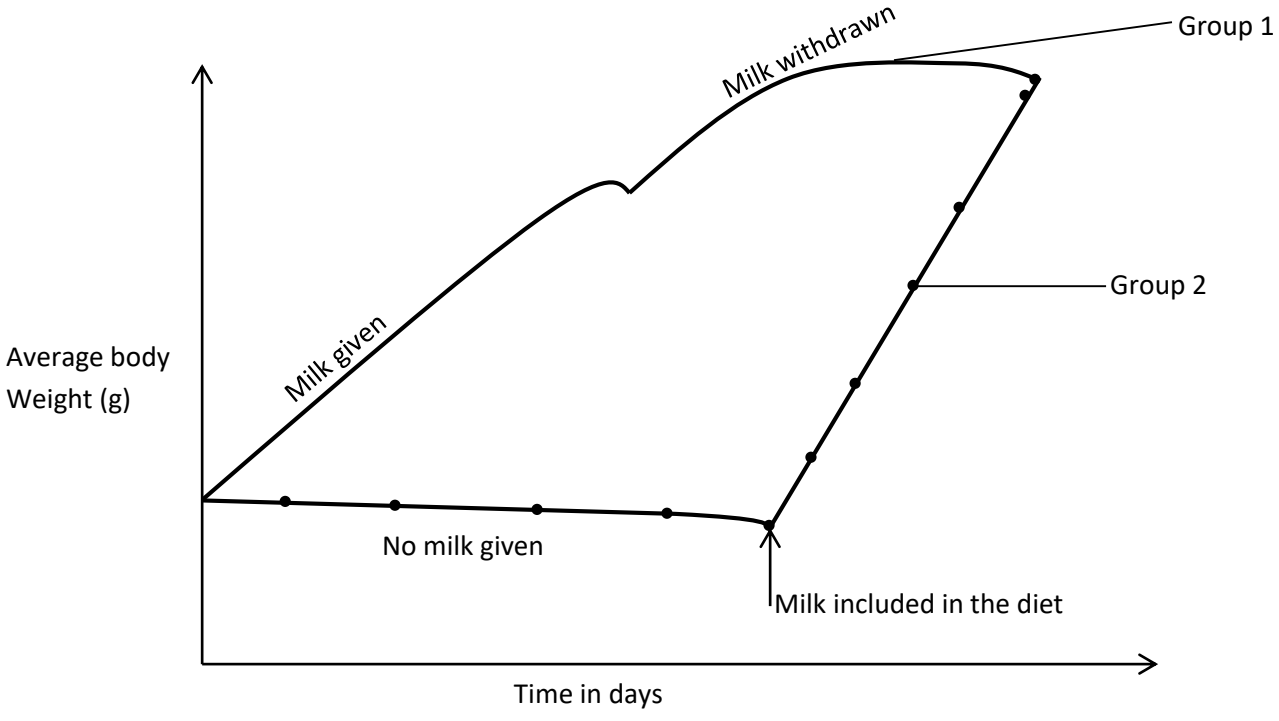


Fig. 2

The most appropriate conclusion of the results is that

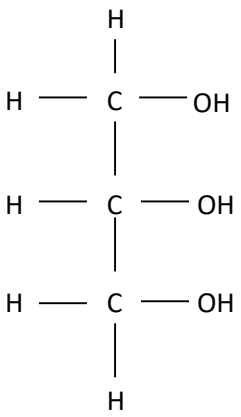
A. In rats, normal growth occurs if the milk contains essential vitamins
B. Milk stimulates growth while lack of it retards growth in rats
C. If milk is added to a milk deficient diet, then the body weight of the rats decreases further
D. Lack of milk in the diet has no effect on the growth of rats

39. Which of the following does not always form part of a bacterium cell?
    A. Cell wall
    B. Flagellum
    C. Cytoplasm
    D. Ribosomes

40. Which one of the following characteristics of a parasite would increase its chances of survival?
    A. Being highly specific
    B. Inflicting severe effects on host
    C. Parasiting more than one type of host
    D. Employing no vectors

Section B (60 marks)

41. (a) Using the structural formula



For glycerol, and molecular formula $CH_3(CH_2)_nCOOH$ for a fatty acid, show the formation of a triglyceride from fatty acids and glycerol.
(02 marks)

……
……

……
……

……
……

……
……

(b) What properties do lipids possess as storage food substances? (2 marks)

……
……

……
……

……
……

……
……

……
……

(c) Outline the structural and physiological functions of lipids in living organisms.
(i) Structural (3 marks)

……
……

……
……

……
……

(ii) Physiological (2 marks)

……
……

……
……

……
……

42. (a) Using an example, give the meaning of adaptive radiation of species. (2 marks)

……
……

……
……

……
……

……
……

……
……

(b) State the ecological importance of adaptive radiation. (2 marks)

……
……

……
……

……
……

……
……

(c) How do adaptive radiation and homologous structures give evidence of evolution?

(i) Adaptive radiation (3 marks)

……
……

……
……

……
……

……
……

(ii) Homologous structures (3 marks)

……
……

……
……

……
……

……
……

43. Figure 3 shows growth curves of the brain, thymus gland, reproductive organs and the whole body of a human. The size attained is expressed as percentage of total gain between birth and maturity (20 years).

(a) Explain the different growth rates of the brain, thymus gland, reproductive organs and the whole body.

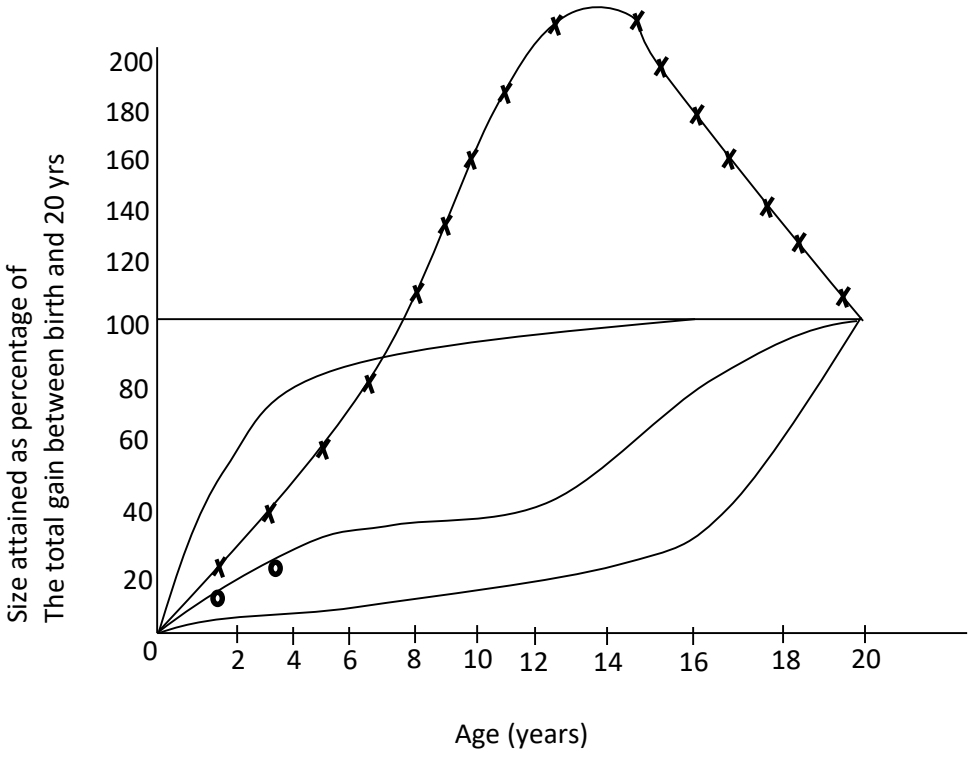


Fig 3

(i) Brain (2 marks)

……
……

……
……

……
……

(ii) Thymus gland (3 marks)

……
……

……
……

……
……

(iii) Reproductive organs (2 marks)

……
……

……
……

(b) What type of growth is exhibited in the figure? (1 mark)

……
……

……
……

44. (a) What do you understand by biological pest control? (2 marks)

……
……

……
……

……
……

(b) What considerations must be made before application of a biological pest control method? (2 marks)

……
……

……
……

……
……

(c) (i) State two ways in which chemical pest control method can upset ecosystems. (2 marks)

……
……

……
……

……
……

(ii) Suggest two reasons why pests may eventually flourish after a period of pesticide application. (2 marks)

……
……

……
……

……
……

(d) Suggest three characteristics of a good pesticide. (3 marks)

……
……

……
……

……
……

(e) Figure 4 shows the oxygen dissociation curves at 2.7 kPa of carbon dioxide, in three organisms: pigeon, human and lugworm that lives in muddy, waterlogged burrows.

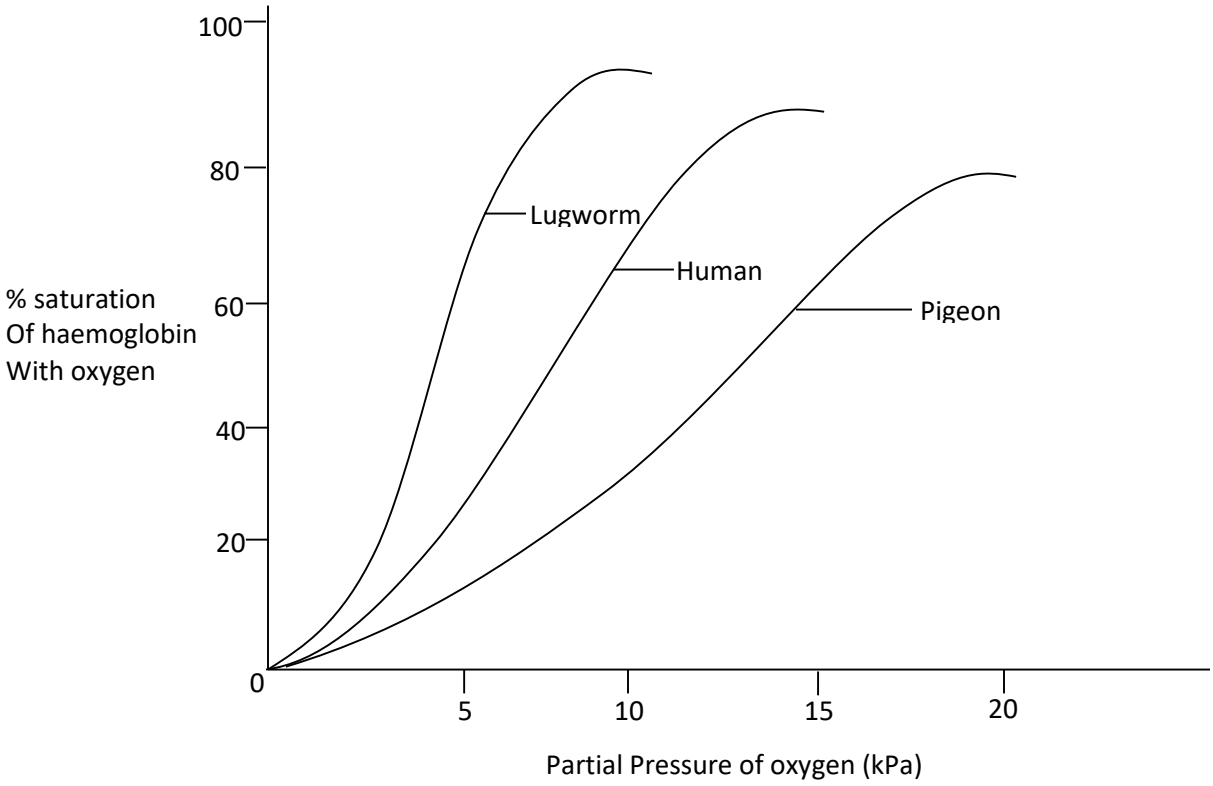


Fig.4

(a) Explain the position of the curves for the lugworm and pigeon in reference to that for human.

(i) Lugworm (3 marks)

……
……

……
……

……
……

(ii) Pigeon
(3 marks)

……
……

……
……

……
……

(b) (i) On the same graph sketch oxygen dissociation curves for the lugworm and human if both organisms were subjected to same higher carbon dioxide tension. (2 marks)
(ii) Explain the position of each of the curves you have sketched (2 marks)

……
……

……
……

……
……

45. (a) What is Photophosphorylation? (2 marks)

……
……

……
……

……
……

(b) Where in the plant cell does cyclic photophosphorylation occur? (1 mark)

……
……

……
……

(c) Describe the process of cyclic photophosphorylation. (5 marks)

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(d) What is the importance of cyclic photophosphorylation in photosynthesis? (2 marks)

……
……

……
……

……
……

……
……

2003.

1. Which one of the following would be a characteristic of a poorly adapted parasite?
   A. Employing vectors
   B. Inflicting mild harm to the host
   C. Having a dormant stage during the life cycle
   D. Inflicting severe harm to the host

2. Which of the following is true about a population where there is no environmental resistance? The population
   A. Grows exponentially
   B. Growth deceleration
   C. Remains constant
   D. grows slowly

3. Which one of the following is caused by a defect on a recessive sex linked allele?

   A. Albinism
   B. Colour blindness
   C. Sickle cell
   D. ABO blood group system

4. In short-day plants, which one of the following will induce flowering?

   A. Period of light longer than a critical length
   B. Period of darkness longer than a critical length
   C. Period of light shorter than a critical length
   D. Period of darkness shorter than a critical length

5. All the following are stimulated by the luteinizing hormone except

   A. Proliferation of the uterine wall
   B. Development of the corpus luteum
   C. Stimulation of corpus luteum to produce progesterone
   D. Ovulation

6. Which one of the following foetal blood vessels carries the most oxygenated blood?

   A. Pulmonary artery
   B. Dorsal aorta

C. Posterior vena cava
D. Umbilical vein

7. Among the following sets of organs, which one contains homologous structure only?

A. Bat wing, bird wing, human forearm
B. Fish pectoral fin, human forearm, insect wing
C. Bird wing, bat wing, insect wing
D. Fish pectoral fin, bat wing, human forearm

8. Pancreatic juice contains the enzymes:

A. amylase, peptide, trypsinogen, renin
B. Amylase, pepsin, trypsinogen, peptidase
C. Lipase, amylase, trypsinogen, peptidase
D. lipase, amylase, pepsin, maltase

9. In sexually reproducing organisms, maintenance of a species is achieved at meiosis by

A. halving DNA amount
B. Doubling DNA amount
C. Maintaining DNA amount
D. increasing DNA amount by fourfold

10. Which one of the following cell organelles would be most active at sites where substances move against diffusion gradient?

A. Ribosomes
B. Lysosomes
C. Mitochondria
D. Golgi bodies

11. The two strands of DNA easily separate during replication because of the

A. helical nature of the nucleotides
B. The closeness of the base pairs
C. weak hydrogen bonds between base pairs
D. the weak hydrogen bonds between phosphate and sugar

12. In the blood, protein can act as bases or acids depending on the

A. temperature of the medium
B. hydrogen ion concentration of the medium

C. nature of the proteins
D. concentration of the solutes in the plasma

13. Wearing a coarse a tickling sensation but later the sensation disappears. Which one of the following is not an explanation of this observation?

A. Supply of the transmitter substance gets exhausted
B. Discharge of impulses at the afferent nerves ceases
C. The membrane surrounding the generator region becomes less permeable to sodium ions
D. Generator potential falls below threshold value

14. Which one of the following features of a structure of an organism is not suitable for classifying the organisms? Its
    A. Size
    B. Number
    C. Shape
    D. Presence or absence

15. Which one of the following is not correct about viruses? They
    A. can only reproductive in living cells
    B. are the smallest living organisms
    C. are facultative parasites
    D. do not have a cellular structure

16. In flowering plants, the number of chromosomes in the structure which gives rise to the embryo sac is
    A. n
    B. 2n
    C. 3n
    D. 4n

17. Among the following compounds, one that cannot be hydrolyzed is
    A. glycogen
    B. galactose
    C. lactose
    D. maltose

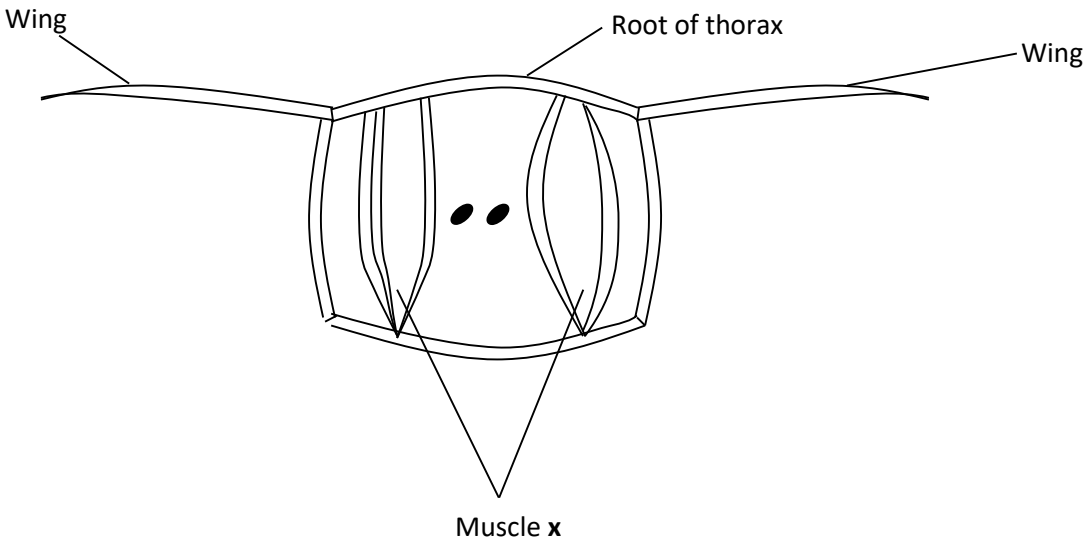
18. Which of the following substances are not transported in the mammalian blood?
    A. urea and glucose
    B. insulin and pepsin
    C. ATP and pepsin
    D. Carbon dioxide and sodium chloride

19. If a father has blood group A and the mother blood AB then the number of possible genotypes of their offspring is
    A. 2
    B. 3

C. 4
D. 6

20. Antidiuretic hormone is produced by the
    A. adrenal gland and decreases urine production
    B. pituitary gland and decreases urine production
    C. adrenal gland and increases urine production
    D. Pituitary gland and increases urine production

21. Figure 1 shows a transverse section through the thorax of an insect



Which of the following is the correct state of the roof of the thorax and direction of the wing beat when muscle **X** contracts?

State of roof of thorax	Direction
A. Raised	Upstroke
B. Flattened	Upstroke
C. Raised	Down stroke
D. Flattened	Down stroke

22. Double fertilization in flowering plants refers to fusion of two male nuclei with
    A. antipodal nuclei and polar nuclei
    B. egg nucleus and polar nuclei
    C. egg nucleus and antipodal nuclei
    D. two egg nuclei
23. Which of the following methods of controlling malaria would cause least damage to the environment?

A. Draining swamps
B. Spraying swamps and ponds with insecticide
C. Spreading oil over stagnant water
D. Introducing fish into the swamps and ponds

24. Figure 2 shows the rate of transpiration of a hibiscus shoot under different light conditions

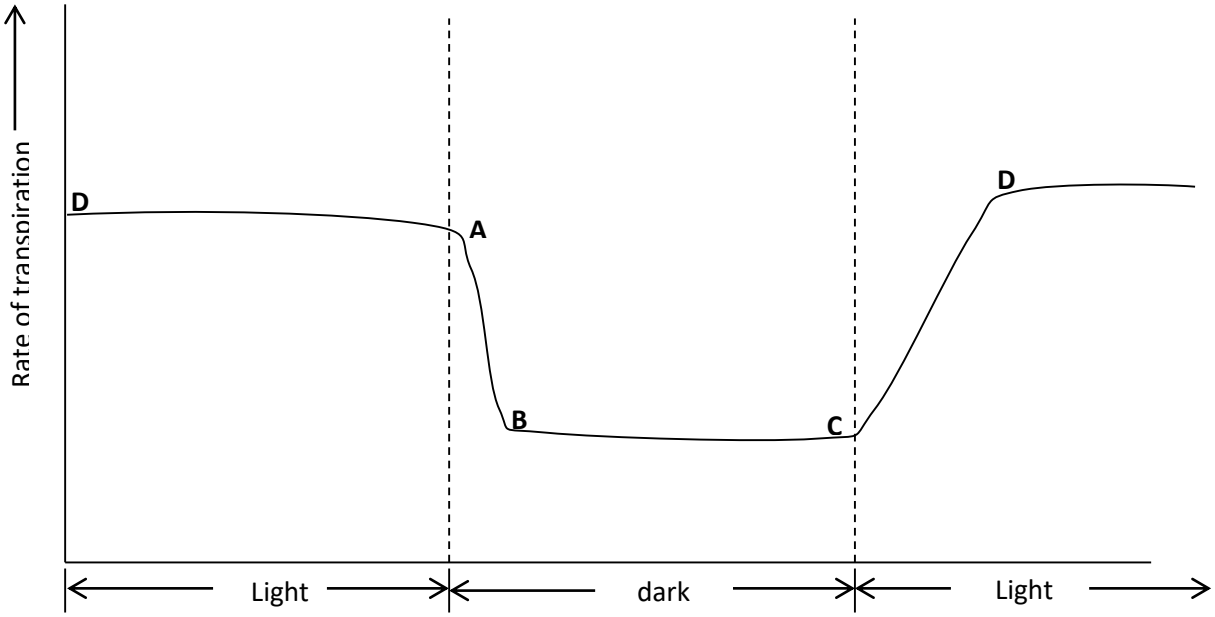


Fig.2

From the graph, at which of the stages indicated did the stomata begin to open?

25. Fig.3 Shows a parallel flow across a gill plate of a fish.

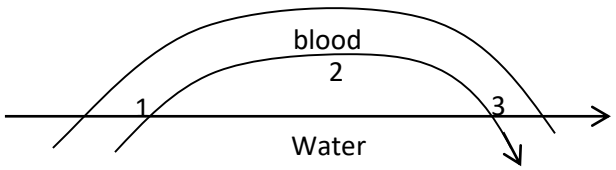


Fig. 3

At which regions is the highest diffusion gradient for oxygen and most oxygenated blood?

Highest diffusion gradient	**Most Oxygenated**
A. 1	2
B. 1	3

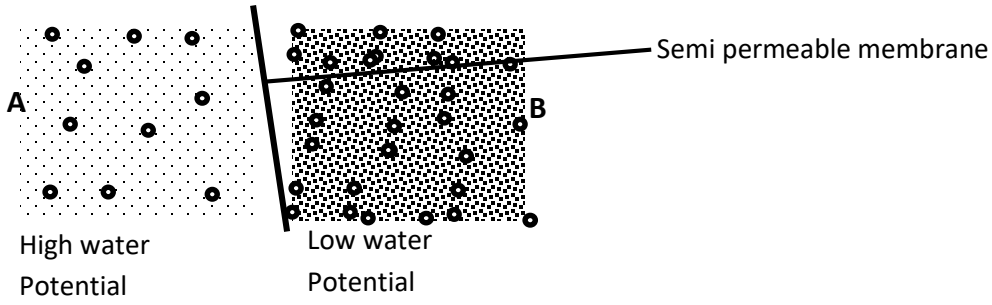
C. 2 D. 3	3 1

26. The main problem of single circulation is the
    A. slow speed of blood to the tissues
    B. mixing of oxygenated and de-oxygenated blood
    C. low rate of oxygenated of blood
    D. slow speed of blood to the heart
27. Which one of the following occurs as a result of a low pH in the guard cells?
    A. conversion of sugar to starch reducing osmotic pressure
    B. conversion of starch to sugar reducing osmotic pressure
    C. conversion of sugar to starch increasing osmotic pressure
    D. conversion of starch to sugar, increasing osmotic pressure

28. The mycorrhiza on some plant roots serve to
    A. fix nitrogen from the atmosphere
    B. absorb mineral salts from the soil
    C. break down humus
    D. synthesize carbohydrates

29. In the duodenum, the products ready for absorption are those of the digestion of
    A. Lipase and amylase
    B. amylase only
    C. trypsin and lipase
    D. lipase only

30. Fig 4 shows conditions on two sides of a semi-permeable membrane.



Which one of the following would occur if the water potential was the same on both sides of the membrane?

A. Movement of water molecules would stop
B. Solute molecules would move at same rate to both sides of the membrane

C. Solute molecules would move to side A
D. Water molecules would move at same rate to both sides of the membrane

31. Lactic acid accumulation in the muscles of an athletic during action is due

A. oxygen debt
B. anaerobic respiration
C. panting
D. high rate of respiration

32. Which one of the following occurs when the axon membrane depolarizes?

A. Sodium ions enter the axon and potassium ions leave
B. Both sodium and potassium ions leaves the axon
C. Potassium ions enter the axon and sodium ions leave
D. Both sodium and potassium ions enter the axon

33. The importance of mutual inhibition in the mammalian eye is to

A. reduce the frequency of impulse transmission
B. increase contrast between light-dark boundaries
C. reduce sensitivity of the eye
D. increase ability to resolve close stimuli separately

34. A mother, who lacked milk in her breasts at the birth of her baby was diagnosed to have a brain damage. Which one of the following parts of the brain is most likely to have been affected?
A. Posterior lobe of the pituitary gland
B. Pineal body
C. Anterior lobe of the pituitary gland
D. Cerebrum

35. At which of the following stages does meiosis occur in the life cycle of a fern? During the formation of the
A. gametes
B. gametophyte
C. spores
D. sporophyte

36. If a messenger RNA has a base sequence of CUGACGAGU, which one of the following would be the possible maximum number of amino acids coded for, if the code is overlapping?
A. 7
B. 6

C. 4
D. 3

37. Which one of the following is characteristic of all vertebrates?
A. Homeothermy
B. A cranium
C. Double circulation
D. Pentadactyl limb

38. The end-product of glycolysis is
A. glucose diphosphate
B. lactic acid
C. citric acid
D. pyruvic acid

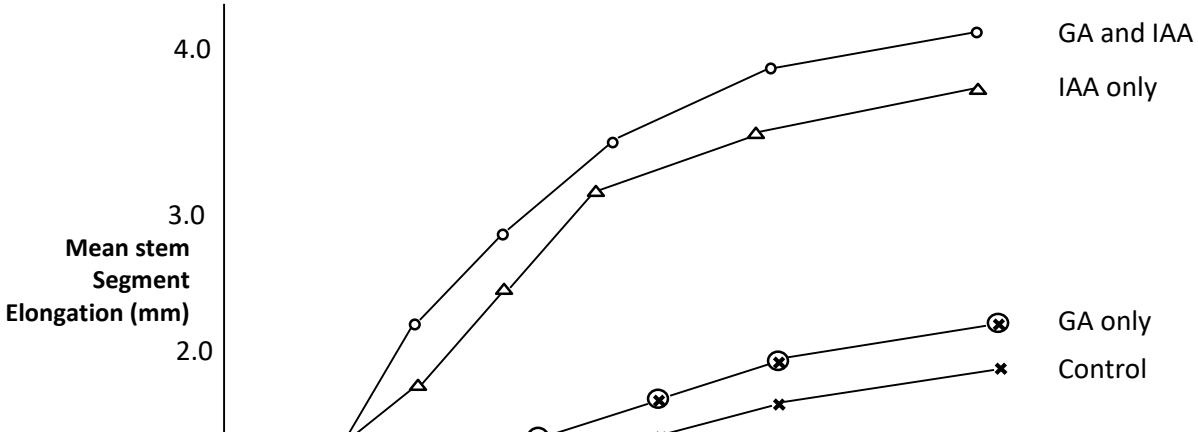
39. Which one of the following processes does not require respiratory energy?
A. Synthesis of cellulose
B. Meiosis
C. Loss of water from the stomata
D. Mineral salt absorption

40. Which one of the following would not lead to evolution?
A. Better suited phenotypes in a specific environment increasing in number
B. The environment remaining stable for a long time
C. Organisms producing more offspring than the environment
D. A larger number of offspring dying before reproduction

SECTION B (60 MARKS)

41. (a) Figure 5 shows the results of an experiment to find out the effects of Indole acetic acid (IAA) and gibberellic acid (GA), on elongation of the stem. Segments from the stem internodes of young pea seedlings were used in four cultures which were kept in the same identical conditions except for the treatments outlined below.

Culture 1 – Control, no plant growth substances added.
Culture 2 – GA only
Culture 3 – IAA only
Culture 4 – GA and IAA



(a) What is the effect on the elongation of the stem segments of

(i) GA and IAA separately? (4 marks)

……
……

……
……

……
……

……
……

(b) What type of interaction is shown by the two growth substances?

……
……

(c) Over which period of the experiment do the plant growth substances have their greatest effect?

……
……

……
……
……
……
……

(d) (i) State two other effects of IAA in plants, other than stem elongation. (1 mark)

……
……
……
……

(ii) For each effect in d(i), state a commercial application of IAA. (1 mark)

……
……
……
……

42. How is each of the following suited for its function?

(a) A red blood cell (4 marks)

……
……
……
……
……
……
……
……

(b) A Xylem vessel (6 marks)

……
……
……
……
……
……
……
……
……
……
……
……

……
……
……
……

43. (a) (i) What is meant by **natural selection?** (2 marks)

……
……
……
……
……
……
……
……

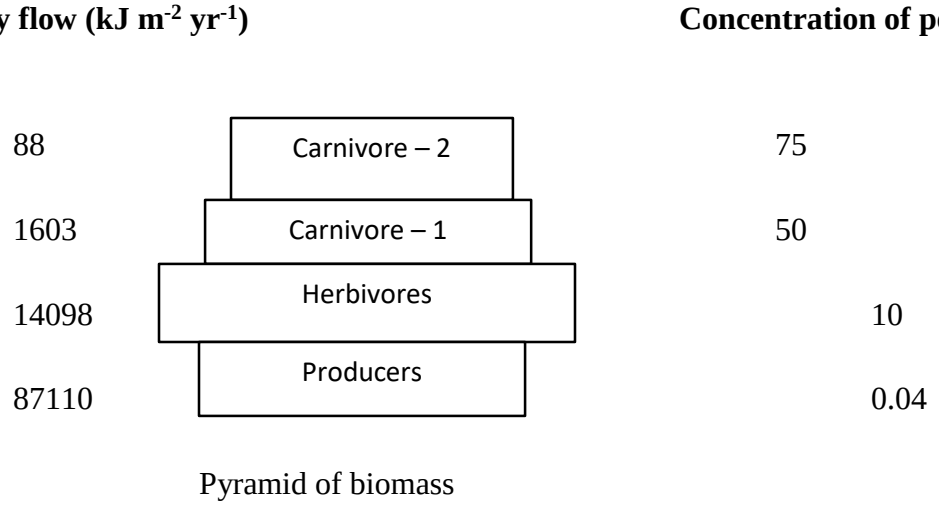
(ii) How does it occur? (6 marks)

……
……
……
……
……
……
……
……
……
……
……
……
……

(b) What is the importance of natural selection? (2 marks)

……
……
……
……
……
……
……
……

44. In an aquatic ecosystem which was affected by an insecticide, analysis of energy flow and concentration of the pesticide at each trophic level in a food chain was made. The results are shown on a pyramid of biomass of the ecosystem, in figure 6.



Pyramid of biomass

Fig.6

(a) What does the width of each bar of the pyramid represent? (1 mark)

……
……
……
……
……

(b) Explain why, from producers to secondary consumers,

(i) The levels of the pesticides increase? (2 marks)

……
……
……
……
……
……
……
……
……

(ii) The flow of energy decrease? (2 marks)

……
……

……
……
……
……
……
……
……

(c) From the biomass, explain how the producers can sustain the herbivores. (2 marks)

……
……
……
……
……

(d) Give three ecological problems that may arise through the use of pesticides. (3 marks)

……
……
……
……
……
……
……
……
……
……
……
……

45. (a) (i) Outline the general features a physiological homeostatic system must have. (3 marks)

……
……
……
……
……
……
……
……
……
……
……
……

(ii) What are qualities of an efficient homeostatic system? (2 marks)

……
……
……
……
……
……
……
……
……
……

(b) Fig.7 shows the metabolic rates of the artic fox (curve **WX**) and the Kangaroo rat (curve **YZ**) in relation to the environment temperature.

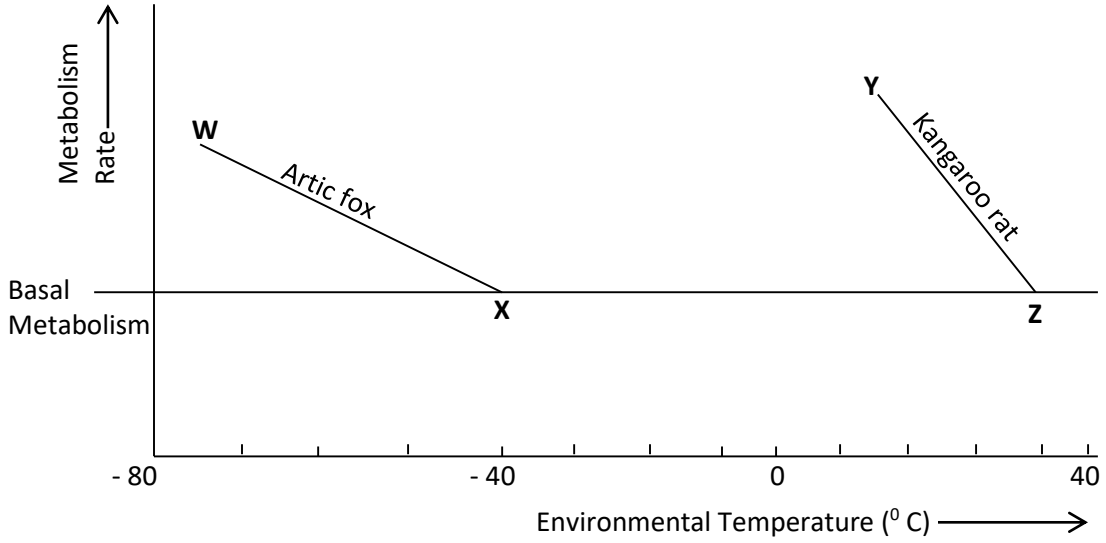


Fig.7

(i) What do points X and Z stand for?

……
……
……
……
……
……

(ii) Give two differences in metabolic rates of the Kangaroo rat and the artic fox in relation to environment temperature. (2 marks)

……
……
……
……
……
……
……
……

(iii) What do the differences you have stated in (b)(ii) imply? (2 marks)

……
……
……
……
……
……
……
……
……
……

46. (a) In the space below, draw and label the structure of a synapse. (4 marks)

(b) How does an impulse cross a synapse? (6 marks)

……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
………………………………………………………………………………………

2002

SECTION A

1. Which one of the following is a chemical mechanism of coping with cold environment in a mammalian body?
   A. Vasoconstriction
   B. Shivering
   C. Raising of body hair
   D. Insulation by the subcutaneous fat.

2. Which one of the following concentrations in the blood would produce the highest frequency of impulses from the carotid nerve?
   A. Low carbon dioxide and high oxygen
   B. High Carbondioxide and high oxygen
   C. Low carbondioxide and low oxygen
   D. High carbon dioxide and low oxygen

3. Which one of the following is the role of reduced NADP in the dark stage of photosynthesis?
   A. Combines with carbondioxide
   B. Provides energy
   C. Provides hydrogen
   D. Acts as an electron acceptor

4. Which one of the following is the role of reduced NADP in the dark stage of photosynthesis?
   A. Combines with carbon dioxide
   B. Provides energy
   C. Provides hydrogen
   D. Acts as an electron acceptor

5. Which one of the following is the function of manganese in the human body?
   A. Essential for the formation
   B. Activates enzymes
   C. Acts as a growth factor in bone development
   D. Utilized as a component of bone and teeth

6. In which one of the following situations would population growth occur?
   A. Births equals the number of deaths
   B. Births plus the number of immigrations is less than the number of deaths plus the number of emigrations
   C. Births plus the number of immigrations is greater than the number of deaths plus the number of emigrations
   D. Deaths plus the number of emigration is greater than the number of births plus the number of immigration

7. Which one of the following is the mRNA strand that corresponds to the DNA strand TAGGCT?
   A. AUCCGU
   B. UUCCGU
   C. CGAAUC
   D. UAGGCU

8. Which one of the following features are most useful to amphibians in living in an aquatic habitat?
   A. Moist skin, membrane around eggs and gills
   B. Membrane around eggs, gills and webbed feet
   C. Long hind limbs, short fore limbs and gills
   D. Webbed feet, moist skin and gills

9. Which one of the following is an intracellular parasite?
   A. Trypanosome
   B. Plasmodium
   C. Schistosome
   D. Hook worm

10. There is a limited biomass at each trophic level in a food chain because at each level, there is progressive
   A. Reduction in numbers of organisms
   B. Loss of energy
   C. Reduction in size of organisms
   D. Reduction in amount of food

11. In flowers, the heterozygous condition of the alleles for Red petals (R) and white petals (W), are pink. Which one of the following proportions and colour of petals is correct if a pink flowered plant is crossed with a red flowered plant?
   A. 3 red : 1 white
   B. 3 red : 1 pink
   C. 1 pink : 1 red
   D. 1 pink : 1 white

12. Which one of the following conditions would most likely result into a miscarriage in humans?
   A. High level of progesterone and low level of Oestrogen in the blood
   B. High level of Oestrogen and low level of progesterone in the blood
   C. Low levels of progesterone and Oestrogen in the blood
   D. High levels of progesterone and Oestrogen in the blood

13. Figure 1 below shows an animal cell during meiosis

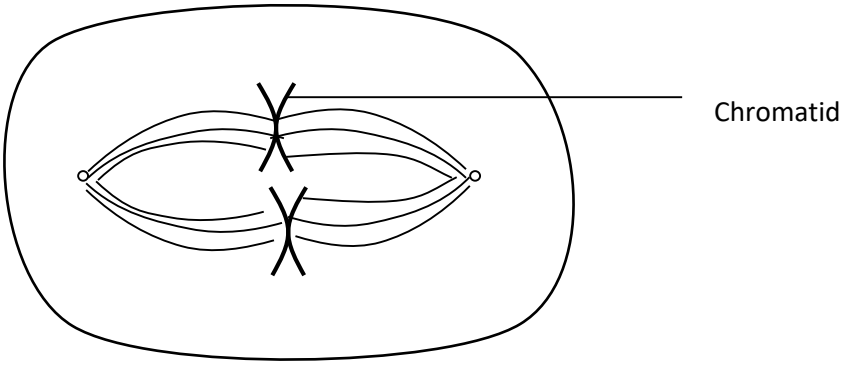


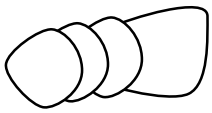
Fig.1

Which one of the following stages is illustrated?

A. Prophase I
B. Prophase II
C. Metaphase I
D. Metaphase II

14. Which one of the following best describes association learning?
    A. Preying bird avoiding to eat a bright coloured caterpillar
    B. Rat eventually learning to traverse a maze if rewarded
    C. Chick following the first moving-object it sees after hatching
    D. Chimpanzee using a stick to reach an object

15. Figure 2 below shows part of an earthworm in motion



In what state are the circular and longitudinal muscles in the region labeled Y?

A. Circular muscles are contracted and longitudinal muscles relaxed
B. Longitudinal muscles are contracted and circular muscles relaxed
C. Circular muscles and longitudinal muscles are relaxed
D. Circular muscles and longitudinal muscles contracted

16. Which one of the following structures operate independently of nervous control?
    A. Cilia of paramecium
    B. Flagella of Euglena
    C. Stinging cells of coelenterates

D. Pigment cells of fishes

17. Which one of the following would be the best indicator that a cell is responding to a hormone?
    A. High concentration of cyclic AMP
    B. Low concentration of AMP in the cell
    C. Low concentration of adenyl cyclase in the cell
    D. High amount of ATP in the cell

18. Which one of the following would result into the production of concentrated urine by an animal?
    A. Possession of large glomeruli
    B. Possession of long loops of henle
    C. Failure to produce ADH
    D. Possession of many glomeruli

19. Which one of the following does not directly affect the pH of the soil?
    A. Absorption of bases by plant roots
    B. Production of carbon dioxide by plant roots
    C. Leaching
    D. Water logging

20. Which one of the following does not involve mass flow?
    A. Blood flow in the arteries
    B. Uptake of food by the tapeworm
    C. Movement of food and water in the gut
    D. Transport of water and mineral salts by the xylem

21. Which of the following is not true about both the blood circulatory and lymphatic systems in mammals? The fluids contains
    A. Excretory products
    B. Leucocytes
    C. Plasma proteins
    D. Dissolved food

22. Which one of the following types of sound waves travels farthest along the basilar membrane? The sound wave with
    A. High frequency and high amplitude
    B. High frequency and high amplitude
    C. High frequency and low amplitude
    D. Low frequency and low amplitude

23. Which one of the following does not occur when the buccal cavity contracts during breathing in a fish?
    A. Mouth valve closes
    B. Opercular valve
    C. Opercular volume increases
    D. Mouth opens

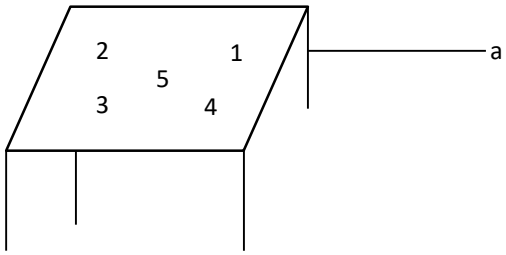
24. In which one of the following does anaerobic respiration not occur?
    A. Skeletal muscle
    B. Yeast cell
    C. Bacteria
    D. Smooth muscle

25. Which one of the following colours of light are most effective in photosynthesis?
    A. Green and red
    B. Blue and red
    C. Blue and yellow
    D. Blue and green

26. Which of the following features would be prominent in mucus secreting cells?
    A. Large nucleus and dense matrix
    B. Numerous rough endoplasmic reticulum and Golgi body
    C. Numerous mitochondria and lysosomes
    D. Dense matrix and smooth endoplasmic reticulum

27. Which one of the following would not reduce the development of Graafian follicles in mammalian ovaries?
    A. High levels of Oestrogen
    B. High levels of progesterone
    C. Deficiency in the pituitary
    D. Low levels of luteinizing hormone

28. Figure 3 represents in motion



If the animal lifted limb a during its movement, in which position would it shift its centre of gravity in order to remain most stable?

A. 2
B. 3
C. 4
D. 5

29. Which one of the following belongs to a different phylum?
    A. Octopus
    B. Scorpion
    C. Millipede
    D. Crab

30. Which one of the following features of red blood cells does not contribute to their high absorptive nature of oxygen? They
    A. Possess a thin flexible membrane
    B. Possess a biconcave disc shape
    C. Are filled with haemoglobin
    D. Are manufactured at a high rate

31. The camel family is found only in North Africa, Asia and South America. This is an example of
    A. Adaptive radiation
    B. Convergent radiation
    C. Divergent distribution
    D. Discontinuous distribution

32. How many reproductive stages does the malarial parasite undergo to complete the life cycle?
    A. 1
    B. 2
    C. 3
    D. 4

Use the information to answer questions 33 and 34

In mice, yellow fur (Y) is dominant over fur (y). When two mice were mated, the offspring were in the ratio of 2 yellow to 1 grey.

33. From the results, which of the following were the likely genotypes of the parents?
    A. Both were homozygous dominant
    B. Both were heterozygous
    C. One was heterozygous and the other homozygous dominant
    D. Both were homozygous recessive

34. Which of the following best explains the results?
    A. Double recessive allele for fur colour is lethal
    B. Heterozygous condition for fur colour is lethal
    C. Fur colour could be sex linked
    D. Double dominant allele for fur colour is lethal

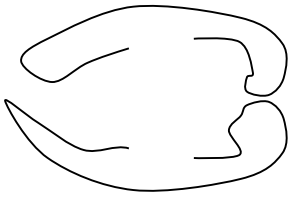
35. Which one of the following is true of diploid parthenogenesis?
    The eggs are formed by
    A. Meiosis and develop without being fertilized
    B. Mitosis and develop after fertilization
    C. Meiosis and develop after fertilization
    D. Mitosis and develop and develop without being fertilized

36. Which one of the following factors least affects the gliding speed of a bird?
    A. Weight of the bird
    B. Size of the bird
    C. Shape of the wings
    D. Length of the wings

37. Which one of the following hormones is secreted by the neurosecretory cell in mammals?
    A. Adrenaline
    B. Antidiuretic hormone
    C. Insulin
    D. Thyroxin

38. Which one of the following concentrations of proteins in mammals is correctly indicated?
    High in
    A. The glomerular filtrate and urine
    B. The blood plasma usually absent in glomerular filtrate and urine
    C. Both blood plasma and glomerular filtrate but low in urine
    D. Blood plasma, glomerular filtrate and urine

39. Which one is true of the respiratory system of an organism whose section is shown in figure 4 below?



The system requires

A. A transport mechanism and a ventilation mechanism
B. Ventilation mechanism and no transport mechanism
C. A transport mechanism and no ventilation mechanism
D. Neither transport mechanism nor a ventilation mechanism

40. Which one of the following types of epithelia experiences the highest rate of wearing?
A. Stratified
B. Columnar
C. Glandular
D. Ciliated

SECTION B
ANSWER all questions in this section in the spaces provided.

41. (a) State three ways by which ions are regulated in mammals

……
……

……
……

……
……

……
……

……
……

(3 marks)

(b) The pH of blood and tissue fluid in humans remains constant at about 7.4 inspite of metabolic activities which produce hydrogen ions. Explain how this constancy is maintained by the kidneys.

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(7 marks)

42. (a) Giving examples differentiate between photosynthetic and chemosynthetic bacteria.

……
……

……
……

……
……

……
……

(3 marks)

(b) Explain how certain bacteria which require light for photosynthesis, survive under weeds in ponds and rocks.

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(7 marks)

43. (a) What do you understand by gene pool?

……
……

……
……

……
……

……
……

(2 marks)

(b) What may cause a gene pool of a population to be static?

……
……

……
……

……
……

(2 marks)

(c) (i) State three factors that may contribute to the change in frequency of dominant and recessive alleles in a population.

……
……

……
……

……
…….

(3 marks)

(ii) Explain how each factor stated in c(i) above may cause changes in the frequency of the dominant and recessive alleles in a population.

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(3 marks)

44. In poultry, feather colour is controlled by two sets of alleles, W(white) dominant over w (coloured) and B (black) dominant over b(brown). A fowl heterozygous for both alleles (WwBb) is white.

(a) Explain why the genetic constitution of WwBb is white.

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(2 marks)

(b) Work out to show the phenotype ratio of crossing a white cock (WwBb), with a brown hen.

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(7 marks)

(c) State the possible genotypes of a black fowl.

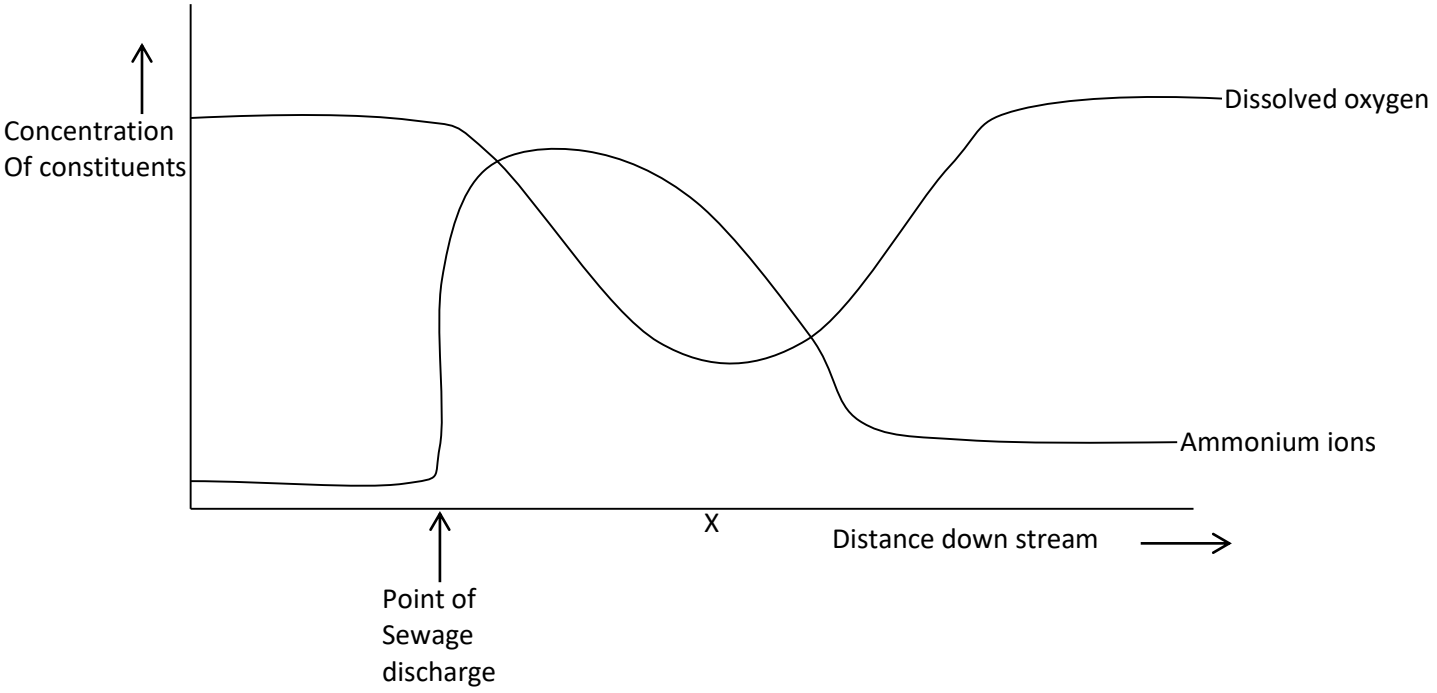
……
……

……
……

……
……

(1 mark)

45. Graph 1 below shows the effect of sewage discharge on some chemical constituents of a river at increasing distances downstream from the point of sewage discharge.



(a) Give explanations for the variation in concentration of ammonium ions and dissolved oxygen, downstream from the point of sewage discharge.

(i) Ammonium ions

……
……

……
……

……
……

……
……

……
……

(ii) Dissolved oxygen

……
……

……
……

……
……

……
……

……
……

(6 marks)

(b) Describe the effect of the sewage on the ecosystem at distance X downstream.

……
……

……
……

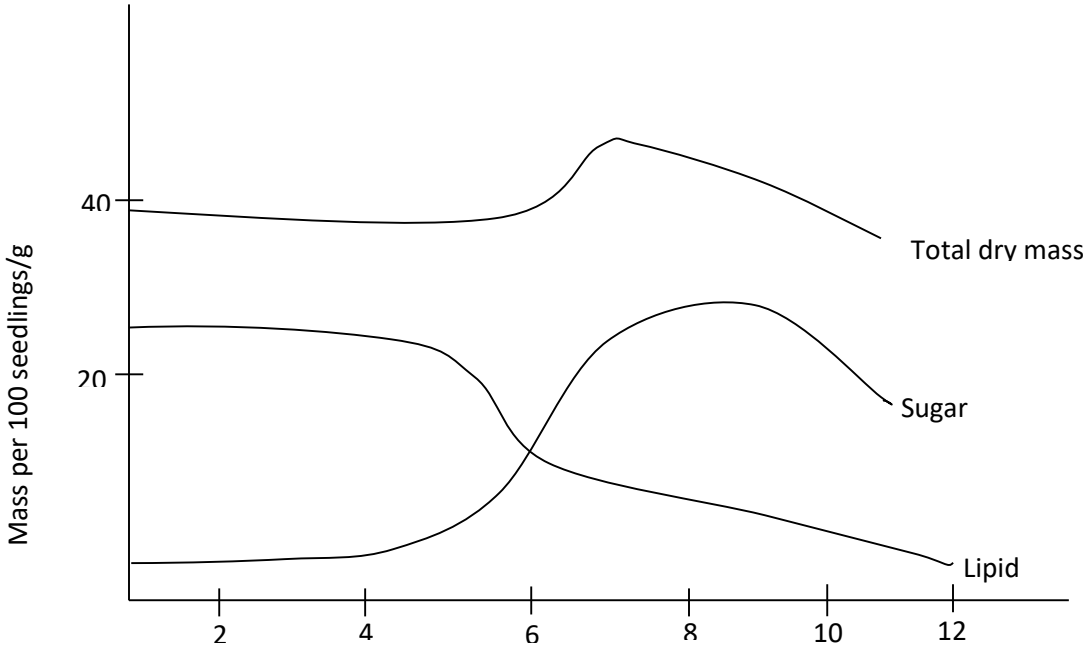
……
……

……
……

……
……

(4 marks)

46. Graph 2 below shows changes in lipid and sugar content of castor oil seeds during germination in the dark.



Graph 2

(a) Explain the changes in lipid and sugar content and total dry mass during the experimental period.

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(b) On the same graph indicate the shape of the curves if the seeds were to germinate in light.
(2 marks)

2001

1. Which one of the following would not be caused by seasonal changes in migratory birds?
   A. Hormonal changes
   B. Feeding behavior
   C. Reproductive behavior
   D. Plumage colouration

2. Which one of the following describes the ‘greenhouse effect’?
   A. Depletion of the ozone layer increases atmospheric temperature
   B. The earth retains the heat it gains from the Sun
   C. Increasing atmospheric carbon dioxide prevents heat loss from the earth surface
   D. The earth gives out carbon dioxide which prevents light rays from the sun reaching the earth

3. The reproductive stage of plasmodium in the liver is represented by the
   A. Zygote
   B. Gametocyte
   C. Merozoite
   D. Sporozoite

4. Which of the following are formed during anaerobic respiration in yeast cell?
   A. Lactic acid and ATP
   B. Lactic acid and ADP
   C. Ethanol and ATP
   D. Ethanol and ADP

5. Which one of the following is the reason for hibernation of a humming bird every night?
   A. Its metabolic rate is so high
   B. It is too cold at night
   C. It feeds on nectar from flowers which close at night
   D. Its relatively large surface area would lose too much heat

6. The circulatory system in insects plays a role in all of the following body systems except
   A. Excretory system

B. Respiratory system
C. Digestive system
D. Reproductive system

7. Which one of the following structures is responsible for initiating the contractions of the heart?
   A. Purkinje tissue
   B. Atrio-ventricular node
   C. Sino atrial node
   D. Heart muscle
8. Which one of the following qualities of the guard cells that contributes to their opening?
   A. Uneven thickened walls
   B. Inner walls being less elastic than other walls
   C. Presence of chloroplasts
   D. Presence of vacuoles

9. In which of the following parts of the cell does most production of ATP occur?
   A. Matrix of mitochondrion
   B. Cristae of mitochondrion
   C. Cytoplasm of cell
   D. Outer membrane mitochondrion

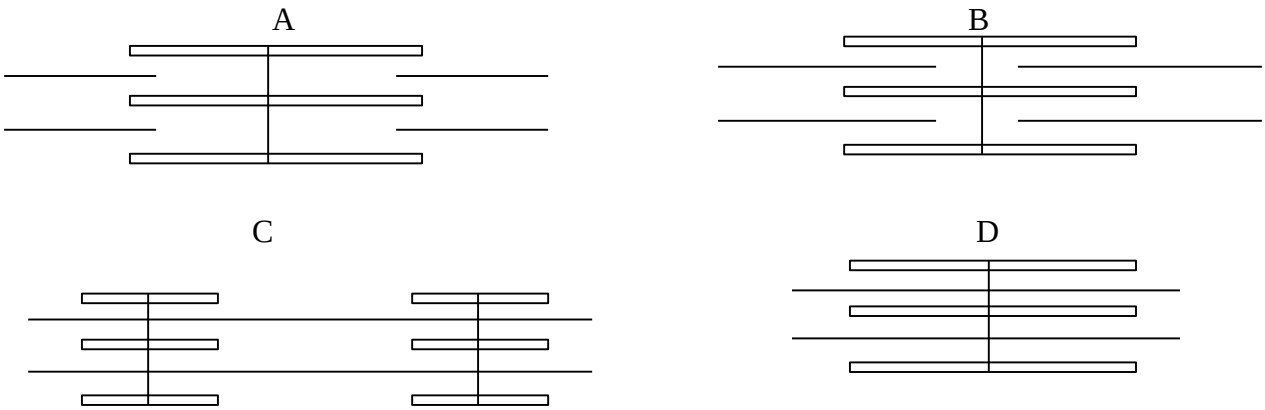
10. The study of gross morphological and histological appearance of organisms in ecology is best describe as
    A. Comparative physiology
    B. Comparative embryology
    C. Comparative anatomy
    D. Cell biology

11. In which one of the following organisms does a notochord exist?
    A. Amphioxus
    B. Hydra
    C. Cockroach
    D. Earthworm

12. The phenotype resulting from a cross between red eyed and white eyed fruit flies depends on which parent is red eyed. This means that the gene for eye colour is
    A. Polygenic
    B. Sex linked
    C. Homogametic
    D. Sex limited

13. Which one of the following is the correct route taken by blood on leaving the heart, in a single circulatory system?
    A. Gills → body → heart
    B. Body → gills → heart
    C. Gills → heart → body
    D. Body → heart → gills

14. Which one of the following sections of a striated muscle in figure 1 below represents the myofibril in a contracted state?



15. Which one of the following describes what happens at the tip of a newly formed amoeboid pseudopodium?
    A. Gel ectoplasm changes to sol endoplasm
    B. Gel endoplasm changes to sol ectoplasm
    C. Sol ectoplasm changes to gel endoplasm
    D. Sol endoplasm changes to gel ectoplasm

16. Which one of the following is likely to happen to a dog fish which has damaged branchial valves?
    A. Water would not enter the mouth
    B. Some water would enter through the gill slits
    C. Water would get out through the mouth
    D. Water would not enter the spiracles

17. Failure to synthesize abscisic acid in plants may lead to
    A. Leaves turning yellow
    B. Plants drying up
    C. Leaves becoming salty
    D. Poor development of roots

18. Which one of the following blood conditions would cause least ventilation rate in humans?
    A. Low carbon dioxide and high oxygen concentrations
    B. High carbon dioxide and oxygen concentrations
    C. Low carbon dioxide and oxygen concentrations
    D. High carbon dioxide and low oxygen concentrations

19. Which one of the following organisms is in the same phylum as the earthworm?
    A. Millipede
    B. Leech
    C. Tape worm
    D. Round worm

20. An individual with vocal cords that have lost elasticity is likely to produce sound that is
    A. High pitched
    B. Loud
    C. Low pitched
    D. Shaky

21. In which one of the following is ciliated epithelium found?
    A. Kidney tubules
    B. Small intestines
    C. Lining of capillaries
    D. Lining of alveoli

22. Which one of the following substances consists of globular proteins?
    A. Enzymes
    B. Keratin
    C. Elastin
    D. Collagen

23. Organism M has the following characteristics:
    (i) Body temperature = 29^0C,
    (ii) Number of limbs = 8,
    (iii) Head and thorax are fused,
    (iv) Feeds on dead animals
    (v) Is nocturnal

    Which of the following combinations of characteristics would be useful in making a dichotomous key?

A. (i), (iv) and (v)
B. (i) and (v)
C. (ii), (iii) and (v)
D. (ii) and (iii)

24. Which of the following would counteract rolling in bony fish?
A. Dorsal flattening of the body
B. General massiveness of the head
C. Pressure of water against the sides of the body
D. Vertical and horizontal fins

25. Which one of the following methods is used by halophytes to conserve water?
A. Shed leaves
B. Store water
C. Reduce number of stomata
D. Have small leaves

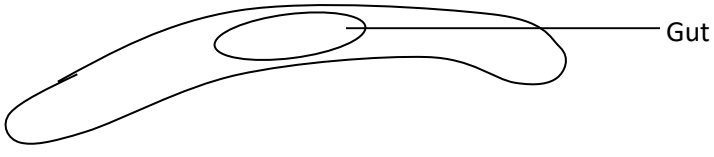
26. Plant roots in association with symbolic bacteria is an indication that
A. The plant is unhealthy
B. The roots have been attacked
C. Soil around roots lacks nitrogen
D. Soil around roots lacks humus

27. Which one of the following is not stimulated by the parasympathetic nerves?
A. Slowing of heart beat
B. Constriction of iris
C. Flow of saliva and other gut secretions
D. Slowing of gut movements

28. A person who walks unsteadily may have a defect in the
A. Cerebrum
B. Cerebellum
C. Medulla oblongata
D. Hypothalamus

29. Which one of the following is not a component of environmental stress?
A. Lack of light
B. Lack of shelter
C. Topography
D. Disease

30. Figure 2 below shows a cross section of an organism



Which of the following means of gaseous exchange would be most suitable for the organism?

A. Diffusion over the body
B. Use of trachea
C. Use of lungs
D. Use of gills

31. Which one of the following symptoms is most likely to be caused by magnesium deficiency in plants?
    A. Yellow leaves and stunted growth
    B. Poor root growth
    C. Weak stems
    D. Yellow spotted leaves

32. Which one of the following enzymes would be adversely affected by high pH?
    A. Trypsin
    B. Pepsin
    C. Amylase
    D. Lipase

33. Which one of the following features is not essential for gaseous exchange in the lungs?
    A. Pleural fluid
    B. Dense network of capillaries
    C. Thin epithelium
    D. Presence of moisture

34. Which one of the following would be the immediate danger to a fish when taken out of water?
    A. Drying-out of gills
    B. Lack of oxygen around gills
    C. Reduced surface area for gaseous exchange
    D. Change in external temperature

35. Which one of the following glands is compound saccular?
    A. Mammary glands
    B. Sebaceous glands
    C. Sweat glands
    D. Gastric glands

36. Which one of the following would lead to genetic death in an animal population?
    A. Heamophilia in a population
    B. Sickle cell trait in a population
    C. Infertile males in a population
    D. Albinism in a population

37. Which one of the following cell organelles is associated with final stage of most cell secretions?
    A. Smooth endoplasmic reticulum
    B. Rough endoplasmic reticulum
    C. Ribosome
    D. Golgi apparatus

38. What would be the phenotypes of children born colour blind man and a normal woman?
    A. All normal
    B. Only girls normal
    C. Only boys colour blind
    D. All colour blind
39. Which one of the following is not a method of measuring the rate of respiration in an organism?
    A. Estimating the amount of food taken in by the organisms per day
    B. Measuring the heat produced by the organism in a given time
    C. Measuring the amount of carbon dioxide produced by the body in a given time
    D. Estimating the amount of oxygen consumed by the body in a given time

40. With respect to the role of Auxins, how would you explain positive and negative geotropism in roots and shoots respectively?
    A. High auxin concentration accelerates growth in roots but retards it in shoots
    B. Low auxin concentration accelerates growth in roots but retards it in shoots.
    C. High auxin concentration accelerates growth in both roots and shoots
    D. Low auxin concentration accelerates growth in both roots and shoots.

SECTION B

Answer all questions in this section in the spaces provided

41. Explain the following observations in humans.
    (a) Production of large volumes of dilute urine on a cold day.

    ……
    ……..

……
……

……
……

……
……

……
……

(b) Urine production almost stops as a result of serious blood loss.

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(c) Presence of sugar in urine

……
……

……
……

……
……

……
……

……
……

……
……

(d) Feeling hungry faster in cold weather

……
……

……
……

……
……

……
……

……
……

……
……

(2 marks)

42. (a) Describe how the following tissues bring about growth in higher plants.

(i) Apical meristem

……
……

……
……

……
……

……
……

……
……

……
……

(ii) Vascular cambium

……
……

……
……

……
……

……
……

(8 marks)

(b) How does growth in mammals differ from that in flowering plants?

……
……

……
……

……
……

……
……

……
……

43. (a) Sate three ways in which water has similar functions in both plants and animals.

……
……

……
……

……
……

……
……

……
……

(3 marks)

(b) Give two ways, in each case, in which flowering plants minimize water loss through

(i) Behavioral means.

……
……

……
……

……
……

……
……

(4 marks)

(ii) Physiological means

……
……

……
……

……
……

……
……

(4 marks)

44. The capture recapture method was used to estimate the population size of dragon flies.
The following results were obtained:
On first day, 300 dragon flies were captured and marked. Two days later 450 dragon flies were captured out of which 100 had been marked.
(a) Using this information, estimate the population size of dragon flies.

……
……

……
……

……
……

……
……

……
……

……
……

(2 marks)

(b) State three assumptions, and two precautions which are taken into account while using this method in estimating population size.
Assumptions:

……
……

……
……

……
……

……
……

……
……

……
……

Precautions:

……
……

……
……

……
……

……
……

……
……

……
……

(5 marks)

(c) State any three sources of error in using this method of estimating population size.

……
……

……
……

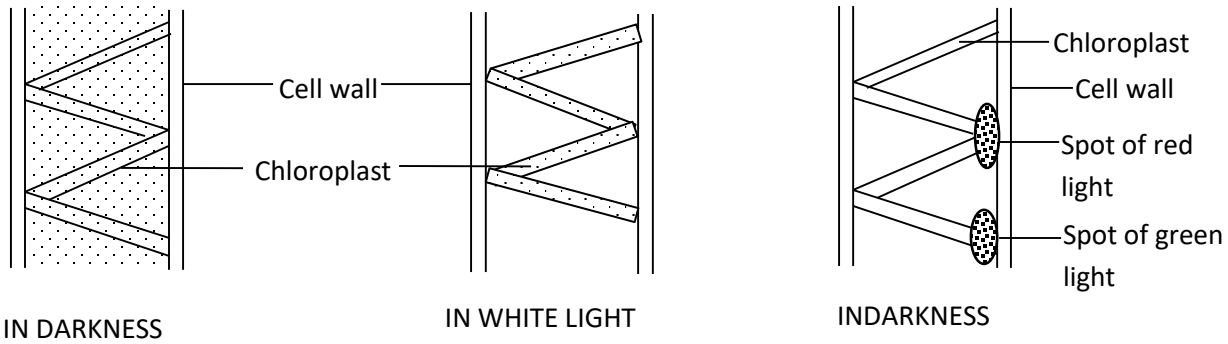
……
……

……
……

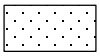
……
……

……
……

45. One strand of spirogyra was placed on each of three microscope slides A, B and C. The spirogyra was in water which contained aerobic, free-moving bacteria. The three slides were placed under conditions as shown in figure 3 below. After one hour of incubation, the results were as shown in figure 3.



KEY

 bacteria

(a) Describe the distribution of bacteria on the three slides A, B and C.

……
……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……

……(3 marks)

(b) Explain the distribution of bacteria on each side.

……
……

……

……

……

……

……

……

……

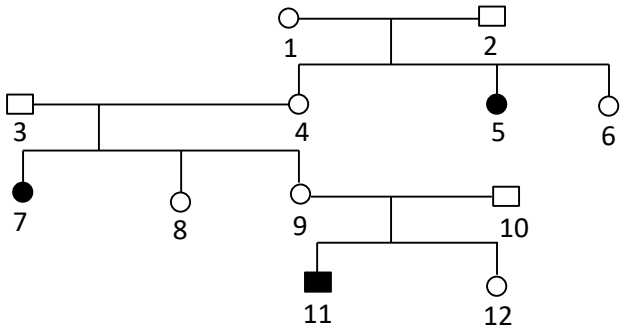
……

……

……

……
……

46. Figure 4 shows how sickle cell anaemia has affected a family line. Sickle cell anaemia is a recessive genetic defeat which is not linked. (Individuals are numbered 1,2,3, ……12)
-



Key to phenotypes

- Affected female
- Unaffected female
- Affected male
- Unaffected male

Fig. 4

(a) State the numbers of all the individuals in the family line that are certain to be heterozygous for this gene.

……
……

(2 marks)

(b) What is the probability that individual 6 is heterozygous for this gene?
(Show your working)

……
……

……
……

……
……

……
……

……
……

(1 mark)

(c) The parasite which causes malaria digests haemoglobin in the red blood cells. Suggest two reasons why an individual who is heterozygous for this gene may show resistance to malaria.

……
……

……
……

……
……

……
……

……
……

……
……

(4 marks)

(d) State the difference between individuals who have sickle cell anemia and those that have sickle cell trait.

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(3 marks)

1999.

1. Which one of the following is a function of the Golgi body in a cell?
   A. Secreting substances out of the cells
   B. Synthesizing proteins
   C. Assembling of raw materials for secretion
   D. Synthesizing carbohydrates

2. Which one of the following cell types are unlikely to be found in the mammalian intestine?
   A. Columnar
   B. Ciliated
   C. Stratified
   D. Squamous

3. Which one of the following statements is true of essential fatty acids? They
   A. Are the most required lipids in the body]
   B. Are required in the body in large quantities
   C. Cannot be synthesized in the body
   D. Are most abundant in animal tissues

4. Which one of the following events will immediately result in an increase in ventilation rate?
   A. Increased level of oxygen
   B. Increased level of carbon dioxide
   C. Accumulation of lactic acid in the body
   D. Increased levels of oxygen and carbon dioxide

5. Which one of the following organisms exhibit intracellular digestion?
   A. snails
   B. insects
   C. mammals
   D. Fungi

6. Termites are able to eat wood because they
   A. Produce cellulase enzyme
   B. Possess strong mandibles
   C. contain cellulose digesting bacteria in the gut
   D. contain fungi in the gut

7. Which wavelength from light spectrum is mostly absorbed by green plants?
   A. Red
   B. Green
   C. Blue
   D. Yellow

8. Where wavelength from light spectrum is mostly absorbed by green plants?
   A. lamelia
   B. stroma
   C. quatasome
   D. granal membrane

9. The spiral valve in the conus arteriosus of an amphibian is to
   A. allow one directional flow of blood
   B. increase the pressure of blood
   C. Reduce resistance to blood flow
   D. separate oxygenated and deoxygenated blood

10. Which one of the following animals has a double circulatory system?
   A. Fish
   B. Octopus
   C. Frog
   D. Squid

11. Which one of the following is not homeostatically regulated in the body?
   A. Glucose
   B. Water
   C. Carbon dioxide
   D. Fat

12. A dodder plant, which attaches on to stems of various plants is yellow in appearance. This indicates that the plant
   A. lacks roots
   B. lacks certain minerals
   C. is parasitic
   D. lacks supporting tissues

13. The main function of Kupffer cells of the liver is to
   A. eliminate sex hormones
   B. form red blood cells

C. eliminate haemoglobin
D. destroy old red blood cells

14. Which one of the following is not characteristic of animals which migrate from fresh water to sea water?
A. Lack means of osmoregulation
B. Have efficient means of osmoregulation
C. Possess tolerant tissues
D. Employ behavioral means in osmoregulation

15. To which one of the following phyla does a flat worm belong?
A. Nematoda
B. Arthropoda
C. Platyhelminthes
D. Coelentrates

16. Which one of the following hormones initiates flowering in long-day plants?
A. Auxins
B. Gibberelins
C. Abscisin
D. Florigen

17. Which one of the following base triplets will pair with ACG triplet base?
A. TGC
B. AAT
C. GTG
D. ACC

18. Which of the following is the reason for sprouting of lateral buds, when terminal bud is removed?
A. Competition for light is removed
B. More carbon dioxide is available
C. Sources of auxins are removed
D. Competition for soil nutrients is removed

19. Which one of the following is the mother cell from which the ovum is developed?
A. Oogonium
B. Primary oocyte
C. Primodial germ cell
D. Secondary germ cell

20. Which of the following describes the pigment within the rod cells?
A. Breaks down easily on illumination
B. requires high light intensity to be activated
C. is not readily resynthesized after breakdown
D. is capable of colour perception

21. Where in the host is a parasite lacking sense organs and osmoregulatory devices likely to be located?
   A. On the skin
   B. Under the hair
   C. in the alimentary canal
   D. in the intercellular fluid

22. Which one of the following is confined within the nucleus?
   A. DNA molecules
   B. Ribosomes
   C. Messenger RNA
   D. Transfer RNA

23. What type of reproductive process results in the production of a hybrid?
   A. Self fertilization in a hermaphrodite
   B. Mating closely related individuals with a recessive parent
   C. Back crossing of an individual with a parent of recessive traits
   D. Mating distantly related individuals

24. Which one of the following is the diploid stage in the life cycle of a moss?
   A. Protonema
   B. Sporophyte
   C. Gametophyte
   D. Antheridium

25. Which one of the following blood pigments contains copper?
   A. Haemocyanin
   B. Myoglobin
   C. Haemoerythrin
   D. Haemoglobin

26. Which of the following is not adaptation to aquatic life by a plant?
   A. Poorly developed roots
   B. Lack of stomata
   C. Presence of tendrils
   D. Poorly developed xylem

27. In a single circulatory system the route taken by blood on leaving the heart is
   A. gills → body → heart
   B. body → gills → Heart
   C. gills → heart → body
   D. body → heart → gills

28. Initial absorption of water by seeds during germination is caused by
   A. osmotically active substances within the seed
   B. imbibition pressure due to colloidal particles present in seed coats
   C. active absorption involving expenditure of energy
   D. mass flow through the micropyle

29. Which of the following substances is not transported in the blood?
    A. Urea and glucose
    B. Insulin and adrenalin
    C. ATP and pepsin
    D. Carbon dioxide and sodium chloride

30. Many small animals use their skins as the only respiratory organ because they
    A. are too small to have other respiratory organs
    B. have large surface area/volume ratio
    C. use less energy and therefore use less oxygen
    D. are less active than big animals

31. Mutual inhibition in the compound eye of insects is to
    A. increase colour vision
    B. increase brightness of light in the eye
    C. increase the contrast in light intensities between adjacent omatidia
    D. reduce the intensity of light into the eye

32. Which one of the following is not a structural component of the ecosystem?
    A. Green plants
    B. Decomposers
    C. Predators
    D. Solar system

33. Which of the following are purines?
    A. Adenine and cytosine
    B. Thymine and adenine
    C. Thymine and cytosine
    D. Adenine and guanine

34. Which of the following belongs to a different phylum from the rest?
    A. Amphioxus
    B. A cone worm
    C. Sea squirt
    D. Sea anemone

35. Which part of the brain is responsible for controlling breathing in mammals?
    A. Thalamus
    B. Pineal body
    C. Medulla oblongata
    D. Cerebellum

36. Which one of the following is not the method by which antibodies attack antigens?
    A. Engulfing
    B. Agglutination
    C. Lysis
    D. Adsorption on surface

37. Which one of the following will result in the formation of gall stones in the liver?
    A. Blockage of the bile duct
    B. Breakdown of haemoglobin in the liver
    C. High level of cholesterol in the diet
    D. Accumulation of bile salts

38. The adaptations of the small intestines to the digestive process is to increase
    A. Surface area and absorption of end products
    B. secretory and absorptive surfaces
    C. secretory and digestive surfaces
    D. the duration of the digestive process

39. The organism that requires only inorganic raw materials from the environment is
    A. virus
    B. amoeba
    C. euglena
    D. plasma

40. Chloride ions are vital for efficient functioning of salivary amylase because the ions
    A. are activators
    B. are co-enzymes
    C. are co-factors
    D. form alkaline medium

SECTION B

Answer all questions in this section in the spaces provided.

41. (a) Distinguish between growth and differentiation.

……
……
……
……

……
……

……
……

(b) Describe how insect larvae are adapted for successful life.

……
……

……
……

……
……

……
……

……
……

(c) Give the hormones that control metamorphosis in insects and for each one of them state where in the body of the insect it is secreted.

……
……

……
……

……
……

……
……

……
……

(d) Both insects and amphibians undergo metamorphosis. Outline three main characteristics of this process.

……
……

……
……

……
……

……
……

42. Figure 1 is a drawing of a rod cells, from the retina of the human eye.

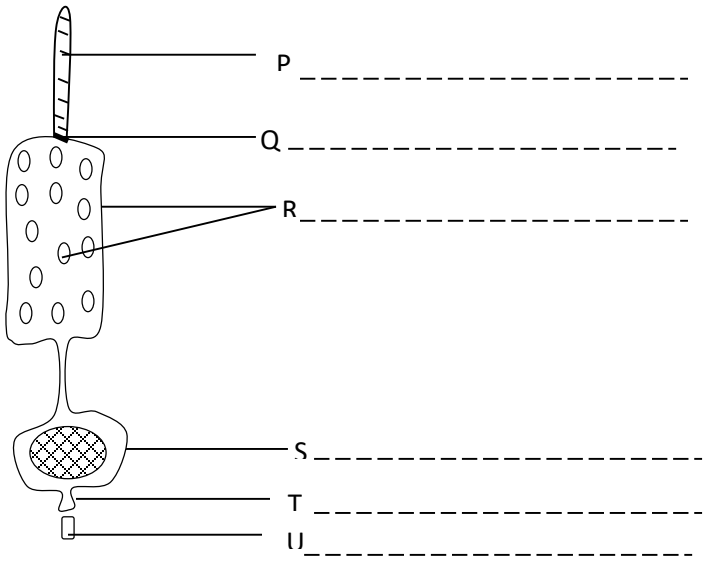


Fig.1

(a) Name the points labeled P, Q, R, S, T and U

(b) (i) Indicate by means of an arrow the flow of the impulse built up in the cell on stimulation.

(ii) Mark with an X, the part which contains the light sensitive pigment.

(c) Give the name of the light sensitive pigment.

……
……

(d) Briefly outline the process which leads to the building up of an impulse in the sensitive cell.

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(e) How is the rod cell specially adapted to increase efficiency in its function?

……
……

……
……

……
……

43. (a) Explain the following:
(i) Competitive inhibition

……
……

……
……

……
……

……
……

(ii) non-competitive inhibition

……
……

……
……

……
……

……
……

(b) In what ways do enzymes differ from catalysts?

……
……

……
……

……
……

……
……

(c) Briefly describe the lock and key hypothesis of enzyme action.

……
……

……
……

……
……

……
……

……
……
……
……

……
……

44. (a) Define the following terms; back cross, sex linked and sex limited characters.

……
……

……
……

……
……

……
……

……
……

……
……

(b) Which cells in cereals are haploid, diploid and triploid?
Haploid
……
……

Diploid
……
……

Triploid
……
……

(c) Describe one method by which polyploidy can be artificially induced.

……
……

……
……

……
……

(d) In sugarcane the genes for yellow midrib (y) and long internodes (n) are recessive to green plants midrib (Y) and short internode (N), and are on the same chromosomes. A yellow sugarcane with long internode was crossed with a sugarcane heterozygous for yellow midrib and long internodes. The offspring were: 256 YyNn, 38 Yynn
272 yynn, 34 yyNn
Calculate the cross over value.

……
……

……
……

……
……

……
……

……
……

……
……

45. (a) State Darwin's theory of natural selection.

……
……

……
……

……
……

……
……

……
……

(b) State three observations and two conclusions from which Darwin derived his theory.

……
……

……
……

……
……

……
……

……
……

……
……

(c) How does the modern view on evolution differ from Darwin's view?

……
……

……
……

……
……

……
……

……
……

46. (a) Distinguish between dormancy and hibernation.

……
……

……
……
……
……

……
……

……
……

(b) List down four causes of dormancy.

……
……

……
……

……
……

……
……

(c) Explain how dormancy can be advantage to plants.

……
……

……
……

……
……

(d) Suggest three ways by which dormancy may be broken.

……
……

……
……

……
……

……
……

1999.

Answer all questions in this section

1. Which one of the following food materials has the highest amount of potential energy per unit weight?
   A. Protein
   B. Vitamins
   C. Monosaccharides
   D. Fats

2. A light flash given in the middle of the night over several days may delay flowering in
   A. Long0day plants
   B. Day-neutral plants
   C. Plants requiring both short and long days
   D. Short-day plants

3. During what stage of prophase I of meiosis are homologous chromosomes attracted to each other and come together?
   A. Leptotene
   B. Zygoten
   C. Pacytene
   D. Diplotene

4. Which of the following have joints of the hinge type?
   A. Knees, shoulders

B. Fingers, hips
C. Shoulders, elbows
D. Elbows, knees

5. If the osmotic pressure of the external solution is lower than that of the cell, the external solution is said to be
   A. Hypotonic to the cell solution
   B. Hypertonic to the cell solution
   C. Isotomic to the cell solution
   D. More concentrated than the cell solution

6. Which one of the following is not a function of globular proteins in the body?
   A. Act as buffers in blood plasma
   B. Form structural proteins
   C. Are vital constituents of plasma membrane
   D. Form enzymes

7. Which one of the following vitamins is water soluble?
   A. A
   B. E
   C. D
   D. C

8. The ability of the heart to contract without fatigue is owed to the
   A. Sino ventricular node
   B. Cardiac muscle
   C. Sino arterial node
   D. Purkinje tissue

9. Which one of the following are target cells for HIV (AIDs virus)?
   A. Erythrocytes
   B. Thrombocytes
   C. Lymphocytes
   D. Phagocytes

10. A young herbaceous stem maintains an erect position mainly due to
    A. Lignified tissue in the stem
    B. Water pressure in xylem tissues
    C. High turgor pressure in the parenchyma cells
    D. Low osmotic pressure in the paranchyma cells
11. The appearance of genes of evolutionary advantage is a functions of
    A. Chance
    B. Environmental demands
    C. Needs of the organism
    D. Natures plan

12. Which one of the following best describes the transport of photosynthesis products in a plant?

A. Active transport
B. Osmotic movement
C. Mass flow
D. Cytoplasmic streaming

13. Which one of the following pairs of animals has an incomplete double circulatory system?
A. Rabbit and toad
B. Toad and lizard
C. Pigeon and monkey
D. Snake and whale

14. Which one of the following mammalian secretions contains an enzyme that digests maltose?
A. Gastric juice
B. Succus entericus
C. Pancreatic juice
D. Saliva

15. The possession of similar structures in organisms having different ancestral origin is a result of
A. Convergent evolution
B. Divergent evolution
C. Adaptive radiation
D. Parallel evolution

16. The existence of ring worm on human skin is an example of
A. Parasitism
B. Mutualism
C. Commensalism
D. Symbiosis

17. In most mammals a high sperm count is maintained by
A. Subjecting the animals to high temperatures
B. Maintaining the testis in the abdominal cavity
C. Insulating the testis
D. Having the scrotal sacs outside the abdominal cavity

18. Which one of the following takes place in the liver?
A. Conversion of glucose into fat
B. Storage of glucose
C. Formation of white blood cells
D. Storage of proteins

19. Which one of these plasma constituents is reabsorbed in the distal convoluted tubule?
A. Urea
B. Chloride
C. Glucose

D. Protein

20. Which one of the following may happen when a mammal is subjected to sever cold?
    A. The superficial blood vessels are dilated
    B. The hair is lowered
    C. Sweating or panting occurs
    D. The rate of metabolism increase

21. What is meant by ecological niche?
    A. Condition in which the organism lives
    B. Specific localities with a particular set of conditions
    C. Geographical regions, cutting across continents
    D. Precise place of an organism and what it does there

22. In which of the following plants showing alternation of generations is the sporophyte generation dominant?
    A. Mosses and algae
    B. Algae and ferns
    C. Ferns and mosses
    D. Ferns and gymnosperms

23. Which one of the following best describes a plant cell which is fully turgid?
    A. Pressure potential of the cell sap is zero
    B. Water potential of the cell sap is equal to the osmotic potential of the sap
    C. Pressure potential is equal to the osmotic potential of the sap
    D. Osmotic potential of the cell is zero

24. Which one of the following glands has a compound tubular structure?
    A. Mucus glands in the skin of the frog and other amphibians
    B. Salivary glands in the mouth of a mammal
    C. Brunners glands in the wall of a mammalian small intestine
    D. Sweat glands in the skin

25. What role is associated with the endoplasmic reticulum?
    A. Site for protein synthesis
    B. Isolation and transport of the proteins synthesized
    C. Synthesis and transport of lipids and steroids
    D. Production of amino acids

26. Which one of the following describes the sodium-potassium pump?
    A. Active pumping of potassium ions out of the axon and sodium ions into it.
    B. Equal concentration of the ions on either side of the axon when it is at rest
    C. Inability of the axon to absorb the two ions passively
    D. Active pumping of sodium ions out of the axon and potassium ions into it.

27. Which one of the following is true during fertilization in higher plants?
    A. One of the male nuclei fuses with polar nuclei
    B. Two of the cells at the nucrophyle become non-functional

C. The antipodal cells fuse with one male nucleus
D. All the polar cells are fertilized

28. Which one of the following is the correct arrangement of microtubules in a cross section of a flagellum?
    A. 9 + 0
    B. 9 + 4
    C. 9 + 2
    D. 9 + 1

29. Inability to see clearly immediately one enters a dark room from bright light could be due to
    A. Denatured rods
    B. Denatured cones
    C. Rhodopsin being resynthesized
    D. ATP molecules being resynthesized

30. Figure 1 shows a longitudinal section of a root apex.

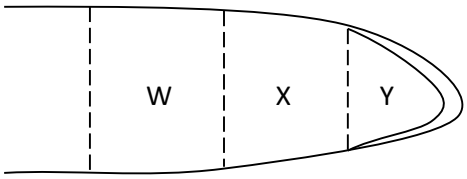


Fig. 1

Which main activity takes place in region labeled X?

    A. Differentiation
    B. Meiotic cell division
    C. Cell expansion
    D. Mitotic cell division

31. What is the role of the luteinizing hormone in menstrual cycle? Promotes
    A. Release of ovum
    B. Healing of uterine wall
    C. Disintegration of the ovum
    D. Implantation of zygote

32. Which one of the following best describes how pesticides have become dangerous today? The pesticides
    A. Persist in soil and make it infertile
    B. Harden the soil
    C. Pass through food chains in more concentrated forms
    D. Cause eutrophication in water and kill the fish

33. Which one of the following is not an adaptation of animals living in desert environment?
    A. Use of metabolic water
    B. Ability to reduce filtrate volume
    C. Possession of a long loop of Henle
    D. Production of ammonia

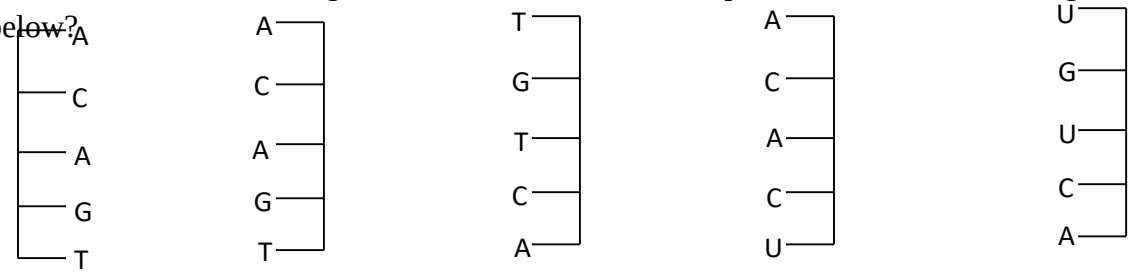
34. Which one of the following structures underwent evolutionary development to increase intelligence in mammals?
    A. Corpora striata
    B. Neopallium
    C. Hypothalamus
    D. Corpus callosum

35. Which one of the following is instinctive behavior?
    A. Courtship and display ceremonies in birds and insects
    B. Avoiding the capture of a distasteful insect by birds
    C. Migration by some birds
    D. Chicks taking cover when a kite is passing

36. The disadvantage of parallel flow system during gaseous exchange in some fish is the
    A. Slow speed of blood
    B. Low blood volume
    C. Low oxygen uptake by blood
    D. Low water volume over the gills

37. Possession of lungs in amphibians is an adaptation to live
    A. Both in water and on land
    B. In moist areas
    C. In water
    D. On dry land

38. Which two of the following strands of nucleotides would pair with strand X in the figure below?



X (i) (ii) (iii) (iv)

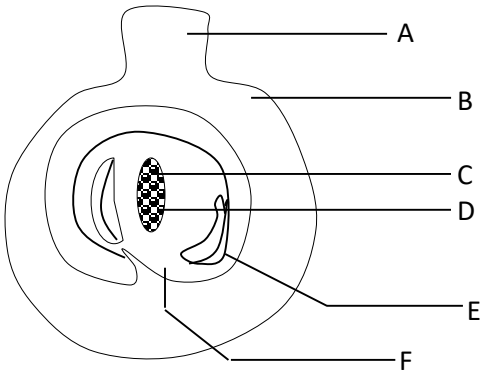
A. (i) and (iii)
B. (ii) and (iv)
C. (i) and (ii)
D. (iii) and (iv)

39. Which one of the following describes the structure of an earth warm?
    A. Diploblastic coelomate
    B. Triploblastic coelomate
    C. Diploblastic acoelomate
    D. Triploblastic acoelomate

40. Which one of the following is not an example of adaptive radiation?
    A. Breaks of Darwin's fiches
    B. Heart and aortic arch system of vertebrates
    C. Teeth and jaw mechanics of vertebrates
    D. Pentadactyl limb of vertebrates

SECTION B

41. Figure 2 below represents a section through the ovary of a flower.



(a) (i) Name structures labeled A, B, C, D, E and F

A

……
……

B

……
……

C

……

……

D

……

……

E

……

……

F

……

……

(ii) State the functions of each of the parts labeled.

A

……

……

B

……

……

C

……

……

D

……

……

E

……

……

F

……

……

(b) In the space below draw a fully labeled structure of a mature pollen grain.

(c) Explain what is meant by double fertilization.

……
……

……
……

……
……

42. (a) (i) What is mutation?

……
……

……
……

……
……

(ii) State the possible causes of mutation.

……
……

……
……

……
……

……
……

(b) What is the role of mutation in the evolution of new species?

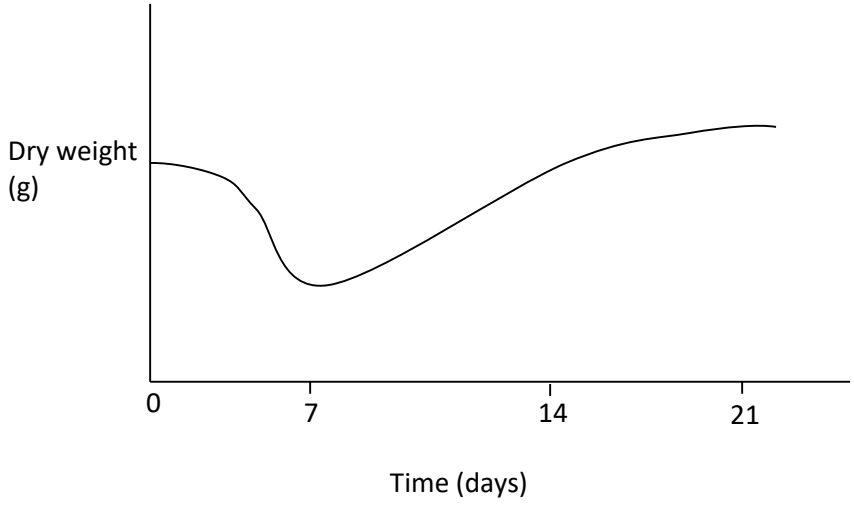
……
……

……
……

……
……

……
……

43. Figure 3 below shows the changes in dry weight of a germinating bean.



(a) Explain the changes

(i) In the first seven days

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(ii) Between the seventh and twenty first day

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(b) Give the major factors that cause seed dormancy.

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

44. (a) State four differences and one similarity between nervous and hormonal communication.

(i) Differences

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(ii) Similarities

……
……

……
……

……
……

……
……

……
……

(b) What is the major role of

(i) Follicle stimulating Hormone (FSH)

……
……

……
……

……
……

……
……

(ii) Luteinizing Hormone (LH) in a human menstrual cycle.

……
……

……
……

……
……

45. (a) What is a sex linked trait?

……
……

……
……

……
……

(b) (i) Why are sex linked traits most common in males among humans?

……
……

……
……

……
……

……
……

……
……

……
……

(ii) Haemophilia is a condition caused by a recessive gene carried on the X chromosome. Determine the phenotype of the children from a carrier mother and a normal father.

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

46. (a) What is deamination?

……
……

……
……

……
……

……
……

……
……

(b) Outline the ornithine cycle in the formation of urea

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(c) In addition for deamination name four other functions of the liver.

(i) ……
……..

(ii) ……
……..

(iii) ……
……..

(iv) ……
……..

1997

1. Which one of the following statements correctly describes the transcription of DNA?
   A. It produces amino acids
   B. It results in an increased DNA synthesis
   C. It produces messenger RNA
   D. It occurs at the surface of the ribosome

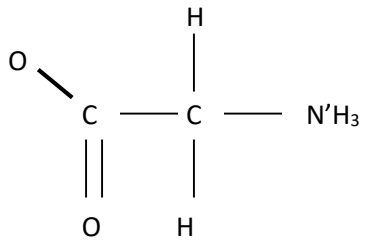
2. Which one of the following events occurs during telophase of mitosis in the meristematic cells of a root tip?
   A. Cleavage of the cytoplasm
   B. Replication of the centrioles
   C. Replication of the chromosomes
   D. Formation of the cell plate

3. The following are metabolic processes:
   (i) Synthesis of plasma proteins
   (ii) Regulation of fat metabolism
   (iii) Storage of vitamin A
   (iv) Manufacture of digestive enzymes

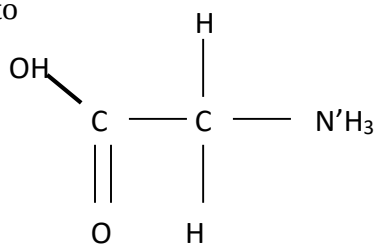
   Which of these are functions of the liver?

   A. (i), (ii) and (iii)
   B. (i), (ii) and (iv)
   C. (i), (iii) and (iv)
   D. (ii), (iii) and (iv)

4. The following structural formula is for an amino acid in solution:



A substance was added to this solution and the structure of the amino acid molecules changed to



What substance was added, and what effect would this have had on the final pH of the solution?

A. Salt added, pH unchanged
B. Acid added, pH lower
C. Acid added, pH unchanged
D. Base added, pH higher

5. What happens to most of the reduced $NADH_2$ molecules in cell metabolism?
   A. Direct use in the synthesis of starch from glucose
   B. Oxidation in mitochondrial ATP formation
   C. Oxidation in the Calvin cycle
   D. Combination with sulphuric acid as part of the Krebs cycle

6. Which base sequence below will pair with AGU?
   A. TGC
   B. TCA
   C. GCC
   D. ATT

7. Which one of the following would cause phenotype variation among organisms of the same genotype?
   A. Exposure to different environments
   B. Continuous variation within the species
   C. Different sexes
   D. Mutation

8. The phenotype approach to classification is used because it groups together all animals that show
   A. Analogous structures
   B. Homologous structures
   C. Convergent evolution
   D. Adaptive radiation

9. Which one of the following sequences correctly represents the action of nitrifying bacteria?
   A. Ammonium > nitrite > nitrate
   B. Ammonium > nitrate > nitrite
   C. Nitrite > nitrate > Ammonium
   D. Nitrite > ammonium > nitrate

10. Which one of the following would speed up the phosphorylation of a hexose sugar?
   A. A decrease in ADP concentration
   B. A decrease in the concentration of ATP
   C. An increase in the concentration of phosphorylase
   D. An increase in the concentration of phosphorylated hexoses

11. Changes in the level of carbon dioxide in mammalian blood is detected by the
   A. Carotid and aortic bodies
   B. Medulla oblongata
   C. Cardio-vascular centres
   D. Hypothalamus

12. Which one of the following may be a result of inbreeding?
   A. Improved fertility
   B. Accumulation of lethal genes
   C. Polyploidy
   D. Increased mutation rate

13. Which one of the following is the main function of the Golgi apparatus in a living cell?
   A. Destruction of worn out cell organelles
   B. Synthesis of cell wall components
   C. Synthesis of proteins
   D. Intracellular transport

14. Which of the methods below is most suitable for estimating the population of the *Paramecium* in a pond?
   A. Capture-recapture method
   B. Total count
   C. Removal sampling
   D. Random sampling

15. Which one of the following pairs of proteins is found in skeletal muscle?
   A. Actin and myosin
   B. Keratin and actin
   C. Myosin and fibrinogen

D. Myosin and collagen

16. The physiological importance of the hair-pin counter current multiplier system in mammalian kidney is to ensure that
    A. Much water is excreted out through the kidney
    B. Much water is reabsorbed
    C. Glucose is not lost in urine
    D. All urea is excreted in urine

17. Which of the following structures are characteristics of hydrophytes?
    A. Small leaves with thick cuticle
    B. Broad and thick leaves with thin cuticle
    C. Broad and thin leaves with large air spaces
    D. Broad thin leaves with hairy surface

18. Which one of the following is not a transmitter substance?
    A. Acetylcholine
    B. Cholinesterase
    C. Atrophine
    D. Noradrenaline

19. Which one of the following groups of terrestrial animals conserves body water most efficiently?
    A. Mammals
    B. Insects
    C. Birds
    D. Reptiles

20. The activity of an enzyme in a chemical reaction depends on the
    A. Molecular weight of the enzyme
    B. Protein nature of the enzyme
    C. Activation energy of the enzyme
    D. Surface configuration of the enzyme

21. The competitive exclusion principle attempts to explain why
    A. A particular niche only contains one species
    B. Pioneer plants are not found in an established community
    C. There are rarely more than five trophic levels in an ecosystem
    D. The diversity of a habitat increases as succession proceeds.

22. Which pair of features could be used as the fine step of a dichotomous key to distinguish between a crustacean and an insect?

A. Calcified of non-calcified exoskeleton
B. Non-segmented of segmented
C. Pair or non-paired appendages
D. Terrestrial or aquatic

23. Which blood vessels are able to change their resistance to blood flow, regulating distribution of blood flow to organs?
A. Veins
B. Arteries
C. Arterioles
D. Capillaries

24. Which of the following indirectly stimulates secretion of alkaline fluids by the pancrease?
A. Stimulation by sympathetic nerves
B. The presence of gastrin in the blood
C. The presence of food in the duodenum
D. The presence of hydrochloric acid in the stomach

25. Which one of the following phenotype ratios results from a recombination due to linkage?
A. 4 : 1 : 1 : 4
B. 1 : 2 : 1
C. 2 : 1
D. 1 : 1

26. The cell wall pressure equals the osmotic potential of a cell
A. When the diffusion pressure deficit is zero
B. At incipient plasmolysis
C. At complete plasmolysis
D. At partial turgor

27. The myelin sheath and the diameter of the axon of a neuron are important in that they
A. Enable impulses to be transmitted from one node of Ranvier to another
B. Increase the speed at which impulses are transmitted
C. Maintain a constant strength of each impulse
D. Allow quick exchange of ions.

28. A woman produced five children. The first two children were girls, followed by a boy. The last two children were again girls. What is the probability that the sixth child will be a boy?

A. ¼ B. ½ C. 1/6 D. 1/8

29. Which of these is not a likely result of polyploidy in plants?
    A. Increased hardiness
    B. Resistance to diseases
    C. Decreased hybrid vigor
    D. Formation of seedless large fruits

30. Which of the following events will cause inspiration in humans?
    A. Internal intercostal muscles and the diaphragm contract
    B. Internal intercostal muscles and the diaphragm relax
    C. Internal intercostal muscles relax and the diaphragm contracts
    D. Internal intercostal muscles contract and the diaphragm assumes a dome shape.

31. Which of the following is an advantage of excreting nitrogenous wastes in the form of uric acid? Uric acid
    A. Is soluble and less toxic
    B. Is excreted in a semisolid state
    C. Cannot stored in the tissue for a long time
    D. Requires plenty of water for its removal

32.

Fig.1

Which one of the following epithelial tissues is illustrated by figure 1 above?

    A. Columnar
    B. Squamous
    C. Cuboidal
    D. Stratified

33. Which one of the following methods is used by marine fishes to overcome the problem of dehydration?
    A. Increase in glomerular filtration rate
    B. Extensive reabsorption of salts from renal fluids
    C. Extrusion of salts by chloride secretory cells
    D. Elimination of nitrogenous waste in form of insoluble compounds

34. Which of the following hormones is responsible for the maintenance of the uterine will during pregnancy?

A. Oxytocin
B. Oestrogen
C. Progesterone
D. Luteinizing hormone

35. During what stage of the dark reaction is $NADPH_2$ used? Conversion of
    A. Ribulose diphosphate to Phosphoglyceric acid
    B. Phosphoglyceraldehyde to excose sugar
    C. Hexose sugar to starch
    D. Phosphoglyceric acid to Phosphoglyceraldehyde

36. Which one of the following features make cones to have better visual acuity than rods?
    A. Each cone is connected to a single optic nerve fibre
    B. Cones are more sensitive to light
    C. Cones are connected to more than one optic nerve fibre
    D. Cones have high retinal convergence

37. Insectivorous plants are most likely to be found growing in
    A. Soils with high organic matter content
    B. Soils with low nitrate content
    C. Soils with low pH
    D. Alkaline soils

38. Which of the following explains why branching in woody plants is stimulated by the removal of the terminal bud?
    A. Competition for mineral salts is reduced
    B. Source of gibberellins is removed
    C. Source of auxins is removed
    D. Growth inhibitors are removed.

39. Cells with uniformly thickened and lignified walls are likely to be
    A. Phloem
    B. Parenchyma
    C. Collenchyma
    D. Sclerenchyma

40. A species of beetles was recently introduced in an attempt to control the water hyacinth in Uganda lakes. If the beetles reduced the spread of the weed, this would be an example of
    A. Ecological balance
    B. Biological control
    C. Dominancy of species

D. Successful competition

SECTION B

41. Mary, a student, with blood group A had a baby with blood group O. Peter, a fellow Student who she named as responsible for the pregnancy, denied responsibility. The case was then taken to court. The following facts were determined.

Peter's mother was of blood group A and father, blood group B. State whether the court will find Peter guilty or innocent. Show how you reached your conclusion.

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

42.

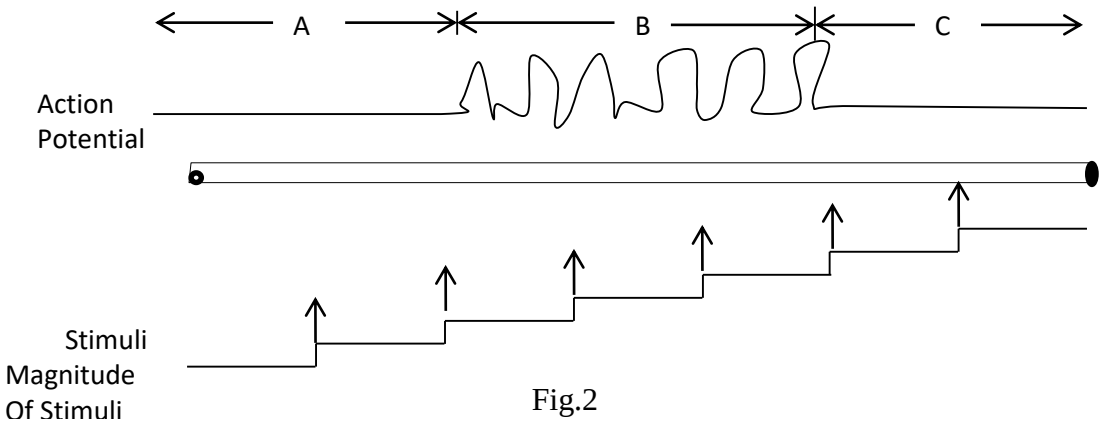


Fig.2

Figure 2 above shows the result of one end of an axon being stimulated with six electrical shocks of gradually increasing intensity and its response recorded from the other end. Study the figure and answer the following questions:

(a) Describe the behavior of the axon in the regions labeled A, B and C in relation to the magnitude of the stimuli given

Region A

……
……
……
……

Region B

……
……
……
……

Region C

……
……
……
……

(b) What principle does the behavior of the axon illustrate?

……
……

……
……

(c) What determines the speed at which an impulse is transmitted along an axon?

……
……
……
……
……
……
……

(d) What is the advantage to an organism of having its impulse transmitted rapidly?

……
……
……
……

43. The diagram below shows part of a rephron of a mammalian kidney.

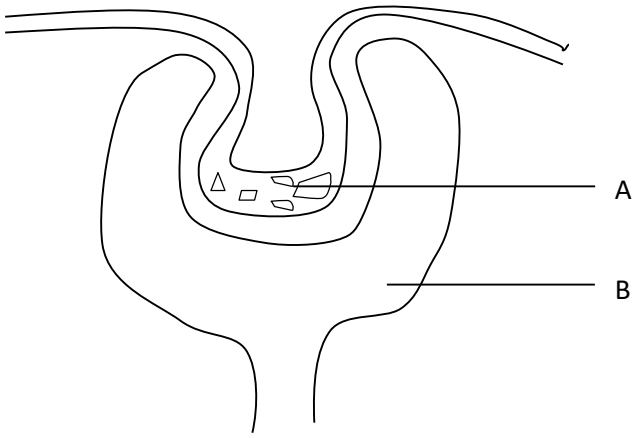


Fig. 3

(a) Identify the part labeled B.

……
……

(b) As blood passes through the blood vessels in the part labeled A, pressure is built up. What is the effect of this increase in pressure?

……
……

……
……

(c) The table below shows the percentage of various components in the blood plasma in the part labeled A, the fluid in the part labeled B and in the urine of a human.

Components Of blood	% in Plasma In A	% in fluid In B	% in Urine In bladder
Protein	7	0	0
Glucose	0.2	0.02	0.05
Urea	0.03	0.03	2.0
Sodium ions	0.32	0.32	0.35
Chloride ions	0.37	0.37	0.6
Water	92	98	96

(i) Give a reason why there is no protein in the urine.

……
……

……
……

(ii) Which component of urine shows the greatest percentage increase in concentration compared to the fluid in B?

……
……

……
……

……
……

(iii) Give a reason why the component you have named in (ii) above has the greatest increase in concentration in urine.

……
……

……
……

……
……

(iv) Suggest with a reason the health condition of the person from whom the figures were obtained?

……
……

……
……

……
……

44. (a) State Mendel's first law of inheritance and explain what it means

……
……

……
……

……
……

(b) (i) State the stages of meiosis that illustrate this law

……
……

……
……

……
……

(ii) Explain what takes place in the stages you have named in a (ii) above.

……
……

……
……

……
……

……
……

(c) In human beings, brown eye are usually dominant over blue eyes. Suppose a blue-eyed man marries a brown eyed woman whose father was blue-eye. What proportion of their children would you predict will have blue eyes?

Show your working

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

45. The table below shows the concentration of organic chloride in different organisms inhabiting a pond. Study the table and answer the questions that follow:

Organisms	Planktons	Large fish	Fish eagle	Small fish
Concentration of Organic chloride (ppm)	0.04	0.5	25	40

(a) Comment on the data given in the table above.

……
……

……
……

……
……

……
……

(b) Using the information given in the table, construct a possible food chain in the pond.

……
……

(c) Explain the high concentration of chlorine in the fish eagle.

……
……

……
……

……
……

……
……

(d) Suggest the properties you would recommend for a suitable chemical to use in water purification.

……
……

……
……

……
……

……
……

……
……

46. (a) Name the two stages of photosynthesis, indicating where, in the chloroplast, they occur.

……
……

……
……

(c) By means of a flow diagram, show the sequence of electron flow during non-cyclic photophosphorylation.

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

1996

1. The reaction rate of salivary amylase with starch decreases as the concentration of chloride ions is reduced. Which of the following describes the role of the chloride ions?
   A. Coenzyme
   B. Competitive inhibitors
   C. Cofactors
   D. Allosteric inhibitors

2. Which of the following is found in both DNA and messenger RNA?
   A. Double helix structure
   B. Ribose
   C. Sugar-phosphate
   D. Thymine

3. Two populations of a given species could only evolve into two distinct species if they were subjected to
   A. Disruptive selection
   B. Geographical isolation
   C. Stabilizing selection
   D. Genetic isolation

4. A boy has blood group A and his sister has blood group B. Which combination of genotype cannot belong to their parents?

	Mother	Father
A.	I^AI^A	I^BI^o
B.	I^AI^B	I^AI^B
C.	I^oI^o	I^AI^B
D.	I^BI^o	I^AI^o

5. Which function is not carried out by the liver?
   A. Removal of ammonia from the blood
   B. Storage of iron from haemoglobin
   C. Conversion of glucose to glycogen
   D. Detoxification of alcohol

6. Climbing the Rwenzori Mountain rapidly may result in altitude sickness. This will be due to
   A. Reduced partial pressure of oxygen in the air.
   B. Reduced quantities of haemoglobin in the erythrocytes
   C. Nitrogen bubbles forming in the blood stream]
   D. Increased carbon dioxide content of the blood

7. Blood plasma contains proteins but glomerular filtrate does not. Why does this difference in composition occur?
   A. Blood osmotic pressure is maintained by the pressure of back proteins.
   B. Proteins are actively transported from the kidney tubule back into the blood capillaries.
   C. Proteins cannot pass through the membranes of the glomerular capillaries
   D. There is a high hydrostatic pressure in the blood within the glomerular capillaries

8. During meiosis crossing-over occurs between one of the following
   A. Two centromeres of homologous chromosomes
   B. Two homologous chromosomes
   C. Two non-homologous chromatids
   D. Two homologous chromatids

9. A generative nucleus in a pollen grain serves to
   A. Fuse with the egg cell to form a zygote
   B. Control the growth of the pollen tube
   C. Produce two male nuclei
   D. Fuse with the polar nucleus to form the triple endosperm nucleus.

10. The introduction into Uganda of two species of South American Beetles which naturally feed on water hyacinth is an example of
   A. Herbivory
   B. Predation
   C. Biological control
   D. Ecological balance

11. Which of the following features is unique to birds?
   A. Endothermy
   B. Possession of feathers
   C. Possession of a horny beak
   D. Internal fertilization

12. Which organ in the body contains cardiac muscle?
   A. Gizzard
   B. Diaphragm
   C. Oesophagus
   D. Heart

13. The pastoralist usually retains within his herd, a bull which whose ancestors have got desirable characteristics. This is an example of
   A. Inbreeding
   B. Artificial insemination
   C. Cross-breeding
   D. Artificial selection

14. The existence of different castes within termites is an instance of
   A. Polymorphism
   B. Genetic drift

C. Melanism
D. Natural selection

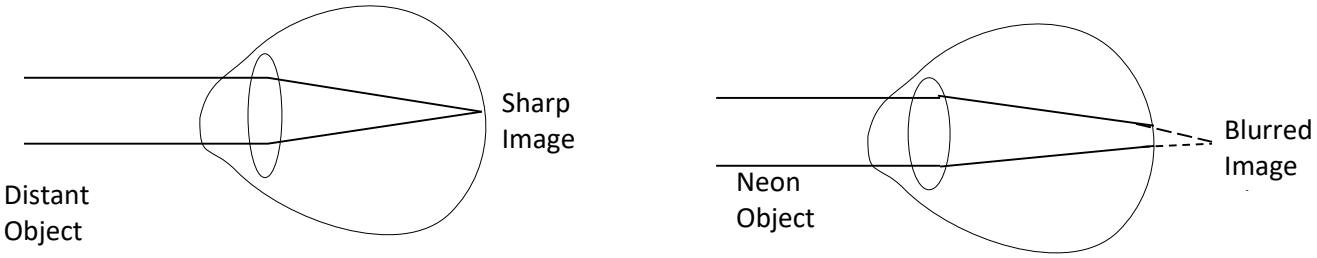
15. What is the maximum number of triplets of nucleotides that could code for the 20 amino acids?
    A. 3
    B. 6
    C. 48
    D. 64

16. Which of the following adaptations would not assist mammals living in arid environments?
    A. Possession of thick fur
    B. Ability to reduce filtrate volume
    C. Use of metabolic water
    D. Possession of special re-absorptive mechanisms

17. The substance that supplies phosphate at the start of glycolysis is
    A. Adenosine diphosphate (ADP)
    B. Adenosine triphosphate (ATP)
    C. Adenosine monophosphate (AMP)
    D. Nicotinamide adenine dinucleotide phosphate (NADP)

18. Which one of the following causes the cupid valves (atrio-ventricular) of the heart to close?
    A. Contraction of the muscles attached to them
    B. Rise of blood pressure in the ventricles
    C. Contraction of the cordae tendinease
    D. Impulses from the bundle of Hesse

19.



The diagram in the Fig. 1 show a defect of the eye. What is it and what does it cause?

A. Eyeball is too short for the lens, causing short sightedness
B. Lens is too thick, causing short sight

C. Eyeball is too short for the lens, causing long sightedness
D. Eyeball is too large for the lens, causing astigmatism

20. We need to eat iodized salt in order to
    A. Prevent obesity
    B. Get a balanced diet improve vision
    C. Improve vision
    D. Avoid goiter

21. Chromatophores are
    A. Reproductive cells
    B. Fat-containing cells
    C. Carotenoid containing cells
    D. Pigment-containing cells in certain vertebrates

22. Yawing in tilapia is counteracted by
    A. Dorsal and ventral fins
    B. Caudal fin
    C. Pectoral fins
    D. Pectoral and caudal fins

23. When an earthworm encounters an unfavourable stimulus it quickly withdraws. This is an example of
    A. A conditioned response
    B. An escape response
    C. Chemotaxis
    D. A terminating stimulus

24. When a piece of liver is dropped into a beaker containing hydrogen peroxide, there is a vigorous reaction. This is due to the enzyme
    A. Catalase
    B. Amylase
    C. Trypsin
    D. Carbonic anhydrase

25.

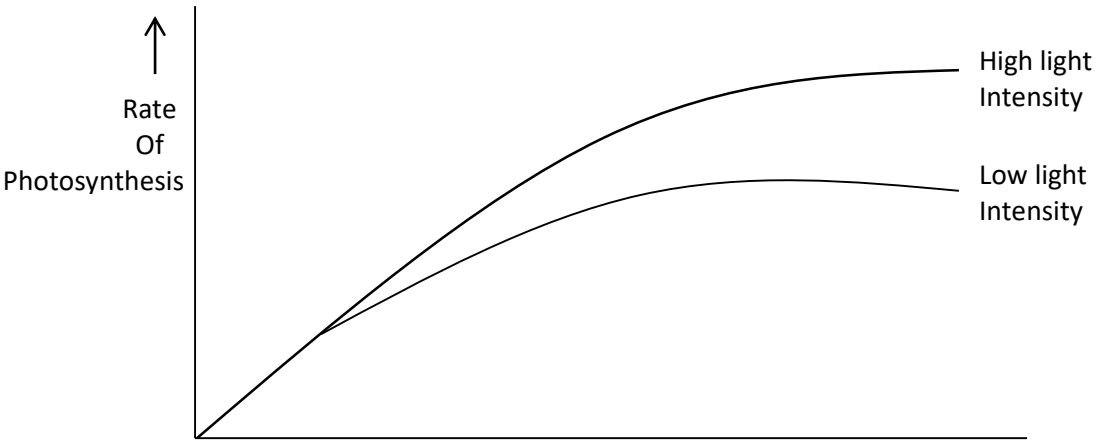
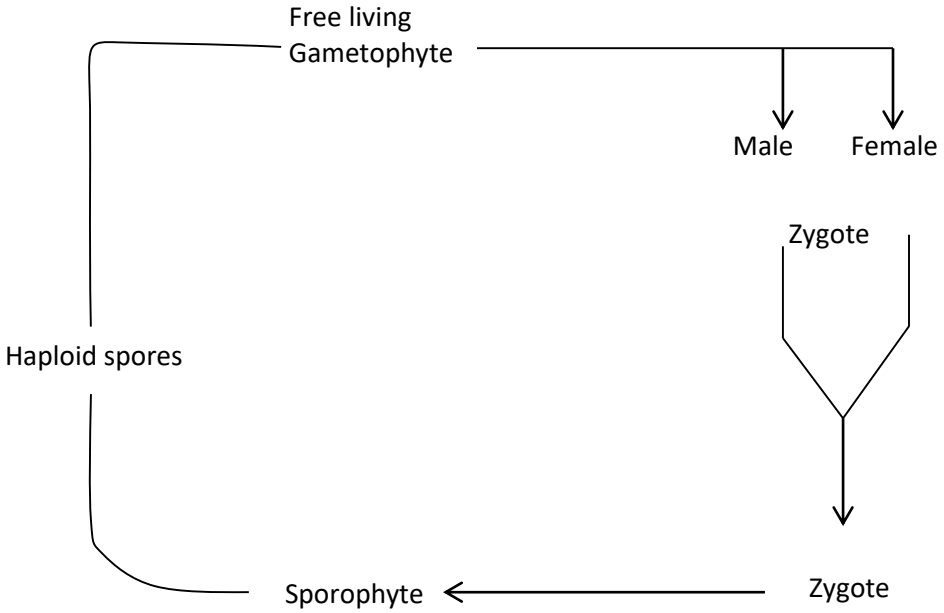


Fig.2

Fig. 2 illustrates the phenomenon of limiting factors. What, in this case, is the limiting factor for photosynthesis?

A. Chlorophyll content
B. Temperature
C. Carbon dioxide
D. Light

26.



The diagram above summarizes the life cycle of a plant. Which plant is it likely to be?

A. Colonial algae
B. Moss
C. Flowering plant
D. Unicellular algae

27. In a stem of Eucalyputs, phelloderm arises from
A. Cork cambium

B. Interfascicular cambium
C. Fascicula cambium
D. Cambium ring

28. The following results were obtained from this selfing of the F_1 generation of pure breeding parents for tall and dwarf plants.

Dominant trait	Recessive trait	Number of F_2 Offspring
Tall plants	Dwarf plants	825

What would be the actual number of F_2 offspring with tall plants?
A. 6189
B. 4126
C. 2063
D. 1500

29. Which one of the following changes brings about opening of stomata in plant leaves?
A. Fall in the pH of the intercellular spaces
B. Synthesis of starch
C. Rise in levels of carbon dioxide in the intercellular spaces
D. Conversion of starch to sugar

30. The islets of Langerhans in the pancreas secrets hormone important for regulation of
A. Carbon dioxide in the blood
B. Blood protein
C. Blood sugar
D. Insulin

31. The following are found in nucleic acids

(i) PHOSPHATE (ii) RIBOSE (iii) DEOXYRIBOSE (iv) PURINE (v) PYRIMIDINE

A. (ii) and (v)
B. (iii) and (iv)
C. (i) and (iii)
D. (iv) and (v)

32. Temperate mammals such as polar bears have lower lethal temperatures than tropical ones. This is because of
A. Better insulation mechanisms in the tropical mammals
B. Body colour
C. Larger size in temperate mammals
D. Better insulation mechanisms in temperate mammals

33. The diagrams in Fig. 3 show vertical sections of kidneys of three mammals, coypu, brown rat and Kangaroo rat, showing the relative sizes of cortex and medulla.

1 2 3

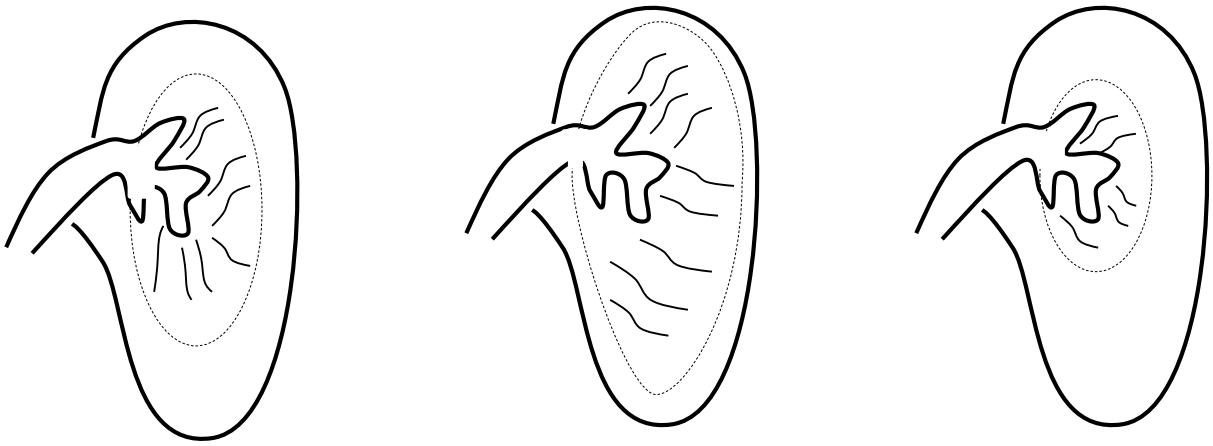


Fig.3

Coypu occur in freshwater and are never short of water to drink, brown rats are able to go some days without drinking. Kangaroo rats are able to live in deserts without drinking at all. Which kidney belongs to which animal?

1	2	3
A. Brown rat	coypu	Kangaroo
B. Kangaroo rat	coypu	brown rat
C. Brown rat	Kangaroo rat	coypu
D. Kangaroo rat	brown rat	coypu

34. The data below indicate the concentration, in parts per million, of a pesticide in the bodies of some organisms in an area after 20 years of use of the pesticide

Phytoplankton	tilapia	zooplankton	Fish eagle
0.04	2.07	0.23	13.80

The most probable reason for the fish eagle to have the highest concentration of the pesticide is that

A. The pesticide accumulates in the fatty tissues of fish eagles
B. Fish eagles are at the end of the blood chain represented by these organisms
C. Fish eagles take more food than the other organisms
D. The elimination of the pesticide is less efficient in fish eagles than in the other organisms

35. One evolutionary advantage of sexual reproduction over sexual reproduction is

A. The formation of diploid gametes
B. A reduced potential for variability

C. Development of specialized somatic tissue
D. An increased potential for variation

36. Which of the following pairs of phenomena is caused by unequal distribution of auxins in plants?
    A. Geotropism and phototropism
    B. Photoperiodism and thigmotropism
    C. Nastic movements and geotropism
    D. Phototropism and Photoperiodism

37. Which of the following statements about immunity is incorrect?
    A. Heat killed bacteria become antibodies when injected into an animal
    B. Antibodies are special proteins
    C. Antibodies are produced against specific antigens
    D. Antigens can be molecules on a foreign microbe

38. The artery is adapted to withstand resulting from the pumping of the heart by having a
    A. Superficial location on the body to allow distension
    B. Thin elastic wall that extends with increased pressure
    C. Thick tough wall to withstand the pressure
    D. System of valves that prevent back flow of blood

39. Which one of the pairs of animals listed below possess an incomplete double circulatory system?
    A. Rat and frog
    B. Cow and baboon
    C. Frog and lizard
    D. Snake and dolphin

40. Plants growing in humid habitats lose excess water by
    A. Transpiration
    B. Cuticular transpiration
    C. Guttation
    D. Forming large numbers of lenticels

SECTION B

41. (a) What is a closed circulatory system?

……
……

……
……

……
……

(b) How is blood flow maintained in such a system?

……
……

……
……

……
……

……
……

……
……

(c) How is blood pressure controlled in the closed system?

……
……

……
……

……
……

……
……

……
……

……
……

……
……

42. Explain what is meant by each of the following concepts
(a) Continental drift

……
……

……
……

……
……

(b) Divergent evolution

……
……

……
……

……
……

……
……

(c) Industrial Melanism

……
……

……
……

……
……

(d) Vestigial organs

……
……

……
……

……
……

……
……

43. Fig 4 shows an animal tissue

Fig. 4

(a) Name
    (i) The parts of the tissue labeled A – F
    (ii) The animal from which the tissue is derived

……
……

(b) Give the functions of each of the parts labeled

B

……
……
……
……

C

……
……
……
……

F

……
……
……
……

(c) Distinguish between tissue and organ levels of organizations.

……
……

……
……

……
……

……
……

(d) Give two advantages of the multicellular state over the unicellular state.

(i) ……
……
……
……

(ii) ……
……
……
……

44. (a) In Table I fill in the phylum to which each invertebrates animal listed belongs.

Table I

Animal	Phylum
Tapeworm	
Leech	
Millipede	
cockroach	

(b) Give four structural differences between a millipede and a cockroach

	Millipede	Cockroach
(i)		
(ii)		
(iii)		
(iv)		

(c) State four adaptations of the tapeworm for its mode of life

(i)

……
……

……
……

……
……

……
……

(ii)

……
……

……
……

……
……

(iii)

……
……

……
……

……
……

(iv)

……
……

……
……

……
……

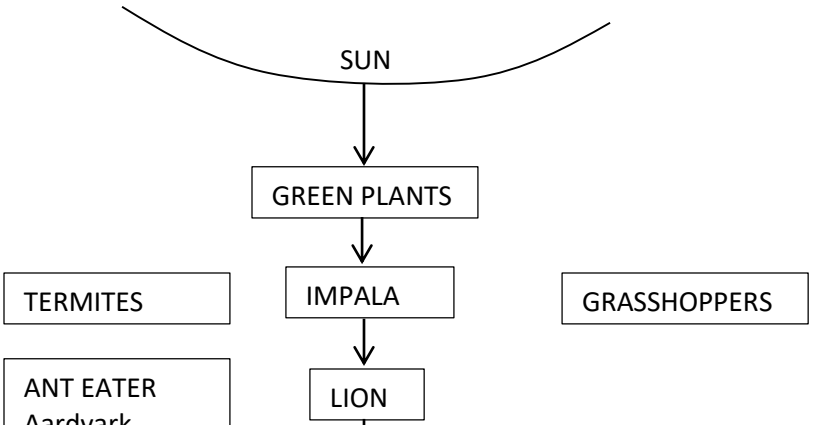

SUN
GREEN PLANTS
TERMITES
IMPALA
GRASSHOPPERS
ANT EATER
Aardvark
LION

Fig. 5

45. Fig.5 above shows part of a food web in a terrestrial habitat.

(a) Complete the scheme by inserting the arrows linking the different organisms.

……
……

(b) What role do vultures, marabou storks and hyenas play in the habitat?

……
……

……
……

(c) What would happen if the saprophytes were removed from the habitat?

……
……

……
……

……
……

(d) What could be the effect of removing the lions from the area?

……
……

……
……

……
……

46. (a) State two important differences which can be recognized under the light microscope between plant and animal cells.

(i) ……
……
……
……..

(ii) ……
……
……
……

(b) (i) Name the membrane- bounded channels which form a network and almost fill the cytoplasm of most cells and are only recognizable under the electron microscope

……
……

(ii) What are the "small granules" associated with the channels mentioned in (i) and what is their function?

……
……

……
……

(c) (i) Give one way by which you would recognize the "colloidal state" of protoplasm.

……
……

……
……

(ii) Which constituents of the protoplasm are responsible for its colloidal state?

……
……

(d) Viewed under the electron microscope, the cell membrane has a three-layered structure. What is the chemical nature of each of these layers?

……
……

……
……

1995

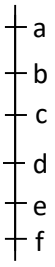
1. Which of the following statements is not true of a recessive sex-linked character in humans?
   A. It is found more frequently in males than in females
   B. It does not appear in a female unless it also appeared in the paternal parent
   C. It rarely appears in both father and son, then only if the maternal parent is heterozygous
   D. It is found more frequently in the female than in the male

2. Which one of the following structures plays an important role in the formation of primary cell walls?
   A. Golgi body
   B. Lysosome
   C. Rough endoplasmic reticulum
   D. Ribosomes

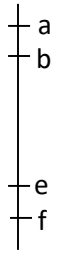
3. A good example of a prokaryote is
   A. *Entamoeba*
   B. *Plasmodium*
   C. *Trypanosoma*
   D. Blue-green alga

4. Chromosomal mutation by inversion is represented by

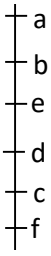
A



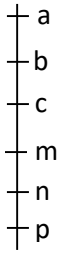
B



C



D



5. The matrix in cartilage is secreted by
   A. Chondroblasts
   B. Oesteoblasts
   C. Fibroblasts
   D. Osteoclasts

6. The table below shows the surface areas and volumes of four animals. Which one of them would least need a transport system?

Animal	Surface area (cm^2)	Volume (cm^3)
A.	54	27
B.	3	0.5

C.	6	1
D.	24	8

7. In an experiment to determine population of a species of animals using the capture-recapture method, the following results were obtained:
   Number of animals marked and released = 210
   Number captured in second collection = 240
   Number recaptured = 24

   What was the estimated total population of the animals?
   A. 474 B. 1890 C. 2100 D. 1860

8. Which one of the following is the growing stage in spermatogenesis?
   A. Spermatid C. Spermatogonium
   B. Spermatozoon D. Primary spermatocyte

9. Which one of the following chromosomal mutations would induce increase in fruit size?
   A. Translocation C. Deletion
   B. Inversion D. duplication

10. A shark (fish) and a porpoise (mammal) are both adapted to swimming. This is an example of
    A. Speciation C. adaptive radiation
    B. Divergent evolution D. convergent evolution

11. Which one of the following tRNA anti-codons will correspond to the MRNA base triplets CAT?
    A. GUA C. GUC
    B. GTC D. GTA

12. Which one of the following characteristics of enzymes distinguishes them from inorganic catalysts? They
    A. Initiate and speed up the rate of reaction
    B. Remain the same at the end of reactions
    C. May promote reversible reactions
    D. Exert their effects when present even in small quantities

13. Some terrestrial plants have solved the problem of water loss physiologically by
    A. Reducing the number of stomata
    B. Possession of long roots which absorb water from deep down the soil
    C. Possession of hairy epidermis
    D. Opening the stomata at night and closing them by day

14. Which of the following substances play a vital role in the transmission of an impulse across a synapse?
    A. Adrenaline and noradrenaline
    B. Acetylcholine and cholinesterase
    C. Noradrenaline and vasopressin
    D. cholinestrase and noradrenaline

15. An enzyme was found to work best between a pH range of 6 to 8. Which one of the following enzymes could it be?
    A. Pancreatic
    B. Salivary amylase
    C. Pepsin
    D. Trypsin

16. What would be the proportions of the F_1 generation if a double recessive parent is crossed with a double heterozygous one?
    A. 1 : 1 : 1 : 1
    B. 1 : 2 : 2 : 1
    C. 9 : 3 : 3 : 1
    D. 1 : 3

17. Which of the following is the characteristic of a rapidly growing population?
    A. There are equal proportions of all age groups
    B. There is more of the reproductive age group
    C. There is more of the pre-reproductive age group
    D. Natality balances mortality

18. Which one of these is a function performed by chiasmata? They
    A. Facilitate separation of homologous chromosomes
    B. Enable exchange of genetic material between homologous chromatids
    C. Facilitate separation of sister chromatids
    D. Enable exchange of genetic material between sister chromatids

19. The synthesis of mRNA may be described as a
    A. Replication
    B. Transcription
    C. Translocation
    D. Transduction

20. What is the fate of the hydroxyl radicals formed during light stage of photosynthesis? They are

A. Broken down into oxygen and free hydrogen
B. Used to raise the activation level of chlorophyll
C. Used to produce oxygen and water
D. Used to reduce carbon dioxide to sugar

21. Which of the following leads to the production of dilute urine by a person?
A. Rise in osmotic pressure of the body fluids
B. Production of less antidiuretic hormone
C. Increased reabsorption of glucose by the kidney tubules
D. Lowering of atmosphere temperature

22. In the lock and key hypothesis for the mechanism of enzyme action, how does the inhibitor substance stop enzyme action? By
A. Raising activation energy
B. Distorting substrate molecule
C. Destroying the co-enzymes
D. Occupying active sites on substrate and enzyme

23. Which one of the following provides a basis on which organisms are classified?
A. Dichotomous keys
B. Natural selection
C. Variation
D. Phylogeny

24. If x pictograms of DNA are contained are contained in a cell whose nucleus has just mitotically divided the amount of DNA in the next anaphase stage of mitosis would be
A. $\frac{x}{4}$
B. 2x
C. $\frac{x}{2}$
D. x

25. Which of the following is the correct order of electron transfer during cyclic photophosphorylation?
A. Chlorophyll ⟶ ferredoxin ⟶ chlorophyll
B. Chlorophyll ⟶ FADP ⟶ chlorophyll
C. Chlorophyll ⟶ NADP ⟶ chlorophyll
D. Chlorophyll ⟶ cytochrome ⟶ chlorophyll

26. Which one of the following best explains why fat digestion does not occur in the human stomach?
A. pH of the stomach is too low for lipase to function
B. bile salts that emulsify fat are missing in the stomach
C. fat digestion is only possible in the duodenum

D. lipase are active within a narrow range of pH

27. Maize seedlings were unilaterally illuminated and were examined daily for a few days, after which it was noted that the plants responded by their colleptiles bending towards light. This response was due to
    A. Elongation of cells in the tip of the coleoptile
    B. Production of auxins by the apical cells of the coleoptiles
    C. Elongation of cells on the side of the coleoptile towards the light
    D. Elongation of cells on the side of the coleoptile away from the light.
28. A high concentration of potassium ions outside the neurone
    A. Produces a high action potential
    B. Has no effect on the amplitude of the action potential
    C. Inhibits the release of a transmitter substance
    D. Polarizes the neurone

29. The pressure which tends to force water out of a cell is called
    A. Osmotic potential
    B. Turgor pressure
    C. Water potential
    D. Pressure potential

30. Which of the following is the best method of measuring the growth rate of maize seedlings from 3 to 6 weeks?
    A. Height
    B. Fresh weight
    C. dry weight
    D. the number of leaves

31. The rodents are particularly successful mammals. An important factor in their success is their
    A. Versatility
    B. High intelligence
    C. keen eyesight
    D. low water requirement

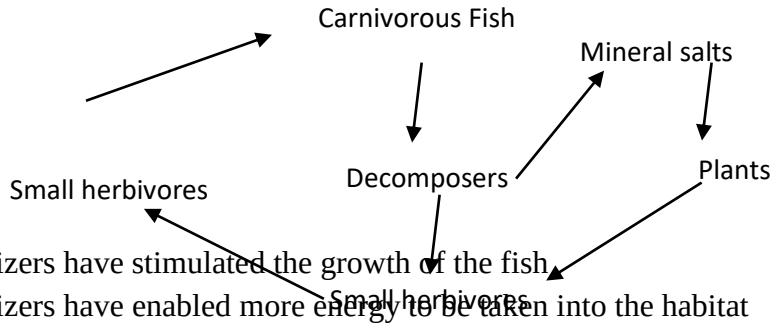
32. The special phenomenon by which young birds recognize their parents is referred to as
    A. Trial and error learning
    B. Insight learning
    C. imprinting
    D. motivation

33. A Transverse section of an unnamed plant when examined under a microscope was found to have an epidermis with poorly developed cuticle, a wide cortex with large intercellular air spaces and a small stele towards the centre. The unnamed plant is most likely a
    A. Hydrophyte
    B. Mesophyte
    C. xerophyte
    D. halophyte

34. An athlete has just finished a race. The phase “oxygen debt” refers to

A. The amount of oxygen originally present in the muscles of the athlete before the race.
B. The total amount of oxygen the athlete required to restore the breathing rate to normal
C. The amount of oxygen taken in after the race and used to complete the combustion of some of the lactic acid
D. The amount of oxygen required after the race to convert excess lactic acid to glycogen in the liver.

35. A small lake in the middle of a rich agricultural land was discovered to contain more carnivorous fish than had been thought. It was suggested that this was due to some of the fertilizer that was being added to the surrounding land reaching the lake after rain. Study the diagram of the food web of the lake community and choose the most likely explanation for the increase in carnivorous fish.



A. Fertilizers have stimulated the growth of the fish
B. Fertilizers have enabled more energy to be taken into the habitat
C. Increased production by plants has provided an additional food source for fish
D. Added nutrients have supplemented the diet of the fish.

36. The lymphatic system is important in
A. Promoting blood clothing
B. Distribution of body heat
C. Transporting hormones around the body
D. Draining excess tissue fluid into the blood circulatory system

37. Which one of the following adaptations would be most essential in animals living in desert environments?
A. Possession of large number of sweat glands
B. Use of metabolic water
C. Possession of light fur
D. Possession of long intestine

38. Which one of the following biological processes does not utilize respiratory energy?
A. Loss of water from the stomata
B. Mineral salt absorption
C. Synthesis of cellulose

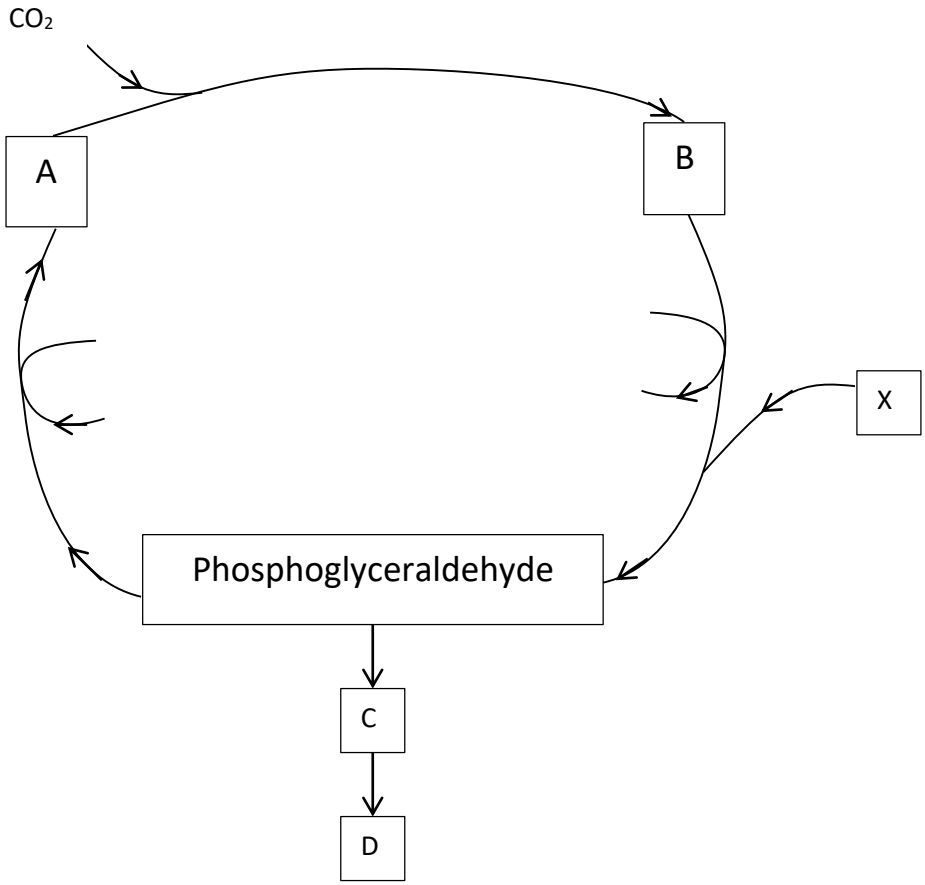
D. Meiosis

39. Which of the following are adaptations of reptiles for terrestrial environment?
    A. Lungs and shelled eggs.
    B. Lungs and scales
    C. Ability to regulate body temperature and body shape
    D. Ability to climb trees and lack of parental care.

40. Which one of the following statements is true for all mammalian muscles? They
    A. Contract only when stimulated by a nervous impulse
    B. Are either smooth or striated except for the heart muscle
    C. Use chemical energy to perform mechanical work
    D. Can be moved by the skeleton

SECTION B

41. Figure 1 below is a flow diagram of one stage in the synthesis of carbohydrates in green plants. Study it and answer the questions that follow;



(a) Name the stage illustrated in the diagram.

……
……

(b) Where does this process occur?

……
……

(c) Name substances

A
……
……

B
……
……

C
……
……

(d) By what process are substances C and D formed?

……
……

(e) Name the source of the 2 ATP molecules.

……
……

(f) From which intermediate substance may fats be synthesized?

……
……

42. (a) (i) What is a compound eye?

……
……

……
……

(ii) What is function of each of the following parts of a compound eye?

Rahbdon

……
……

……
……

Pigment cells

……
……

……
……

(b) (i) Give three structural similarities between the compound eye and the mammalian eye.

……
……

……
……

……
……

(ii) Give two advantages each has over the other. Compound eye over mammalian eye.

……
……

……
……

Mammalian eye over compound eye.

……
……

……
……

43. (a) Distinguish between activation, dormancy and hibernation.

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(b) (i) How do the states of activity in (a) above differ from senescence?

……
……

……
……

……
……

……
……

(ii) What is the ecological significance of these states of activity?

……
……

……
……

(c) Give an example of an organism that undergoes

(i) Aestivation

……
……

(ii) Hibernation

……
……

(d) Why do small animals hibernate more than large ones?

……
……

44. Gene R for red colour can only express itself in a Dihybrid cross in the presence of gene C which complements its action to form colour. When two white flowering genotypes CCrr and ccRR were crossed the F_1 generation were all red flowers.
    (a) (i) What would be the genotypes of F_2 when the F_1 progeny are selfed? (Show your working).

……
……

……
……

……
……

……
……

(ii) What would be the phenotype ratio of the F_2 progeny?

……
……

……
……

……
……

(b) Comment on the F_2 phenotype ratio you have obtained in (a)(ii) above.

……
……

……
……

……
……

……
……

45. (a) What is mass flow in relation to transport in plants?

……
……

……
……

(b) State three conditions under which mass flow may occur?

……
……

……
……

(c) Give two differences between mass flow and cytoplasmic streaming.

……
……

……
……

……
……

46. The graph below shows the effects of sewage pollution on some physical and chemical constituents of a river at increasing distances downstream from the point of sewage discharge.

(a) Suggest explanations for the variation, downstream from the point of sewage discharge, in concentrations of ammonium ions, dissolved oxygen, and suspended solids.

(i) Ammonium ions

……
……

……
……

……
……

……
……

(ii) Dissolved oxygen

……
……

……
……

……
……

……
……

(iii) Suspended solids

……
……

……
……

……
……

……
……

……
……

……
……

……
……

……
……

(b) Mention two consequences of discharging sewage into a river.

……
……

……
……

……
……

……
……

……
……

1994

1. The following is a dichotomous key for the identification of four plants K, L, M and N.
   1. True nucleus present ……..
      go to 2 No true nucleus present
      …….. K

   2. Vascular tissues present ……..
      go to 3 No vascular tissue
      ……. L

      Motile gametes
      ……. M
      Non – motile
      …….. N

      Which one of the plants is an angiosperm?

A. M
B. K
C. L
D. N

3. Which one of the following compounds acts as a hydrogen acceptor during anaerobic respiration in animals?
   A. NAD
   B. NADP
   C. Lactic acid
   D. Pyruvic acid

4. In which one of the following pairs do the organisms belong to two different phyla?
   A. Round worm and tapeworm
   B. Trypanosoma and plasmodium
   C. Centipede and cockroach
   D. Fish and crocodile

5. At what stage in the life cycle of a moss does meiosis occur?
   A. Germination of spores
   B. Formation of spores
   C. Formation of gametes
   D. Gametophyte stage

6. The lymph fluid is slightly different from blood plasma in that it contains
   A. Less proteins, more of the other food materials and more waste products
   B. Less proteins, less of the other food materials and more waste products
   C. More proteins, less of the other food materials and more waste products
   D. Less proteins, less of the other food materials and less waste products

7. Which one of the following methods is used by marine fish to overcome the problem of dehydration?
   A. Increase in glomerular filtration rate
   B. Extensive reabsorption of salts from renal fluids
   C. Extrusion of salty by chloride secretory cells
   D. Elimination of nitrogenous waste in form of insoluble compounds

8. Which of the following factors may not alter the frequency of electrical excitation of the Sino – atrial node of the heart?
   A. Increase in carbon dioxide content of blood
   B. Accumulation of mineral salts in blood
   C. Increase in oxygen content of blood
   D. Increased blood sugar level

9. The insect compound eye can receive more stimuli per unit time than the mammalian eye because the
   A. Insect eye occupies a larger part of the head than the mammalian eye
   B. Insect eye has more focusing units than the mammalian eye
   C. Time lapse between reception of light stimulus and recovery is shorter in the insect eye
   D. Insect eye has a wider field of view than the mammalian eye

10. Which of the following are the main mechanism for the uptake and transport of solutes by root hairs and xylem respectively?
    A. Active transport and mass flow
    B. Diffusion and active transport
    C. Diffusion and mass flow
    D. Mass flow and osmosis

11. Below is a list of some amino acids

(i)	Alanine	(iv)	Histidine
(ii)	Arginine	(v)	Leucine
(iii)	Glycine	(vi)	Lysine

Which of the following combinations consists of essential amino acids only?
A. (i) (ii) (iii)
B. (ii) (iv) (v)
C. (i) (iii) (vi)
D. (ii) (iv) (vi)

12. In a plant, secondary cortex is produced by the
    A. Cork cambium
    B. Vascular cambium
    C. Apical meristem
    D. Intercalary meristem

13. Rolled leaves with sunken stomata, thick cuticle and hairy lower epidermis is typical of a
    A. Xerophyte
    B. Mesophyte
    C. Halophyte
    D. Hydrophyte

14. When does synapsis occur during meiosis?
    A. Anaphase I
    B. Metaphase II
    C. Prophase I
    D. Prophase II
15. In the opening and closure of stomata, the osmotic theory is associated with
    A. The conversion of starch into sugar in the guard cells
    B. Accumulation of mineral salts in guard cells
    C. Synthesis of abscisic acid in guard cells
    D. Production of starch during photosynthesis in guard cells.

16. In an experiment using maize with two contrasting characters, the F_2 progeny were made up of 3 : 1 ratio instead of the 9 : 3 : 1 Dihybrid ratio. This is most likely to be a case of
    A. Crossing over
    B. Sex – linkage
    C. Ordinary linkage

D. Incomplete dominance

17. The carbon acceptor in the Calvin cycle of the dark stage of photosynthesis is
    A. Pyruvic acid
    B. Phosphoglyceric acid
    C. Phosphoglyceraldehyde
    D. Ribulose – 1.5 – diphosphate

18. Which of the following is the correct sequence of combinations forming a double helix of DNA?
    A. Phosphate – sugar – guanine – hydrogen bond – cytosine – phosphate
    B. Thymine – sugar – phosphate – hydrogen bond – adenine – sugar – phosphate
    C. Sugar – phosphate – cytosine – hydrogen bond – guanine – sugar – phosphate
    D. Phosphate – sugar – guanine – hydrogen bond – thymine – sugar – phosphate

19. In an ecosystem, the greatest amount of energy is present in
    A. Decomposers
    B. Carnivores
    C. Omnivores
    D. Herbivores

20. Which one of the following best describes the evolution of new species from the same ancestor in different environments?
    A. Divergent evolution
    B. Adaptive radiation
    C. Convergent evolution
    D. Directional selection

21. The following features are characteristics of the nervous and endocrine coordination:

(i)	Rapid transmission	(iv)	slow transmission
(ii)	Response usually short lived	(v)	response specific
(iii)	Response long lasting	(v)	response widespread

Which of them are associated with the endocrine system?
    A. (i) (ii) (iv)
    B. (i) (iv) (v)
    C. (ii) (iii) (v)
    D. (iii) (iv) (vi)

22. Hydroxylamine, a mutagen, converts cytosine to a compound which pairs with adenine. If DNA is treated with hydroxylamine, the resulting mutation is
    A. A deletion
    B. A substitution
    C. An insertion
    D. An inversion

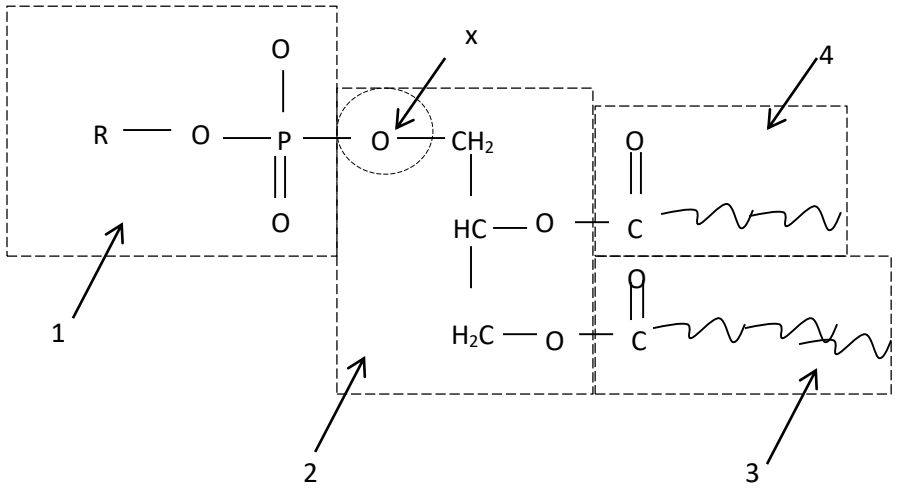
23. Which one of the following is true of the products of gametogenesis in flowering plants?
    A. The pollen grain is haploid

B. The synergids are diploid
C. The generative nucleus is haploid
D. The definitive nucleus is haploid

24. Which of the following farm practices eventually become disadvantages to the environment?
(i) Addition of fertilizers
(ii) Irrigation
(iii) Use of organic mulch
(iv) Use of pesticides
A. (i) and (ii)
B. (i) and (iv)
C. (ii) and (iii)
D. (iii) and (iv)

25. In a living cell, the lysosome organelle contains a number of enzymes. What would be the effect on the cell of puncturing the organelle? The cell would undergo
A. Plasmolysis
B. Hemolysis
C. Crenation
D. Autolysis

Figure 1 below represents a simplified structure of a phospholipid molecule. Use it to answer questions 26 and 27.



26. Which of the following is the hydrophilic part of the molecule?
A. Part labeled 1
B. Part labeled 2
C. Part labeled 3
D. Parts labeled 3 and 4

27. The link labeled X is formed by the process of
    A. Hydrolysis
    B. Decarboxylation
    C. Condensation
    D. Dehydrogenation

28. Which of the following is the function of the Golgi apparatus?
    A. Synthesis of secretory substance
    B. Protein synthesis
    C. Sites for respiratory metabolism
    D. Intracellular digestion

29. The part of the mammalian gut that contains the chief glands, columnar epithelial cells and goblet cells is the
    A. Colon
    B. Caecum
    C. Duodenum
    D. Stomach

30. An ecological niche is the
    A. Abiotic component of an organism's environment
    B. Habitat where an organism finds the most suitable climate
    C. Place where an organism finds its food supply
    D. Way an organism interacts with other organisms

31. The bacteria which convert ammonia into nitrites in the soil are
    A. Nitrococcus and nitrosomonas
    B. Nitrobacter and nitrites bacteria
    C. Nitrite bacteria and Azotobacter
    D. Nitrate bacteria and Azotobacter

32. Roughage in a human diet is essential because it
    A. Contains plenty of nutrients, especially proteins
    B. Eliminates possibility of constipation
    C. Is easily digested by bacteria in the caecum
    D. Stimulates the secretion of bile salts

33.

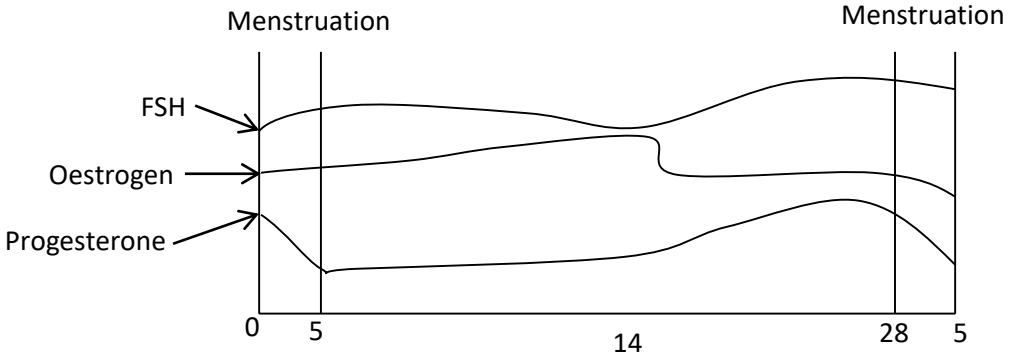


Figure 2

Figure 2 above represents the changes in levels of female sex hormones during the menstrual cycle. Which one of the following changes brings about ovulation?

A. Fall in Oestrogen level
B. Rise in progesterone level
C. Fall in FSH level
D. Fall in FSH and rise in progesterone levels.

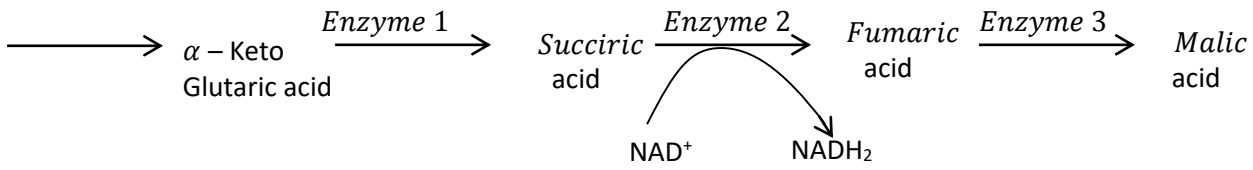


Fig. 3

34. Succinic acid accumulates when malonic acid is added to the reaction medium. Which one of the following statements best describes the role of malonic acid?
    A. Malonic acid is an inhibitor of enzyme 1
    B. Malonic acid reacts with α – Keto Glutaric acid to form succinic acid
    C. Malonic acid is an inhibitor of enzyme 2
    D. Malonic acid acts as a coenzyme of enzyme 1

35. Enzyme 2 is a
    A. Dehydrogenase
    B. Decarboxylase
    C. Dehydrase
    D. Reductase

36. Which one of the following is the least reliable method of birth control?
    A. Rhythm method
    B. Coitus interuptus

C. The pill
D. Condom

37. Very small mammals cannot live at altitudes of over 3500 metres on the mountains of East Africa because
    A. They would lack suitable food materials
    B. They lack sufficient fur to keep warm
    C. Their surface area/ volume ratio is too high
    D. At such high altitude the oxygen pressure is too low

38. Which one of the following adaptions would not assist animals living in desert environment?
    A. Use of metabolic water
    B. Possession of a large number of sweat glands
    C. Ability to reduce nitrate volume
    D. Possession of special absorptive mechanism

39. Which one of the following features of viruses makes it difficult to classify them as living organisms?
    A. They can be reconstituted from crystals
    B. They are not destroyed by antibiotics
    C. They do not have chromosomes
    D. They are all parasitic

40. Which of the following is true of blood entering the efferent vessel as it leaves the glomerulus? It has a high concentration of
    A. Glucose
    B. Water
    C. Protein
    D. Urea

SECTION B

41. (a) (i) Define Bohr effect.

……
……..

……
……..

……
……..

(ii) What is the physiological importance of Bohr Effect in man?

……
……..

……
……..

……
……..

……
……..

(b) Figure 4 below represents the oxygen dissociation curves for the foetal and maternal blood.

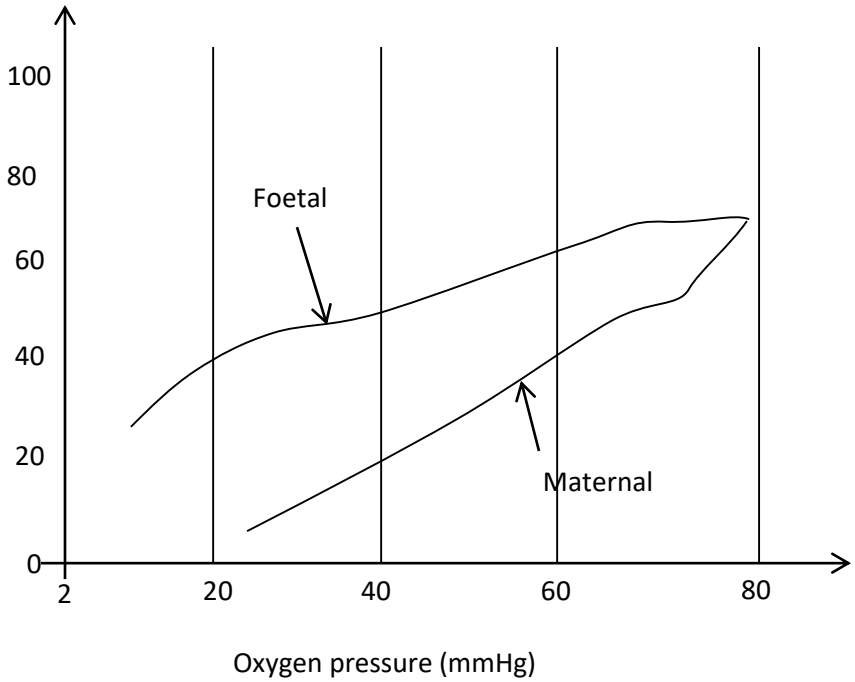


Fig. 4

(c) What is the biological significance of the two curves?

……
……..

……
……..

……
……..

……
……..

……
……..

42. (a) With an example in each case, distinguish between homologous and analogous organs.

……
……..

……
……..

……
……..

……
……..

……
……..

……
……..

(b) (i) What is meant by the pentadactyl limb system?

……
……..

……
……..

(iii) How has this system been modified in the following animals to suit their functions?
The monkey,

……
……..

……
……..

……
……..

The rat.

……
……..

……
……..

……
……..

……
……..

……
……..

(c) What is the evolutionary significance of these modified organs?

……
……..

……
……..

……
……..

43. Table 1 gives information on the frequency (%) of three plants along grassland / woodland transect.

Table 1

Plant Type	Distance along transect (m)					
	0	4	8	12	16	20
Grass A	95	85	90	5	0	0
Grass B	10	8	5	10	5	5
Herb G	0	0	0	5	10	15

Open Grassland ⟷ Woodland

(a) List the structural and physiological adaptations that enable a grass e.g Grass A, to survive in its habitat.

……..

……..

……..

……..

(b) Give two structural adaptations you would expect to find in herb G that would enable it to survive in the woodland.

……..

……..

(c) How would you describe the distribution of grass B?

……..

……..

44. In a variety of beans, yellow seed colour is dominant over green and smooth seed coat is dominant over wrinkled. When yellow smooth beans were crossed with green wrinkled beans, all F_1 had yellow smooth seed. The F_2 progeny yielded 556 seeds.
    (a) Assuming no linkage, state the four possible characters in the F_2 progeny and their corresponding phenotypic ratios.

……..

……
……..

……
……..

……
..……
……..

(b) Calculate the number of individuals for each of the characters in the F_2 population.

……
……..

……
……..

……
……..

……
……..

(c) Calculate the percentage crossover in this experiment.

……
……..

……
……..

……
……..

……
……..

1992

SECTION A

1. Which one of the following photosynthetic pigments is universal to all the groups of algae?
   A. Xanthophyll
   B. Chlorophyll a
   C. Carotene
   D. Chlorophyll b

2. Glucose and fructose have the same molecular formulae, $C_6H_{12}O_6$, but some of their chemical properties are different because
   A. The glucose molecule has a straight chain but the fructose molecule has a ring structure
   B. The positions of the hydroxyl groups on the sugar molecules are different
   C. Glucose is a ketose and fructose is an aldose
   D. The glucose molecule has a ring structure and fructose has a straight structure

3. Which one of the following would normally decrease the cardiac rate?
   A. Secretion of adrenalin into the blood
   B. Accumulation of lactic acid in the tissues
   C. Increase in the blood oxygen content
   D. Increase in the carbon dioxide content in blood

4. Purkinje nerve cells are found in the

A. Cerebellum of the brain
B. Spinal cord
C. Medulla oblongata
D. Cerebrum of the brain

5. Enzymes are proteins that differ from inorganic catalysts because they are specific. This specific. This specificity is associated with the
   A. Internal structure of the protein molecule
   B. High molecular weight of the protein molecule
   C. Surface configuration of the protein molecule
   D. Absence of metallic ions in the protein molecule

6. Which one of the following characteristics of the annelid e.g Lumbricus can be said to limit most, its efficiency as a terrestrial animal?
   A. Lack of eyes
   B. Hermaphroditism
   C. Lack of red blood cells
   D. Possession of mucus – secreting epithelial cells

7. A transverse section of an unnamed plant was examined under a microscope and found to consist of an epidermis with poorly developed cuticle, a wide cortex with large inter – cellular air spaces. The unnamed plant is most likely a
   A. Halophyte
   B. Mesophyte
   C. Xerophyte
   D. Hydrophyte

8. Which one of the following is a typical evolutionary adaptation for reproduction in terrestrial plants?
   A. Alternation of generations
   B. Meiosis at gamete formation
   C. Pollen grain formation
   D. Formation of antheridia and archegonia

9. The correct order of sperm movement after formation is
   A. Seminiferous tubule ⇢ vasa efferentia ⇢ epididymis ⇢ vas deferens
   B. Seminiferous tubule ⇢ epididymis ⇢ vasa efferentia ⇢ vas deferens
   C. Vasa efferentia ⇢ seminiferous tubule ⇢ epididymis ⇢ vas deferens
   D. Seminiferous tubule ⇢ epididymis ⇢ vasa efferentia ⇢ vas deferens

10. Initiation of blood flow in insects is caused by contraction of the
    A. Pericardiac membrane
    B. Abdomen
    C. Pseudoheart.
    D. Thorax

11. Nutrients are transported across cell membranes by

A. Osmosis
B. Active transport
C. Mass flow
D. Diffusion

12. The relationship between cellulase – secreting bacteria and herbivorous mammals is an example of
A. Parasitism
B. Commensalism
C. Autotrophism
D. Mutualism

13. Which of the following may not be used as evidence of organic evolution?
A. Geographical distribution of animals
B. Comparative physiology
C. Analogous structure
D. Fossils

14. To which two of the following features is the success of birds in their environment attributed?
(i) Possession of features
(ii) Pneumatic skeletal structures
(iii) Large keel muscles
(iv) Presence of sweat glands
A. (i) and (iv) C. (ii) and (iv)
B. (ii) and (iii) D. (iii) and (iv)

15. In addition to oxygen, the other products of the light phase in photosynthesis are
A. $NADPH_2$ and ADP
B. $NADPH_2$ and ATP
C. $NADPH_2$ and ATP
D. $NADH_2$ and ADP

16. Colorblindness in man is a sex – linked recessive condition. If a normal man marries a woman whose father was colorblind, what are the chances of their male children being colour blind?
A. 0%
B. 25%
C. 50%
D. 75%

17. An enzymatic reaction of the type
ATP + Hexose $\longrightarrow$ ADP + hexose – 6 – phosphate is an example of
A. A hydrolysis
B. An isomerization
C. A transfer
D. A synthesis

18. Which one of the following changes causes the closure of stomata in plant leaves?
    A. Rise in the pH of the intercellular spaces
    B. Synthesis of glucose
    C. Fall in levels of carbon dioxide in the intercellular spaces
    D. Conversion of glucose into starch

19. If the bases on the t – RNA are ACU, what would be the corresponding bases on the original DNA coding strand during protein synthesis?
    A. ACT
    B. UGA
    C. TGA
    D. ATG

20. Plants of same species may show different responses to deficiency of the same nutrient. Which one of these best explains this phenomenon?
    A. Water stress tolerance
    B. Genetic variability
    C. Disease tolerance
    D. Different photosynthetic mechanisms

21. Isolated cells of multicellular plants are usually unable to survive because
    A. Isolated cells lack plasmodesmata
    B. They lose their protoplasts
    C. Essential enzymes are lost during the isolation
    D. Cell walls are removed during isolation

22. Study the following table which gives information about four animals.

Animal	concentration of Urea in urine	Relative length of intestine to body size	Period of greatest activity
A	High	Long	night
B	High	short	night
C	High	short	day
D	Low	short	night

    Which animal is most likely to be a carnivore of desert areas?

23. Why is it that blood does not normally clot within the vascular system despite the presence of thrombokinase and calcium ions?
    A. Antithrombin is always present in excess in blood
    B. The coenzyme for activating thrombokinase is lacking

C. The enzyme for the process must be released by disintegration of the plate less on exposure
D. Prothrombin in inactive

24. The frequency and amplitude of an action potential in an axon depends on
A. Concentration of potassium ions inside the membrane
B. Frequency of stimulation of the membrane
C. The relative refractory period
D. Concentration of sodium ions inside the membrane

25. Which of the following pairs of structures cannot be accepted as evidence of an evolutionary relationship?
A. Legs of insects and those of mammals
B. Arms of man and wings of birds
C. Pods of beans and pericarps of maize grain
D. Pectoral fins of fish and arms of man

26. The phenomenon of apical dominance in plants shows
A. That growth hormones produced in the apex bypass lateral buds
B. That growth hormones are confined to the terminal bud
C. That concentrations of hormones reaching lateral buds are too low to promote growth
D. Evidence that there is communication among plant parts

27. Which of the following changes may result in the increase of lung pressure in man?
(i) Contraction of abdominal muscles
(ii) Relaxation of outer intercostal muscles
(iii) Contraction of the diaphragm
(iv) Relaxation of intercostal muscles
A. (i) and (ii)
B. (i) and (iii)
C. (iii) and (iv)
D. (ii) and (iv)

28. What would be the effect of photoxidation if ferredoxin during the light reaction of photosynthesis?
A. Inhibition of cyclic photophosphorylation
B. Water would not be oxidized
C. Inhibition of ATP synthesis
D. $NADPH_2$would be formed.

29. Hydro active control of stomatal movement in plants is due to
A. Synthesis of abscisic acid (ABA)
B. Active accumulation of mineral ions in guard cells
C. Inter conversion of glucose and starch in guard cells
D. Synthesis of glucose during photosynthesis

30. Which one of the following phenotypic ratios results from Dihybrid inheritance?
    A. 1 : 1
    B. 1 : 2 : 1
    C. 3 : 1
    D. 9 : 3 : 3 : 1

31. A high concentration of potassium ions outside the neurone
    A. Produces a high action potential
    B. Has no effect on the amplitude of the action potential
    C. Inhibits the release of a transmitter substance
    D. Polarizes the neurone

32. An estuarine invertebrate such as the shore crab (Carinus) has to osmoregulate because
    A. It lives in an environment that is hypertonic
    B. Of widely fluctuating salinity in its environment
    C. It has to maintain a lower internal osmotic pressure
    D. Its body fluid has to remain isotonic with the environment

Each of the questions 33 to 35 consists of an assertion (statements) on the left hand side and a reason on the right hand side. Select:

A. If both assertion and reason are true statements and the reason is a correct explanation of the assertion
B. If both assertion and reason are true statements but the reason is not a correct explanation of the assertion
C. If the assertion is true but the reason is an incorrect statement
D. If the assertion is incorrect but the reason is a true statement

Instructions summarized	
Assertion	*Reason*
A. True	True (Reason is a correct explanation)
B. True	True (Reason is not a correct explanation)
C. True	Incorrect
D. Incorrect	True

33. Acetyl CoA is important in Use breakdown of sugar to release energy BECAUSE Acetyl CoA links glycolysis and Krebs cycle

34. Mutation may cause changes In either chromosome number Or structure BECAUSE Mutation leads to formation of new characteristics In the offspring

1992

SECTION A

1. Which one of the following photosynthetic pigments is universal to all the groups of algae?
   A. Xanthophyll
   B. Chlorophyll a
   C. Carotene
   D. Chlorophyll b

2. Glucose and fructose have the same molecular formula, $C_6H_{12}O_6$, but some of their chemical properties are different because
   A. The glucose molecule has a straight chain but the fructose molecule has a ring structure
   B. The positions of the hydroxyl groups on the sugar molecules are different
   C. Glucose is a ketose and fructose in an aldose
   D. The glucose molecule has a ring structure and fructose has a straight structure

3. Which one of the following would normally decrease the cardiac rate?
   A. Secretion of adrenalin into the blood
   B. Accumulation of lactic acid in the tissues
   C. Increase in the blood oxygen content
   D. Increase in the carbon dioxide content in blood

4. Purkinje nerve cells are found in the
   A. Cerebellum of the brain
   B. Spinal cord
   C. Medulla oblongata
   D. Cerebrum of the brain

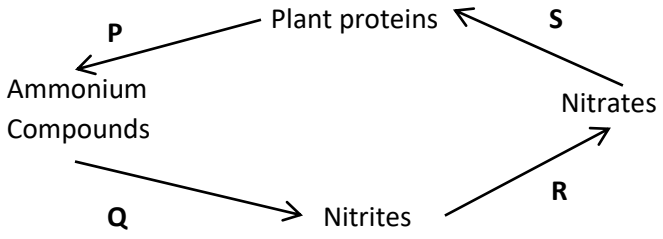
5. In a survey of an area, pupils observed organisms in various habitats. Millipedes were found in rubbish pits as well as on walls of buildings. Black ants were seen on trees and wall of buildings. A pupil made the following conclusions:
   I. An animal lives in one habitat only
   II. Different animals can live in the same habitat
   III. One animal can live in different habitats
   IV. Animals live in one habitat at different times

Which pair of conclusions represents a correct picture of the observations?

A. I and II
B. II and IV
C. II and III
D. I and IV

6. In humans, inhalation is stimulated by
   A. The carbon dioxide content of the blood
   B. Lack of oxygen in the blood
   C. Stimuli from the carotid sinus
   D. Stimuli from the carotid body

7. The figure below is a simplified representation of the nitrogen cycle



Which of the following bacteria are responsible for the changes along Q and R?

A. *Rhizobium and Clostridium*
B. *Nitrosococcus and* putrefying bacteria
C. *Nitrobacter andNitrosomonas*
D. *Azotobacter and Clostridium*

8. The following results were obtained from the selfying of the F_1 generation of pure breeding pea parents for round and wrinkled seeds.

Dominant trait	Recessive trait	Number of F_2 Offspring
Round seeds	Wrinkled seeds	7524

What would be the actual number of F_2 offspring with round seeds?
A. 1881 B. 2508 C. 3762 D. 5643

9. Which one of the following combinations is true about the sympathetic stimulation?
(i) Heart beats faster
(ii) More blood in the muscular tissues
(iii) Pupils constrict and hairs fall on the body surface
(iv) Glycogen in the liver is converted into glucose
A. (i), (ii) and (iii)
B. (i), (ii) and (iv)
C. (ii), (iii)and (iv)
D. (i), (ii) and (iv)

10. In a flowering plant the cork cells develop from the
A. Epidermis
B. Phellogen
C. Phloem
D. Phelloderm

11. An enzyme which catalyzes the conversion of a dipeptide into separate amino acids is an example of a
A. Dehydrogenase
B. Hydrolase
C. Decarboxylase
D. Tranferase