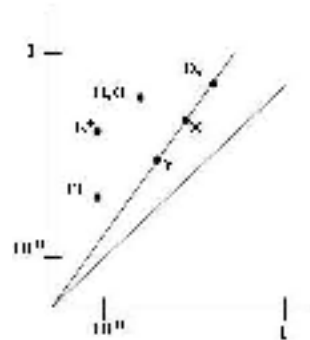


- To a culture medium containing cells in the phase of differentiation, a marker molecule capable of binding to the newly synthesising cellulose molecules was added. The marker will appear in:
 - middle lamella
 - primary wall layer
 - secondary wall layer
 - both b and c
- While the light reaction of photosynthesis is going on, the pH of the matrix of thylakoids in comparison with the pH of the fluid in stroma would be:
 - lower
 - higher
 - identical
 - variable
- Comparison between permeability of certain molecules across a lipid bilayer and a biological membrane is depicted in the diagram. What could X and Y respectively be?



- Glycerol and CO_2
- CO_2 and Glycerol
- Sucrose and PO_4^{-3}
- PO_4^{-3} and Sucrose

- During the process of digestion, food is exposed to a range of pH. The relative pH of fluids in I, II and III regions of the alimentary canal shown in this diagram is:



- $\text{I} > \text{II} < \text{III}$
 - $\text{I} > \text{II} > \text{III}$
 - $\text{I} < \text{II} < \text{III}$
 - $\text{I} < \text{II} > \text{III}$
- An egg was placed in diluted HCl till the shell was completely dissolved. It was then transferred to another fluid and was found to swell within 10 minutes. What can this solution be?
 - Sugar syrup
 - Soap solution
 - Concentrated salt solution
 - Tap water
 - A scion from a short day plant was grafted on the stalk of long day plant. The flowering response of the grown plant will be like a:
 - short day plant
 - long day plant
 - day neutral plant
 - non-flowering plant
 - The most significant factor limiting primary production at a depth of 20 meters in sea is the:
 - availability of CO_2
 - availability of nutrients
 - quality of light
 - temperature
 - Half the pups in the litter of a dog were given meat and remaining half were given only pancreas of freshly slaughtered goats. After maintaining this diet for 6 weeks, clinical

examination was done. In comparison to the pups raised on meat, the ones fed on pancreas would show:

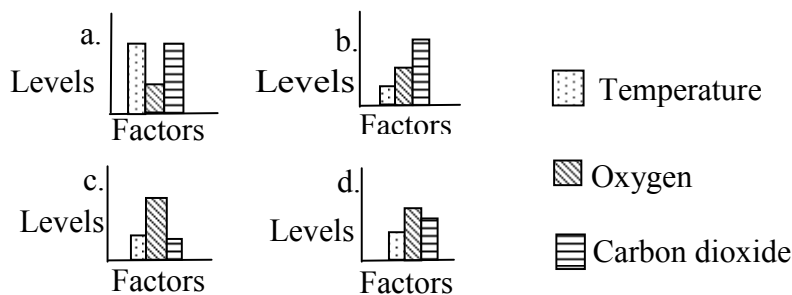
- a. hypoglycaemia
- b. hyperglycaemia
- c. protein deficiency
- d. no detectable difference

9. Select the hormones that influence the process of digestion:

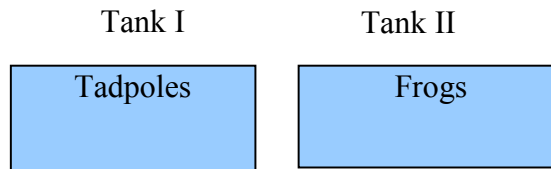
- i. Secretin
- ii. Cytokinin
- iii. Cholecystokinin
- iv. Enterogastrone
- v. Somatostatin

- a. i, ii and iii
- b. i, iii and iv
- c. iii, iv and v
- d. i, iii, iv and v

10. Choose the combination of conditions in a tissue that would influence the most rapid dissociation of oxyhemoglobin.



11. Water from the two tanks shown in the diagram was tested 3 hours after they were stocked with indicated animals. The predominant nitrogenous waste detected in Tank I and Tank II respectively would be:



- a. urea in both
- b. ammonia in both
- c. ammonia and urea
- d. urea and uric acid

12. A radioisotope having half life of 1000 years occurs in a proportion of 1:100 with the non-radioactive isotope. If a fossil had this proportion of about 0.02:100 of this element it must have been fossilised:

- a. 800 to 2000 years ago
- b. 1600 to 3200 years ago
- c. 4000 to 5000 years ago
- d. 5000 to 6000 years ago

13. Grass seeds trapped in the crevices of rock causes its fragmentation in monsoon. This is owing to the phenomenon of:

- a. imbibition by seed coat.
- b. hydrolysis of minerals by enzymes from seeds.
- c. pressure of CO₂ in respiration.
- d. pressure of germinating radicals.

14. Though triploblastic platyhelminthes are considered acoelmates since the mesoderm is:

- a. underdeveloped.
- b. non-cellular jelly-like.
- c. organized into discontinuous patches.
- d. spongy, filling the space between ectoderm and endoderm.

15. Both, absorption and translocation of water are assisted by this property of cell wall:
 a. porosity. b. mechanical strength. c. hydrophilic nature. d. elasticity.

16. Arrange the following animals in the order of increasing rate of heart beats.

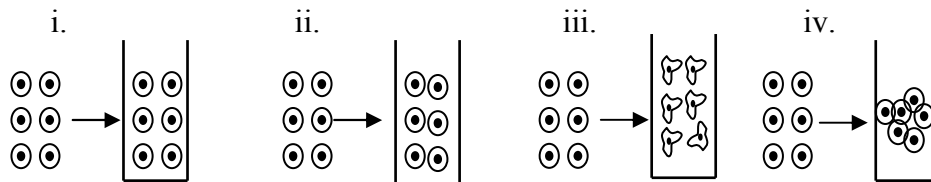
- i. Sheep
- ii. Mouse
- iii. Rabbit
- iv. Horse
- v. Elephant

- a. ii, i, iii, iv, v b. v, iv, ii, iii, i c. v, iv, i, iii, ii d. i, iii, iv, v, ii

17. Raj encountered a plant with thick, leathery, dark green leaves with prominent petioles; elongated, branched, prostrate stem and very long adventitious roots. From these adaptations, the plant seems to be:

- a. a sand binder. b. a marsh dweller. c. a shade loving plant. d. a submerged plant.

18. Consider the following hypothetical experiment. A definite number of eukaryotic cells were placed for 30 minutes in some solutions and the result is depicted below :



The solutions (i), (ii), (iii) and (iv) respectively most likely are:

- a. nutrient medium, hypotonic medium, isotonic medium, hypertonic medium.
- b. hypotonic medium, hypertonic medium, isotonic medium, nutrient medium.
- c. isotonic medium, hypertonic medium, hypotonic medium, nutrient medium.
- d. hypertonic medium, hypotonic medium, nutrient medium, isotonic medium.

19. Which of the following is expected to have a lining of stratified epithelium?

- i. alveoli in lungs
- ii. oesophagus
- iii. duodenum
- iv. urinary bladder
- v. major arteries

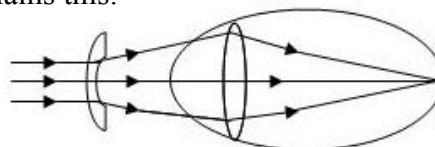
- a. ii, iv and v b. i, ii, iii, and v c. only ii and v d. only ii

20. Forest fires are natural means of:

- i. secondary succession.
- ii. elimination of predators.
- iii. mineralization of nutrients.
- iv. discouraging primary consumption.

- a. ii and iii b. i and iii c. i, ii and iii d. i, ii and v

21. The figure depicts an eye defect and its correction. Select the most appropriate alternative from the following that best explains this.



- a. Myopia, concave lens of suitable focal length
- b. Hypermetropia, concave lens of suitable focal length
- c. Myopia, convex lens of suitable focal length
- d. Hypermetropia, convex lens of suitable focal length

22. Which of the following sequences of mRNA will not translate completely?

- a. 5' AUG UUC AGC UCG UGA 3'
- b. 5'AUG AAC UAA CCA CUC 3'
- c. 5'AUG UUA CUC GCG UAA 3'
- d. 5' AUG CCA UAC GAC UAG 3'

23. In living organisms, mucilage prevents damage to the underlying cells from either acidic or alkaline fluids in contact. This is due to which of the following properties of mucilage?

- a. Hydrophilic nature
- b. Viscosity
- c. Reducing properties of sugar residues
- d. Amphoteric nature of protein component

24. In Galapagos Islands mountain peaks sustain populations of related species of snails. This is an example of:

- a. genetic drift.
- b. gene flow.
- c. reproductive isolation.
- d. migration.

25. Which of the following can be a reliable indication that the body fats are being consumed?

- a. Respiratory Quotient dipping below 1
- b. Rapid loss of body weight
- c. Increased thirst
- d. Hypoglycemia

26. Antidiuretic hormone has the most abundant receptors in the kidneys of:

- a. frogs in tropical pond.
- b. rabbits in a grass land.
- c. spotted deer in moist evergreen forest.
- d. Kangaroo rats in deserts.

27. A bacterium-like cell was retrieved from space and on its analysis revealed the presence of biochemical constituents identical to those of eubacteria except for the presence of 33 types of amino acids. The codons to code for them would be made of a minimum:

- a. 2 deoxyribonucleotides.
- b. 3 deoxyribonucleotides.
- c. 4 deoxyribonucleotides.
- d. 5 deoxyribonucleotides.

28. Which of the following will be immediately affected if sodium potassium pumps start malfunctioning in the body?

- a. Impulse transmission
- b. Secretion of gastri juicec
- c. Ultrafiltration
- d. Oogenesis

29. Protein molecules giving individuality to cells have to be membrane proteins of this category:

- a. Peripheral or Extrinsic.
- b. Integral proteins on cytoplasmic lamina.
- c. Integral proteins on extracytoplasmic lamina.
- d. Lipoproteins.

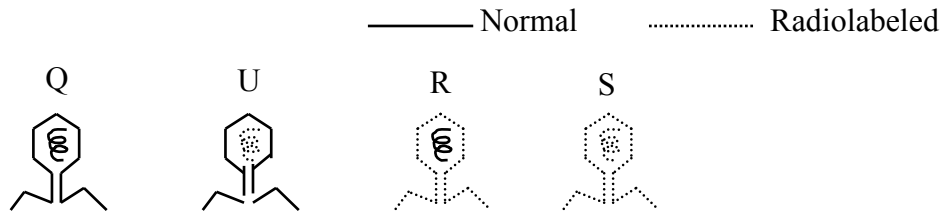
30. The dominant alleles A and B each add 2 g weight to a basal weight (in homozygous recessive condition) of 6g of fruits of a certain plant. If two plants, each with fruits weighing 8g and having heterozygous condition for one gene each are crossed. What phenotypic ratio is expected among the offspring?

- a. 25% with 10g: 50% with 8g: 25% 6g fruit
- b. 50% with 10g: 50% with 6g fruits
- c. 25% with 12g: 25% with 10g: 25% with 8g: 25% with 6g fruits
- d. 12.55 with 14g: 25% with 12g: 25% with 10g: 25% with 8g: 12.5% with 6g fruits

31. Of the following sequences, which one shows trend from mutually beneficial to mutually deleterious interactions?
- Protocooperation → Obligatory symbiosis → Competition → Parasitism
 - Commensalism → Amensalism → Facultative Symbiosis → Predation
 - Obligatory Symbiosis → Commensalism → Amensalism → Competition
 - Facultative Symbiosis → Amensalism → Parasitism → predation
32. Which of the following is NOT a function of mitochondria?
- Synthesis of high energy compounds like creatine.
 - Storage of divalent cations like Ca^{++} and Mg^{++} .
 - Influencing extranuclear hereditary characters.
 - Storage of reserved food materials, particularly in ova.
33. Cells were cultured in a medium containing heavy isotope of phosphorous till the entire DNA complement had only this isotope. Subsequently some cells were transferred to a medium with the normal isotope of phosphorous. After a certain period some cells were harvested and analyzed for heavy phosphorous. It was found that only 6.25% of phosphorous in DNA was heavy. How many times the cells must have divided?
- Twice
 - 4 times
 - 8 times
 - 10 times
34. A female plant with spadix inflorescence for three successive generations was cross pollinated with male plant having simple spike for three successive generations and all plants in the first generation were with spadix inflorescence. When the male plants among them were crossed with the female plants bearing simple spike, all the descended were with simple spike inflorescence. What can you conclude from this?
- Gene for spadix inflorescence is dominant one that for simple spike.
 - Gene for spadix inflorescence is incompletely dominant.
 - Gene for spadix and simple spike inflorescence are co-dominant.
 - This is an example of oocyte inheritance.
35. In the forest ecosystem the biomass of primary producers might not have been consumed completely if the following consumers were not there:
- rodents
 - elephants
 - ants
 - aphids
36. A botany student encountered a palm like, short tree with pinnately compound leaves with sessile leaflets bearing midrib but no lateral veins. The stem has persistent, woody, leaf bases. Branched, blunt finger-like structures could be noticed on ground around the base of trunk. The plant has to be:
- Araca nut
 - Cycas
 - The fern
 - Coconut palm
37. Plant of genotype AaBBCc was cross pollinated with another having the genotype aaBbcc. If all genes involved have complete dominance, the phenotypic ratio in the first generation plants will be
- 1:2:1
 - 1:3:3:9
 - 1:1:1:1
 - 1:1:1:1:1:1
38. A skull excavated from a place had large zygomatic arches, 2 pairs of large incisors, 2 pairs of premolars following a gap and 3 pairs of large molars. The foramen magnum was directed posteriorly. This skull belongs to a:
- predatory mammal with bipedal locomotion.
 - predaceous dinosaur with bipedal locomotion.
 - herbivorous mammal with quadrapedal locomotion.
 - herbivorous dinosaur with quadrapedal locomotion.

39. A field scientist counted the number of individuals of the following:
 i. Grass ii. Hawks iii. Sparrows iv. Plant bugs from a place and has jumbled up the titles of the datasheet. Can you identify the numbers with the organisms in the sequence mentioned above?
 a. 13254, 5, 279, 8379
 b. 8379, 279, 5, 13254
 c. 13254, 279, 8376, 5
 d. 13254, 5, 8376, 279

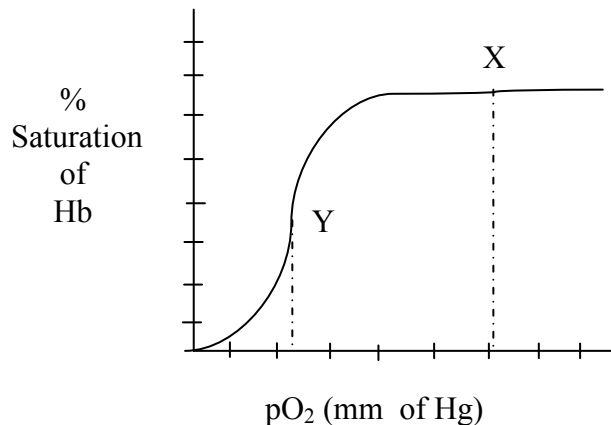
40. Bacterial cultures on separate culture plates were infected by phages as shown below



Post infection, the bacterial cells in each plate were lysed and centrifuged. The supernatant from bacteria infected by which phage/s will show radioactivity?

- a. Q and R b. Q and S c. U and R d. U and S

41. The accompanying graph depicts the % saturation of vertebrate haemoglobin with oxygen. What does X and Y indicate?

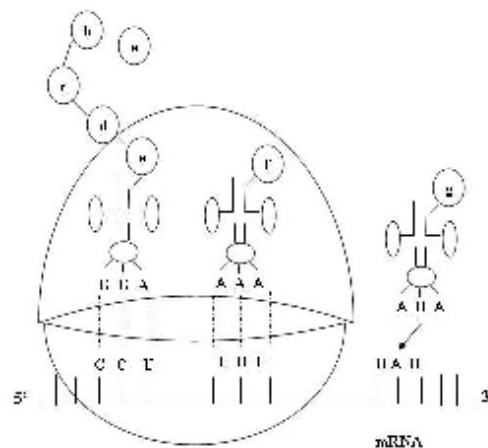


- a. X- oxygenated blood, Y- deoxygenated blood
 b. X- deoxygenated blood, Y- oxygenated blood
 c. X- blood of haemophilic person, Y- blood of normal person
 d. X- blood of foetus, Y- blood of adult

42. Rohit complained of stomach ache and heart burn. Deepak advised him to take lime juice (i) while Jyoti advised him to take milk of magnesia (ii) which of these do you feel will work and how?

- a. i – because it will neutralize acidity in stomach
 b. ii – because it will neutralize excess acidity in stomach
 c. i- because it will suppress the secretion of acid in stomach
 d. ii- because it will suppress the secretion of acid in stomach

43. The figure illustrates the process of translation in protein synthesis. If the triplet UAU is modified to UAG what will be the consequence?

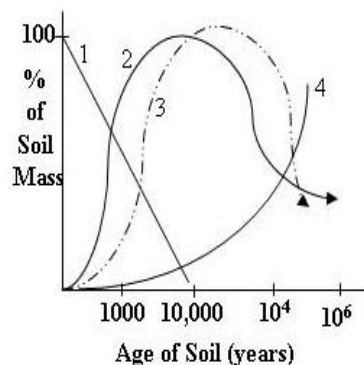


- a. amino acid 'f' will be omitted from resultant polypeptide chain.
- b. the amino acid 'g' will be replaced by some other amino acid in the resultant polypeptide
- c. the polypeptide with a, b, c, d, e and f will be released
- d. the polypeptide will not be produced at all

44. Leaves of eucalyptus hang vertically on weak branches that themselves hang down. The advantages of it are:

- i. Availability of light is assured to all leaves
 - ii. Leaf lamina is not presented directly to mid-day sun
 - iii. Heating as well as water loss is kept under control
 - iv. Trunk and major branches get shielded from intense light
- a. i, ii and iii b. i, iii and iv c. Only ii and iii d. Only i and iii

45. The accompanying diagram shows the changing amounts of clay, calcium carbonate, humus and biomass. Match these with the numbers representing lives in the diagram:



- a. 1- CaCO₃, 2- Biomass, 3 - Humus, 4 – Clay
- b. 1- Clay, 2- Humus, 3- Biomass, 4 - CaCO₃
- c. 1 – Humus, 2- Clay, 3 - Biomass, 4 - CaCO₃
- d. 1- Biomass, 2- CaCO₃, 3 - Clay, 4 - Humus

46. Select the statement related to the effect of ethylene

- i. Promotes lateral swelling of stem
 - ii. Inhibits elongation of cells
 - iii. Causes loss of sensitivity of stem to gravitropic stimuli
 - iv. Loosens cell wall
 - v. Delayed leaf senescence
- a. i, ii and v b. ii, iv and v c. i, iv and v d. i, ii and iii

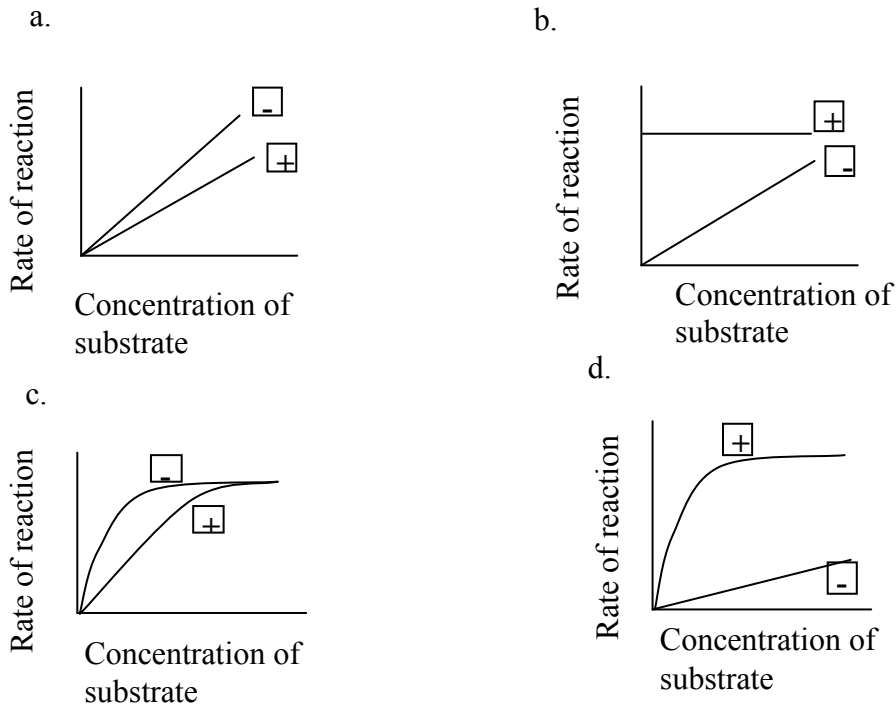
47. The lateral line sense organ in fish is a

- a. Chemoceptor b. Photoceptor c. Mechanoceptor d. Gustatoceptor

48. Which of the following elements is NOT involved in the information transfer from DNA to finished protein?

- a. Ribosome b. tRNA c. DNA polymerase d. RNA polymerase

49. Which of the following graphs correctly indicates the reaction in presence (indicated by +) and absence (indicated as -) of an enzyme?



50. P, Q and R are the three ploidy levels.

P: $4n$,

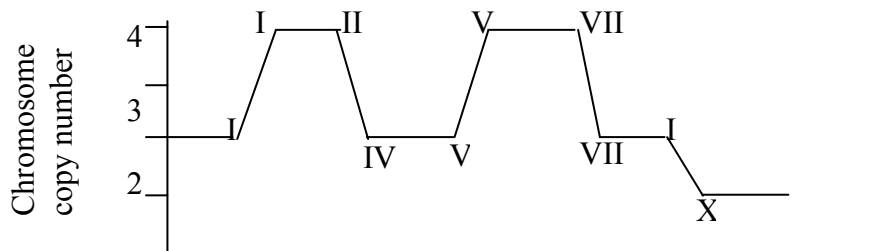
Q: $2n$

R: n .

Which of these ploidy levels can be found in the cells of a multicellular eukaryotic organism?

- a. Q and R b. Only Q c. P and Q d. All P, Q and R

51. Chromosome copy numbers in different cell division cycles are shown in the graph.



Mark the option that correctly depicts the numbers and the process.

- a. V - X: Meiosis I b. III - IV: Mitosis c. VII - X: meiotic division d. I-IV: Mitotic division

52. A few events that occur in the lytic cycle of a virus (bacteriophage) are listed.

- i. Host cell transcribes and translates phage proteins.
- ii. Host DNA is digested.
- iii. New phage DNA is formed.
- iv. Phage enzyme causes the cell to lyse.
- v. Phase particles are released.

The correct order in which these events occur is:

- a. iv, ii, iii, i, v b. ii, iii, i, iv, v c. v, iv, ii, iii, i. d. i. ii. iii. iv, v.

53. Macrophages are white blood cells that phagocytose any foreign body while plasma cells are effector B cells that produce antibodies. When these two cell types are activated, the predominant organelle at work will be respectively:

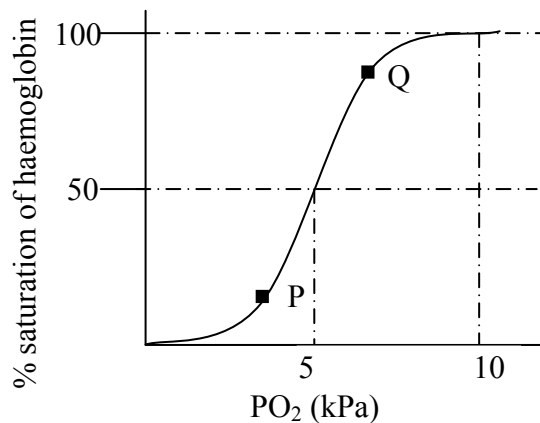
- a. Rough Endoplasmic Reticulum and Smooth Endoplasmic Reticulum.
- b. Golgi bodies and lysosomes
- c. Lysosomes and Rough Endoplasmic Reticulum
- d. Peroxisomes and lysosomes.

54. Various life forms appeared on earth at certain time periods in the history of several million years. Arrange the following in the order of their appearance on earth (starting with the earliest):

1. Multicellular organisms
2. Eukaryotes
3. Organisms with exoskeleton
4. Angiosperms

- a. 2, 1, 3, 4. b. 1, 3, 2, 4. c. 2, 1, 4, 3. d. 1, 2, 4, 3.

55. Oxygen saturation curve of haemoglobin molecule is shown in the graph.



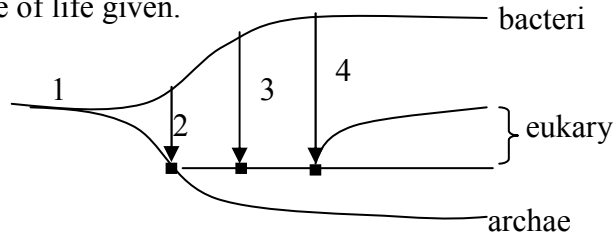
The correct representation of haemoglobin molecule at points P and Q is respectively:

- a. HbO_2 and HbO_4 b. HbCO and HbCO_2 c. HbO_2 and HbO_8 d. HbO_4 and HbO_6

56. Which of the following is the correct representation of primary RNA (pre m-RNA) transcript?

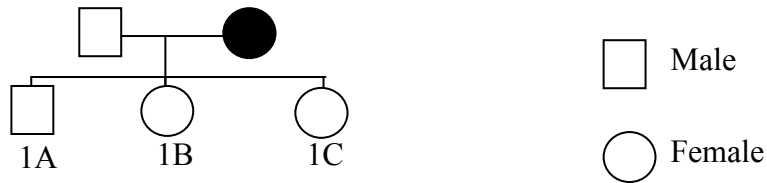
- a. exon-intron-exon-intron-polyA sequence
- b. promoter-enhance-exon-intron-exon-intron
- c. exon-intron-exon-intron-poly A signal
- d. Start codon-exon-exon-stop codon-polyA tail

57. Study the tree of life given.



The numbers indicating symbiosis of chloroplast and mitochondrial ancestors respectively are:
 a. 3 and 1 b. 2 and 3 c. 3 and 4 d. 4 and 3

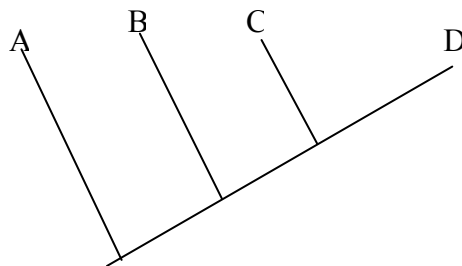
58. The following pedigree depicts the inheritance of an X-linked recessive trait.



If the mother shows the affected phenotype and the father is phenotypically normal but having an unknown genotype then:

- a. Offspring 1A, 1B and 1C would be normal. b. Offspring 1B and 1C would be affected
 c. Only offspring 1A would be affected. d. Offspring 1A, 1B and 1C would all be affected.

59. A cladogram depicting the evolution of various plant forms with respect to the evolutionary time scale is shown below.



If 'D' indicates 'flowering plants', then C would represent:

- a. Mosses b. Liverworts c. Ferns d. Conifers

60. The following list indicates certain molecules/ions and their mechanism of transport across the cell membrane. Determine the correct pair/s from the list.

- I. Diffusion – Na^+
- II. Active transport – Amino acids
- III. Osmosis – Water
- IV. Facilitated diffusion – Glucose

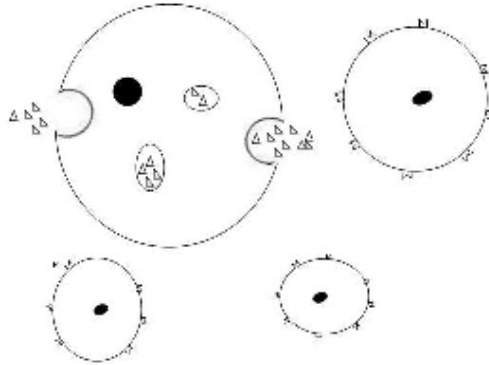
Options:

- a. III only b. II and IV only c. II, III and IV only d. I, II, III and IV

61. If a person is suffering from hypocalcaemia, which one of the following could be the possible reason?

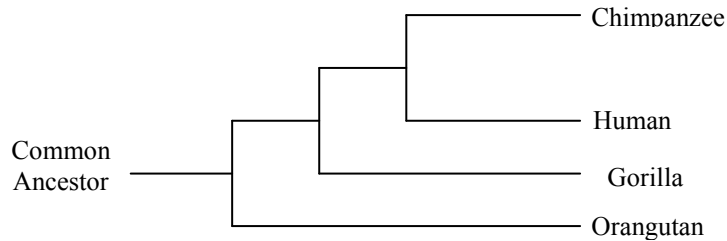
- a. Absence of parathyroid hormone. b. Malfunction of pancreas.
 c. Pineal gland dysfunction d. Decreased level of corticosteroids.

62. Which type of cell communication/signaling is described in the following figure?

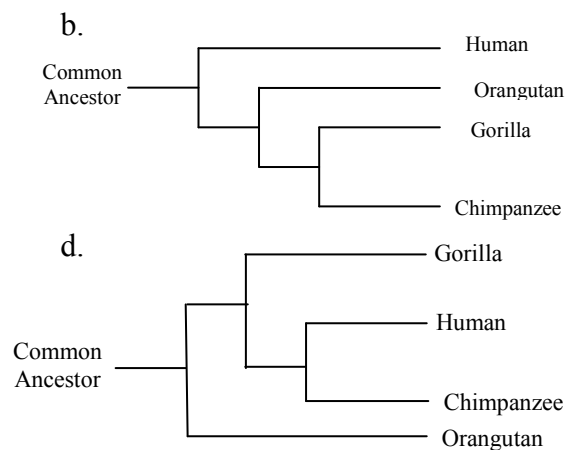
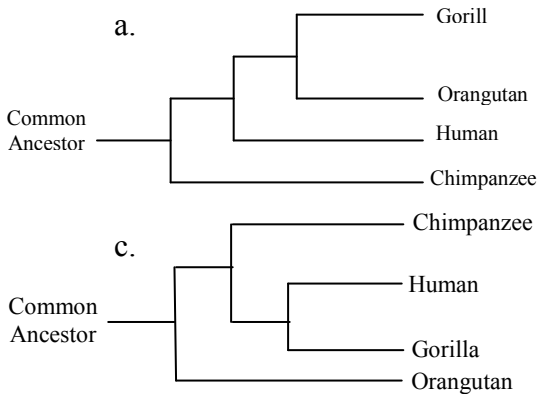


- a. Synaptic b. Exocrine c. Endocrine d. Paracrine

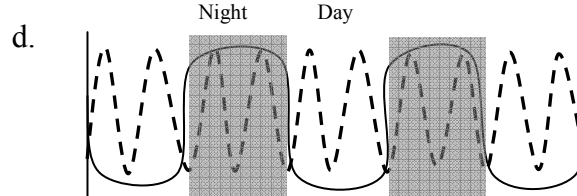
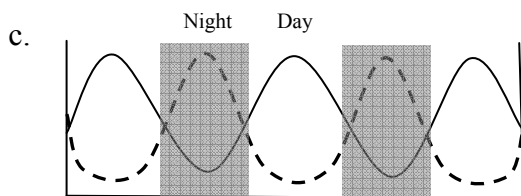
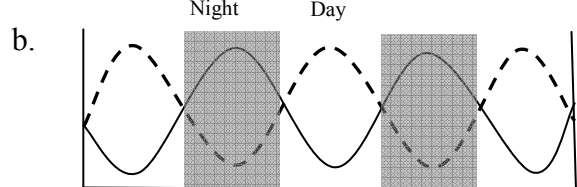
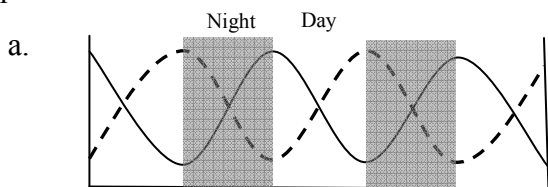
63. A cladogram depicting the evolutionary relationship between some primates is shown below.



Which one of the following would describe the relationship in exactly same manner?



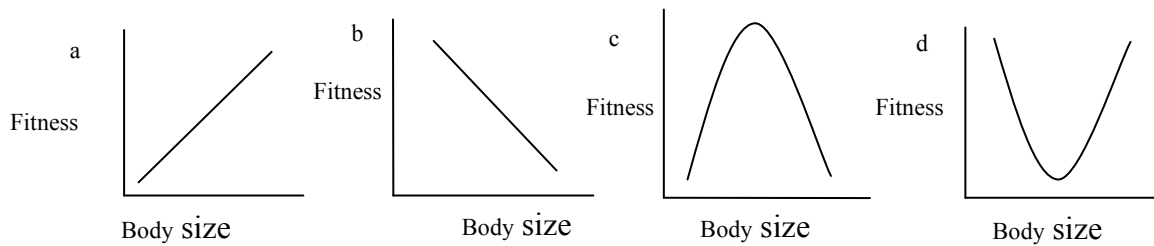
64. Red algae *Gonyaulax polyhedra* follow circadian rhythm for two different activities; i.e. Photosynthesis and Bioluminescence. Which of the following graphs correctly explains this phenomena?



----- Bioluminescence

———— Photosynthesis

65. Which one of the following graphs correctly describes disruptive selection?



66. If two people who are both carriers for a genetically inherited fatal recessive disease decide to marry, what will be the odds that their children will also be carriers?

- a. 1 out of 4 b. 1 out of 2 c. 3 out of 4 d. 4 out of 4

67. Sequences that correctly describes the cell cycle is

- a. $\rightarrow G1 \rightarrow G2 \rightarrow S \rightarrow \text{mitosis} \rightarrow \text{cytokinesis} \rightarrow$
 b. $\rightarrow S \rightarrow G2 \rightarrow \text{mitosis} \rightarrow \text{cytokinesis} \rightarrow G1 \rightarrow$
 c. $\rightarrow G1 \rightarrow S \rightarrow G2 \rightarrow \text{cytokinesis} \rightarrow \text{mitosis} \rightarrow$
 d. $\rightarrow \text{cytokinesis} \rightarrow \text{mitosis} \rightarrow G1 \rightarrow S \rightarrow G2 \rightarrow$

68. Which of the following is NOT a part of human chromosomes?

- a. Centriole b. Histone c. Nucleosome d. Centromere

69. Which of the following requires energy?

- a. Diffusion b. Osmosis c. Facilitated diffusion d. None of these

70. Transmission across a synapse is dependent on the release of:

- a. neurotransmitters b. synaptic vesicle c. Neurons d. receptor proteins

71. Persons suffering from albinism have problems of vision in bright light because they lack:

- a. cones b. Rods c. Melanin d. keratin

72. If bacterial genome and plasmid are allowed to replicate in the same manner then:

- a. bacterial genome replicates faster.
 b. plasmid genome replicates faster.
 c. both will take equal time for replication.
 d. speed of replication is dependent on AT/ GC ratio.

73. Two animal cell lines were cultured separately and only one cell type among them expressed a protein with green fluorescence. When these two cell types were mixed together and allowed to grow for some time, all cells showed green fluorescence. Which of the following must be having a key role in this?

- a. Desmosomes b. Plasmodesmata c. Gap junctions d. Tight junctions

74. A novel protein changes its conformation below pH 6 and above pH 8 . This protein was made to pass through a column in which beads are coated with its receptor molecules at pH7. Column was then washed with buffer of pH 6.8 and fraction collected is labelled as A. A second buffer of pH 5 was then passed through and fraction is collected which is labelled as B. Similarly a third C fraction is collected with buffer of pH9.

Which of these fractions will show maximum concentration of the novel protein?

- a. Fraction A b. Fraction B c. Fraction C d. Fractions B and C both

75. Three proteins A, B and C of equal molecular weight are being investigated in a study. They contain six, four and four cysteine residues respectively. Only Proteins A and B were treated with β -mercaptoethanol (which reduces disulphide bond) and heated in boiling water bath for a few minutes. Which of the following is expected in the SDS PAGE gel run?

- a. Protein C will move fastest.
- b. Protein B will move fastest.
- c. Proteins A and B will move at the same speed but faster than C.
- d. Proteins B and C will move at the same speed.

76. Eukaryotic protein synthesis starts with Methionine coded by AUG and terminates at sequence UAA or UAG or UGA in mRNA. The longest polypeptide chain formed by DNA sequence given below will have:

5'-TATGAGGATACCACACAACAGCTAGTTCTAAGCCTATTAGCGCTG-3'

- a. 6 amino acids
- b. 7 amino acids
- c. 8 amino acids
- d. 11 amino acids

77. Considering levels of organizational hierarchy in biological world, the correct relationship is:

- a. Cells : Tissues : : Biosphere: Population
- b. Molecules : Tissues : : Ecosystem : Communities
- c. Communities : Population : : Organs : Tissues
- d. Cells : Organelles : : Population : Organisms

78. Which of the following is/are the examples of structural polysaccharides?

- i. Microfibrils
 - ii. Chitin
 - iii. Glycogen
 - iv. Starch
- a. i & ii
 - b. ii & iv
 - c. i & iv
 - d. i, ii & iii

79. In the sickle cell anemia which of the following is affected?

- i. Primary structure of haemoglobin
 - ii. Secondary structure of haemoglobin
 - iii. Tertiary structure of haemoglobin
 - iv. Quaternary structure of haemoglobin
- a. Only iii & iv
 - b. Only i & ii
 - c. Only i, ii & iii
 - d. All the four

80. Cholesterol serves the role of 'temperature buffer' in biological membrane because:

- a. it resists change of pH of membrane core at any temperature.
- b. it resists fluidity changes of membrane at low temperature.
- c. it resists movement of phospholipids at all temperature.
- d. it promotes close packing of phospholipids and increases temperature required for membrane to solidify.

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