

Indian Association of Teachers in Biological Sciences
NATIONAL STANDARD EXAMINATION IN BIOLOGY 2009-2010

Date of Examination 22nd November 2009

Time 15.00 to 17.00 Hrs

INSTRUCTIONS TO CANDIDATES

01. On the answer sheet, fill up all the entries carefully in the space provided, **ONLY IN BLOCK CAPITALS**. Use only **BLUE** or **BLACK BALL PEN** for making entries and marking answers. Incomplete / incorrect / carelessly filled information may disqualify your candidature.
02. The question paper has 80 multiple choice questions. Each question has 4 options, out of which only one is correct. Choose the correct answer and mark a cross in the corresponding box on the answer sheet as shown below:

Q.	a	b	c	d
22			X	

03. A correct answer carries 3 marks and 1 mark will be deducted for each wrong answer. No weightage will be given to unattempted question.
04. All rough work may be done on the blank sheet provided at the end of the question paper.
05. **PLEASE DO NOT MAKE ANY MARKS OTHER THAN (X) IN THE SPACE PROVIDED ON THE ANSWER SHEET.** Answer sheets are evaluated with the help of a machine. Due to this, **CHANGE OF ENTRY IS NOT ALLOWED.**
06. Scratching or overwriting may result in wrong score. **DO NOT WRITE ANYTHING ON THE BACK OF ANSWER SHEET.**
07. Use of a calculator is allowed.
08. The answers / solutions of this question paper will be available on our website - www.iapt.org.in by 27 th November 2009.

CERTIFICATES & AWARDS

Following certificates are awarded by I.A.T.B.S. to students successful in NSEB.

- i) Certificates to top 10% students of each centre.
 - ii) Merit certificates to statewise Top 1% students.
 - iii) Merit certificate and a prize in the form of a book to Nationwide Top 1% students.
09. **Result sheets** and the “**centre top 10%**” certificates of NSEB are dispatched to the Professor in charge of the centre. Thus you will get your marks from the Professor in charge of your centre by January 2010 end.
10. TOP 300 (or so) students are called for the next examination -Indian National Biology Olympiads (INBO). Individual letters are sent to these students **ONLY**.
11. Gold medals may be awarded to TOP 35 students in this entire process.
12. No queries will be entertained in this regard.



ARYAN

Q.1. The key feature of gymnosperms that is absent in present day pteridophytes is:

- a. heterospory
- b. seed
- c. triploid endosperm
- d. tracheids

Q.2. The subunits of ribosomes of mouse hepatocytes are:

- a. 50S and 30S
- b. 40S and 23S
- c. 70S and 16S
- d. 60S and 40S

Q.3. In meiosis, separation of homologous chromosomes occurs during:

- a. Anaphase I
- b. Metaphase I
- c. Anaphase II
- d. Metaphase II

Q.4. Hydrogen cyanide causes irreversible inhibition of cytochrome oxidase. If this compound is added to a preparation of intact mitochondria, which of the following would be expected?

- a. Fall in hydrogenation of molecular oxygen
- b. Rise in electrochemical gradient
- c. No change in ATP synthesis
- d. Inactivation of ATP synthetase

Q.5. Select the correct statement from the following :

- a. Yellow fever is transmitted by tse-tse fly
- b. Night blindness is a result of deficiency to vitamin B₆
- c. Filariasis is transmitted by culex mosquito
- d. Excessive consumption of mercury causes itai- itai

Q.6. In the thylakoid membrane, the photosynthetic pigments are held in place by:

- a. ionic linkages
- b. hydrophobic interaction
- c. covalent bonds
- d. coordination bonds

Q.7. The odd group from the following is:

- a. cray fish, pipe fish, puffer fish.
- b. monitor lizard, cobra, tortoise
- c. scorpion, crab, tick
- d. jelly fish, sea anemone, coral

Q.8. The correct description of sporophyte of *Marchantia* and gametophyte of a fern is:

- a. former is haploid while latter is diploid.
- b. both show poorly developed vascular tissue.
- c. both are free living structures.
- d. both represent the dominant generation in their respective life cycle.

Q.9. Which of the following is not a function of calcitonin?

- a. promoting deposition of Ca^{2+} in bones
- b. suppressing Ca^{2+} absorption in GI tract
- c. countering the action of parathormone
- d. increasing reabsorption of Ca^{2+} in nephrons

Q.10. A long day plant with critical day length of 14 hrs will flower under which of the following treatments?

- a. 7 hrs light-2 hrs darkness-3 hrs light-5 hrs darkness-7 hrs light
- b. 5 hrs light-9 hrs darkness-8 hrs light-2 hrs darkness
- c. 11 hrs darkness-13 hrs light
- d. 6 hrs light-6 hrs darkness-7.5 hrs light-4.5 hrs darkness

Q.11. Application of auxin in a concentration far more than cytokinin causes callus to undergo :

- a. caulogenesis
- b. histogenesis
- c. rhizogenesis
- d. morphogenesis

Q.12. The correct order in terms of molecular weight is:

- a. DNA<tRNA<mRNA<insulin
- b. tRNA<mRNA<rRNA<DNA
- c. rRNA<insulin<cDNA <Z DNA
- d. insulin<B-DNA<cDNA< Z-DNA

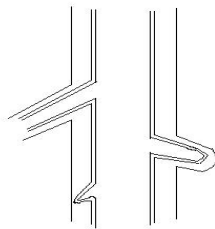
Q.13. Algal scum floats on the surface of water because:

- a. The density of cells is lesser than that of water
- b. Oxygen accumulates in it
- c. Carbon dioxide accumulates in it
- d. It generates methane gas

Q.14. In maize the colour of grains is controlled by 3 pairs of genes. Gene 'C' and 'R' independently do not form any colour but when together, they impart greenish-brown colour to the stem, while the grains remain colourless. In presence of an additional allele 'A' the stem as well as grains become violet. In a trihybrid cross what phenotypic ratio is expected in grains?

- a. 48 coloured : 16 colourless
- b. 36 coloured : 28 colourless
- c. 27 coloured : 37 colourless
- d. 40 coloured : 24 colourless

Q.15. Accompanying diagram is a longitudinal section of a tender plant part . This plant part must be :



- a. root
- b. stem
- c. inflorescence
- d. midrib of a leaf

Q.16. In recombinant DNA technology, a promoter sequence helps in :

- a. modifying the transgene
- b. integration of foreign gene in host DNA
- c. recognising and cutting the specific gene
- d. expressing the transgene at right time and place

Q.17. Involuntary muscles are **not** found in

- a. iris
- b. bronchi of the lungs
- c. tongue
- d. heart

Q.18. In a typical angiosperm anther, 1000 pollen grains were found in each pollen sac. How many meiotic divisions would have occurred in the microspore mother cells before these pollen were formed?

- a. 2500
- b. 1000
- c. 250
- d. 100

Q.19 If a cytotoxin blocks the activity of an enzyme permanently, it is a :

- a. competitive inhibitor
- b. non-competitive promoter
- c. non-competitive inhibitor
- d. competitive promoter

Q. 20. Based on the morphological features the plant in the accompanying diagram has to be a:



- a. Hydrophyte
- b. Submergent hydrophyte
- c. Emergent hydrophyte
- d. Halophyte

Q.21. Which of the following is a set of traits with continuous variation?

- a. Blood group, Sex
- b. Red Green colour blindness, Haemophilia
- c. Eye colour, Hair texture
- d. Skin colour, Height

Q.22. Which of the following statements are the functions of a medullary ray in plants?

- (i) storage of food
 - (ii) secondary growth
 - (iii) transmission of water and food
 - (iv) seat of origin of inter-fascicular cambium
-
- a. i, ii and iii
 - b. i, iii and iv
 - c. ii, iii and iv
 - d. only i and iii

Q.23. Different microorganisms taking part in nitrogen cycle are

- (i) Rhizobia in root nodules
- (ii) Ammonifying bacteria
- (iii) Nitrifying bacteria
- (iv) Denitrifying bacteria

Which of them work strictly under anaerobic conditions?

- a. only iv
- b. i and iv
- c. i, ii and iv
- d. none

Q.24. The linear protein that has catalytic function is :

- a. actin
- b. collagen
- c. myosin
- d. trypsin

Q.25. The genome of onion has 8 chromosomes ($n=8$). In a root tip cell undergoing anaphase the number of chromosomes will be :

- a. 8
- b. 16
- c. 32
- d. Indeterminate

Q.26. Biological clock is influenced by this part of brain:

- a. hypothalamus
- b. corpus callosum
- c. crura cerebri
- d. neocortex

Q.27. Among the following an exclusively marine form is :

- a. prawn
- b. slug
- c. salamander
- d. brittle star

Q.28. Which of the following events, essential for cell division, is accomplished in G_2 phase of cell cycle ?

- a. Duplication of centrioles
- b. DNA replication
- c. Disorganization of nucleolus
- d. Accumulation of mRNA

Q.29. Considering size, which of the following series is the most appropriate ?

- a. bacteria > viruses > yeast
- b. hornworts > mosses > liverworts
- c. smooth muscle cell < striated muscle cell < cardiac muscle cell
- d. platelets < human erythrocytes < human eosinophils

Q.30. Light has **no** influence on this molecule:

- a. Phytochrome
- b. Florigen
- c. Vernalin
- d. Auxin

- Q.31. What would the molecular weight of a homotriglyceride if the molecular weight of glycerol is 92 and that of fatty acid is 596?
- 653
 - 688
 - 1880
 - 1844
- Q.32. The nucleus owes its shape mainly to:
- hydrostatic pressure of nucleoplasm
 - abundance of chromatin
 - nuclear lamina
 - nuclear envelope
- Q.33. Which of the following treatments will **not** cause denaturation of most proteins?
- Transfer from aqueous to organic solvent
 - Addition of electrolyte
 - Agitation of the solution
 - Addition of strong acid
- Q.34. Dilation and increased permeability of blood vessels is a response to:
- pyrogen
 - antibodies
 - histamine
 - interferons
- Q.35. What is **not** true about the sympathetic nervous system?
- It has functions antagonistic to those of parasympathetic system.
 - It has bilateral ganglionated cords.
 - It has longer post ganglionic fibres.
 - It has stimulatory influence on involuntary organs.
- Q.36. If t-RNA isolated from *E.coli* and m-RNA as well as ribosomes isolated from mouse liver cell are incubated with ATP and free amino acids, what may happen?
- Protein specific to mouse will be synthesised
 - Protein specific to *E.coli* will be synthesised
 - Protein synthesis will not occur
 - A hybrid protein will be synthesised

Q.37. Purple cabbage leaves do not lose their colour in cold water but do so in boiling water because:

- a. The pigment is not soluble in water at low temperature.
- b. The cell wall becomes porous in hot water
- c. The cell membrane is disorganised at high temperature
- d. The pigment breaks down at higher temperature

Q.38. Match the fruits with the appropriate edible part

- | | |
|----------------|----------------------------|
| I: date palm | M: endosperm |
| II: pear | N: peduncle and cotyledons |
| III: coconut | O: thalamus |
| IV: cashew nut | P: pericarp |

- a. I- P, II- O, III- M, IV- N
- b. I-O, II- N, III- P, IV-M
- c. I- M, II- P, III- O, IV- N
- d. I-N, II- M, III- O, IV-P

Q.39. The incorrect pair is:

- a. pseudocoel : tapeworm
- b. retrogressive metamorphosis : tunicate
- c. metameric segmentation : millipede
- d. trichocysts : paramoecium

Q.40. The indirect development in insects is because of :

- a. abundance of food in water
- b. lack of stored food in eggs
- c. spiral cleavage of zygote
- d. short life span of adults

Q.41. A cell when viewed under the microscope clearly revealed nucleus, glycogen granules and cell wall. The cell most likely belongs to:

- a. a bacterium
- b. a plant cell
- c. fungal cell
- d. a protist

Q.42. The community that always has an inverted pyramid of numbers is:

- a. grassland
- b. desert
- c. freshwater
- d. tropical forests

Q.43. Which of the following communities has maximum net primary production?

- a. Mangroove
- b. Coral reef
- c. Tropical forest
- d. Marine benthos

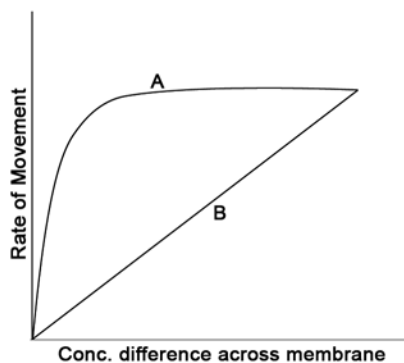
Q.44. Species that have evolved in earlier era and undergone minimum evolutionary changes are called living fossils. Which of the following species is a living fossil?

- a. Amoeba
- b. King crab
- c. Squid
- d. Monitor lizard

Q.45. Q and R are the flowering plants belonging to the same species. Plant Q is defoliated and both Q and R are then exposed to appropriate photo inductive cycles. A branch of R is then grafted on Q, which of the following response can be obtained?

- a. Only R will flower
- b. Only Q will flower
- c. Both Q and R will flower
- d. There will be no flowering in both.

Q.46. The accompanying figure depicts movement of a solute across a membrane without consumption of energy. 'A' and 'B' would be:



- a. facilitated diffusion and passive diffusion
- b. passive diffusion and active transport
- c. passive diffusion and facilitated diffusion
- d. facilitated diffusion and active transport

Q.47. Considering a fertility of 80%, how many meiotic divisions will be involved in development of a brood of 160 fish?

- a. 160
- b. 200
- c. 250
- d. 320

Q.48. Leber's optic neuropathy is a disease caused by a mutation in mitochondrial DNA. As a genetic counsellor, what will you advise to a couple with healthy husband and wife with this disease?

- a. Their children would suffer from the disease irrespective to gender.
- b. If daughter is born, she would not be suffering from the disease.
- c. If they have a son, he would be suffering from the disease.
- d. Their children are not likely to suffer from the disease irrespective of gender.

Q.49. In pigs, a gene of length of 2160 base pairs, codes for an enzyme with 218 amino acids. The length of initial and processed mRNA transcript would respectively be:

- a. 2160 & 660 bp.
- b. 720 & 564 bp.
- c. 720 & 218 bp
- d. 2160 & 564 bp

Q.50. During the assembly of progeny of lysogenic bacteriophage sometimes the segment of bacterial DNA gets incorporated in the phage capsid. Such a phage can infect a new bacterial host. This host cell will:

- a. lyse
- b. becomes lysogenic
- c. remains healthy
- d. gets transformed

Q.51. Water-striders are the insects that walk on the water surface without sinking. This owes to:

- a. high specific gravity of water
- b. high surface tension of water
- c. greater bond length between H and O
- d. anomalous property of water

Q.52. The movement of dissolved materials from the lumen through the space between adjacent epithelial cell is prevented by :

- a. tight junction
- b. desmosomes
- c. gap junction
- d. basal lamina

Q.53. Animals habituated to hot climate are generally:

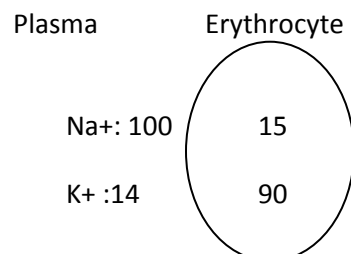
- a. small and long lived
- b. large and long lived
- c. small and short lived
- d. large and short lived

Q.54. As part of a student project, Sheela surgically made a full cut in the hypothalamo-hypophyseal tract in pregnant rabbits and studied the physiological effects on different tissues/organs. Which of the following should be expected?

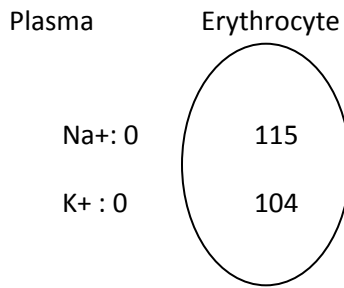
- (i) Formation of large volume of dilute urine
- (ii) Reduced synthesis of milk by the mammary gland
- (iii) Increased heart rate
- (iv) Difficulty in parturition

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

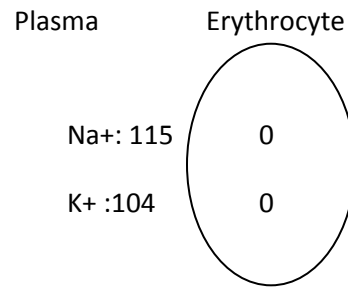
Q.55. If the cell shown below stops respiring, the resultant cell milieu will be:



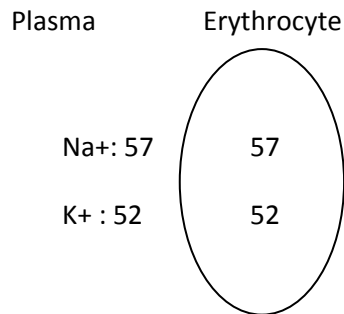
a.



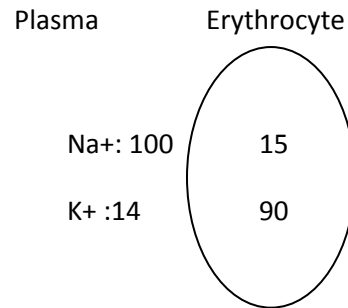
b.



c.



d.



Q.56. A few statements about algae and bryophytes are given below. The correct statement/s is/are:

- (i) Bryophytes are found in terrestrial habitats while algae are not.
- (ii) Bryophytes are better adapted to conserve water than algae.
- (iii) Bryophytes and algae need aquatic media for reproduction.
- (iv) Bryophytes and algae have short- lived gametophytic generation.

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

Q.57. While taking a stroll in the garden, you happen to see a tall fern plant. The correct description of this plant will be:

- a. It is a gametophyte that will produce gametes by mitosis.
- b. It is a sporophyte with haploid number of chromosomes in each cell.
- c. It is a gametophyte with haploid number of chromosomes in each cell.
- d. It is a sporophyte that will produce spores by meiosis.

Q.58. Which of the following animals are likely to have more esters of unsaturated fatty acids in the cell membranes?

- (i) Cold blooded animals
- (ii) Warm blooded animals living in cold climate.
- (iii) Warm blooded animals living in hot climate.

- a. (i) and (ii)
- b. (ii) and (iii)
- c. only (i)
- d. only (ii)

Q.59. The correct statements about respiration are :

- (i) In cockroach gaseous exchange occurs mainly between tracheoles and haemolymph
- (ii) Increase in inspiratory capacity does not involve an increase in tidal volume
- (iii) Partial pressure of oxygen in blood is less than that in alveoli
- (iv) Chloride shift in erythrocytes maintain the ionic balance

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

Q.60. Which of the following statement/s about fungi is/are true?

- (i) Some fungi are parasitic.
- (ii) Some fungi are saprotrophs.
- (iii) Some fungi are mutualistic.
- (iv) Some fungi are autotrophic.

- a. (i) and (ii) only
- b. (ii) and (iii) only
- c. only (i)
- d. (i), (ii) and (iii)

Q.61. An animal **cannot** be classified as coelomate or acoelomate if it shows:

- a. radial symmetry
- b. haemocoel
- c. diploblasty
- d. metameric segmentation



ARYAN

Q.62. An inexperienced mouse may readily attack a brightly coloured, slow-moving caterpillar only to find its mouth full of distasteful fluid. Following this experience, the mouse may avoid attacking insect larvae with similar coloration and behaviour. This is an example of:

- a. habituation
- b. sensitization
- c. spatial learning
- d. associative learning

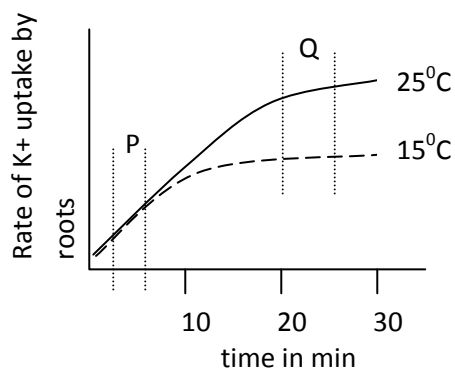
Q.63. Kiran was born with 6 toes on each foot, a dominant trait called polydactyly, due to the allele D. Two of her five siblings and her mother have extra digits but not her father. The genotypes of Kiran and her mother respectively are:

- a. DD and DD.
- b. Dd and Dd.
- c. Dd and DD.
- d. DD and Dd

Q.64. A lake was found to harbour alarming level of a pesticide-DDT. The people most affected by accumulation of DDT in the body would be those that:

- a. consumed products of plants growing in the lake.
- b. ate fish from the lake.
- c. ate birds dwelling in the same area.
- d. used same water for bathing.

Q.65. Following graph was obtained when rate of K^+ uptake by roots of growing seedlings was measured at different temperatures. The limiting factor/s at region P and Q is/are:



- a. time and rate of metabolism respectively.
- b. temperature and time respectively.
- c. rate of metabolism
- d. temperature

Q.66. Consider a hypothetical situation where a cell Q with pressure potential of 0.05 units filled solely with water is surrounded by four cells A, B, C and D. The pressure and solute potentials (ψ_p and ψ_s) of the respective cells are tabulated below.

	A	B	C	D
ψ_p	0	0.3	0.23	-0.23
ψ_s	-0.23	-0.23	-0.23	-0.23

Water from which of the cells is likely to enter the cell Q?

- a. A
- b. B
- c. C
- d. D

Q.67. A student carrying out cell fractionation of plant tissue forgot to label her tubes. The contents of one tube when studied showed organelles bounded by single membrane with acidic internal components. These organelles could be:

- a. nucleus
- b. chloroplast
- c. lysosome
- d. peroxisome

Q.68. Which of the following animals has exoskeleton but no endoskeleton?

- a. Lizard
- b. Frog
- c. Sponge
- d. Cockroach

Q.69. If the blood groups of parents are O Rh+ and AB Rh+, the blood group of child will be:

- a. A Rh+
- b. O Rh+
- c. AB Rh+
- d. A Rh-

Q.70. In a biology laboratory an unknown protozoan culture is given for observation. When observed under high power of microscope, the protozoan showed ciliary movements and rotated on the long axis while moving. The organism must be:

- a. *Paramecium*
- b. *Amoeba*
- c. *Vorticella*
- d. *Chlamydomonas*

Q.71. A piece of skull showing a thecodont and diphyodont dentition was discovered in a cave. It must be of which of the following animals?

- a. Salamander
- b. Monitor lizard
- c. Man
- d. Platypus

Q.72. Which group of organelles is involved in anabolic processes in a cell?

- a. lysosome, vacuole, ribosome
- b. ribosome, rough ER, smooth ER
- c. vacuole, rough ER, smooth ER
- d. smooth ER, ribosome, vacuole

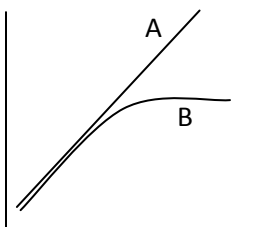
Q.73. Which of the following structures, absent in algae, is very important for complete and permanent invasion of land by plants?

- a. chloroplasts
- b. tracheids
- c. sporangia
- d. free living gametophyte

Q.74. What would be the molecular weight of a polypeptide with 20 amino acids, assuming an average molecular weight of amino acids to be 128?

- a. 2200
- b. 2560
- c. 2578
- d. 2218

Q.75. The same enzyme catalyzed reaction showed two different kinetic patterns as shown in the graph. Y-axis indicates product formed and X-axis indicates time. Mark the correct interpretation.



- a. Reaction A is carried out at higher temperature than B.
- b. Reaction B is carried out at a pH higher than that for reaction A.
- c. Substrate is replenished from time to time in reaction A and not in B.
- d. Only reaction A is carried out at optimum ion concentration.

Q.76. Which of the following clues would tell you whether a cell is prokaryotic or eukaryotic?

- a. the presence or absence of a rigid cell wall
- b. whether or not the cell is partitioned by internal membranes
- c. the presence or absence of ribosomes
- d. whether or not the cell contains DNA

Q.77. In humans, the first polar body formed during oogenesis has:

- (i) 46 chromosomes
- (ii) 23 chromosomes
- (iii) 46 chromatids
- (iv) 23 chromatids

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

Q.78. The cytoskeletal elements, called microfilaments, are involved in :

- (i) amoeboid movement of granulocytic leucocytes
- (ii) separation of chromosomes during anaphase
- (iii) formation of cell plate during cytokinesis
- (iv) ciliary movement in *Paramecium*

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

Q. 79. There are 36 possible genotypes for an autosomal gene with 8 alleles. How many genotypes will be possible for an X- linked gene with 8 alleles?

- a. 18
- b. 36
- c. 44
- d. 72

Q. 80. If the sequence of bases on one strand of DNA is given as GCTAAGTCGAC, the sequence of bases in the complementary strand is written as:

- a. CGATTCAGCTG
- b. CAGCTGAATCG
- c. GCTAAGTCGAC
- d. GTCGACTTAGC

