

Section M: Zoology

Q. 1 – Q. 10 carry one mark each.

- Q.1 The fur color of a newly identified species of dog is either white or red and is controlled by a single gene with two alleles. In a genetic experiment, a red dog was mated with a white dog. The white to red ratio among the offspring was 1 : 1. What is the genotype of the parent with the red fur?
- (A) Heterozygous (B) Homozygous for the dominant allele
(C) Homozygous for the recessive allele (D) Insufficient data to decide
- Q.2 Which one of the following is NOT true regarding human reproduction?
- (A) Oestrogen has both positive and negative feedback effects on the pituitary gland.
(B) Corpus luteum produces progesterone.
(C) Progesterone is essential to maintain the structure of the endometrium.
(D) Chorionic gonadotropin is secreted by corpus luteum if fertilization occurs.
- Q.3 Which one of the following statements is true?
- (A) All vertebrates contain amnion.
(B) All chordates are vertebrates.
(C) All tunicates are chordates.
(D) Cephalochordates are characterized by the presence of a well defined skull.
- Q.4 The body plan common to both annelids and insects is _____.
- (A) Acoelomate (B) Pseudocoel (C) Coelom (D) Homocoel
- Q.5 Which one of the following is an anatomical feature unique to marine and desert mammals?
- (A) Four-chambered heart (B) Long kidney loops
(C) Waterproof skin (D) Very small kidneys
- Q.6 Which one of the following is the most useful method to determine the evolutionary distance between two closely related species?
- (A) Comparison of anatomical structures
(B) Comparison of the DNA sequences of the exons of conserved genes
(C) Comparison of the intronic sequences
(D) Fossil records
- Q.7 Hydrostatic skeleton is one of the characteristics of _____.
- (A) Onychophorans (B) Jelly fish
(C) Nematodes (D) Sponges

- Q.8 Rearrange the following taxonomic terms in the correct hierarchical order.
 ORDER – FAMILY – PHYLUM – CLASS
 (A) FAMILY - PHYLUM - CLASS - ORDER
 (B) PHYLUM - ORDER - CLASS - FAMILY
 (C) CLASS - PHYLUM - FAMILY - ORDER
 (D) PHYLUM - CLASS - ORDER - FAMILY
- Q.9 The following is a list of animals and their geographical distribution. Among the options, choose the one that matches the animals to their correct geographical distribution.
- | | |
|----------------|----------------|
| a. Tardigrades | 1. Ocean |
| b. Snail | 2. Leaf litter |
| c. Peripatus | 3. Fresh water |
| d. Oyster | 4. Moist soil |
- (A) a-4, b-3, c-2, d-1
 (B) a-3, b-2, c-1, d-4
 (C) a-2, b-2, c-4, d-3
 (D) a-3, b-4, c-2, d-1
- Q.10 Which one of the following anatomical feature enables the sessile life style of sea-squirts?
- (A) Endostyle
 (B) Otolith
 (C) Branchial basket
 (D) Solenocytes

Q. 11 – Q. 26 carry two marks each.

- Q.11 Which one of the following is a true statement?
- (A) The embryos of higher organisms resemble the adults of lower organisms.
 (B) Intestine develops from the germ layer called endoderm.
 (C) Blood vessels develop from somites.
 (D) All the brain cells develop from mesoderm.
- Q.12 The following paired terms are not correctly paired. Which one of the four options is the correct pairing?
- | | |
|-----------------------|--|
| a. Hedgehog signaling | 1. Anterior – posterior axis duplication |
| b. Wnt signaling | 2. Cyclopic eye of lambs |
| c. Notch signaling | 3. Vertebrate limb development |
| d. Hox genes | 4. Nematode germ cell proliferation |
- (A) a-1, b-2, c-3, d-4
 (B) a-3, b-4, c-1, d-2
 (C) a-4, b-1, c-2, d-3
 (D) a-2, b-1, c-4, d-3
- Q.13 Which one of the following gives rise to bone?
- (A) Somites
 (B) Osteoclasts
 (C) Chondrocytes
 (D) Osteocytes

- Q.14 The Michaelis-Menton constant K_m is a measure of _____.
- (A) The rate of the reaction
 - (B) The affinity of the enzyme for the substrate
 - (C) The concentration of the enzyme-substrate (ES) intermediate
 - (D) None of the above
- Q.15 Which one of the following is the major force of attraction that stabilizes the three dimensional structure of globular proteins?
- (A) Peptide bond
 - (B) Van der Waal's interactions
 - (C) Hydrogen bonds
 - (D) Hydrophobic interactions between the side chains
- Q.16 The histone H1 is present in the _____.
- (A) Linker region
 - (B) Nucleosome
 - (C) Nucleolus
 - (D) hnRNPs
- Q.17 Proper execution of cell division cycle is ensured by _____.
- (A) Apoptosis
 - (B) DNA polymerases
 - (C) Cyclins
 - (D) Proteins of the cell cycle checkpoints
- Q.18 The following is a list of subcellular structures and their functions. Choose the option that correctly matches the subcellular structures to their functions.
- | | |
|----------------|-----------------------------|
| a. Tonoplast | 1. Lipid biosynthesis |
| b. Peroxisomes | 2. Protein degradation |
| c. Endosome | 3. Storage of starch |
| d. Proteasome | 4. Removal of free radicals |
- (A) a-1, b-2, c-3, d-4
 - (B) a-3, b-4, c-1, d-2
 - (C) a-3, b-4, c-2, d-1
 - (D) a-1, b-2, c-4, d-3
- Q.19 Choose the correct statement.
- (A) The endosymbiotic theory views that organelles like mitochondria were once free living organisms.
 - (B) Endosymbiotic theory states that bacteria, like *E. coli*, were once endoparasites.
 - (C) Endosymbiotic theory states that endospores are prone to parasitic bacterial infection.
 - (D) Endosymbiotic theory states that endospores exist in symbiotic association with bacteria.
- 20 Cohort is defined as _____.
- (A) Individuals in a population with all of very different age.
 - (B) Individuals in a population with approximately same age.
 - (C) Individuals belonging to different species of animals.
 - (D) Individuals exhibiting most diverse behaviour in a population.

- Q.21 The neotropical biogeographical region for terrestrial species include _____.
- (A) India and Indonesia (B) Southern Africa
(C) South America (D) Australia
- Q.22 Pseudocoelomate body cavity is found in _____.
- (A) *Caenorhabditis elegans* (B) *Octopus vulgaris*
(C) *Fasciola hepatica* (D) *Lumbricus terrestris*
- Q.23 Asexual reproduction by longitudinal binary fission occurs in the protozoan _____.
- (A) Paramecium (B) Plasmodium (C) Amoeba (D) Trypanosoma
- Q.24 According to fossil history, Hyacotherium is an ancestor of _____.
- (A) Hayena (B) Horse (C) Elephant (D) Lion
- Q.25 Immunoglobulin IgG has 4 chains held by disulphide bonds. The maximum number of different amino acids present at the C terminal end of a monoclonal IgG is _____.
- (A) 1 (B) 2 (C) 3 (D) 4
- Q.26 There is a change of concentration of ions during formation of urine, the concentration in urine being higher than that in plasma in healthy humans. The correct order of change in ion concentration between plasma and urine is _____.
- (A) $\text{NH}_4^+ > \text{PO}_4^{3-} > \text{K}^+ > \text{Na}^+$ (B) $\text{PO}_4^{3-} > \text{K}^+ > \text{Na}^+ > \text{NH}_4^+$
(C) $\text{NH}_4^+ > \text{PO}_4^{3-} > \text{Na}^+ > \text{K}^+$ (D) $\text{Na}^+ > \text{K}^+ > \text{PO}_4^{3-} > \text{NH}_4^+$

Linked Answer Questions: Q27a to Q28b carry two marks each

Statement for Linked Answer Questions 27a & 27b: Assume genes *a*, *b* and *c* are on the same chromosome. In a mating experiment to map the relative positions of these three genes, the following results were obtained:

1. Out of 500 progenies of the parents with the genotype $a(-) b(-) / a(+) b(+)$, 20 were $a(-) b(-) / a(-) b(+)$.
 2. Out of 1000 progenies of the parents with the genotype $a(-) c(-) / a(+) c(+)$, 80 were $a(-) c(-) / a(+) c(-)$.
- Q.27a What are the frequencies of recombination between *a* and *b*, and between *a* and *c*?
- (A) 8 and 4 (B) 24 and 12 (C) 4 and 8 (D) 12 and 24
- Q.27b Which one of the following is definitely true in terms of the relative map positions?
- (A) *a* is closer to *c* than to *b* (B) *a* is closer to *b* than to *c*
(C) *b* is closer to *a* than to *c* (D) *c* is closer to *b* than to *a*

Statement for Linked Answer Questions 28a & 28b: Assume that a population meets Hardy-Weinberg conditions, where p and q are dominant and recessive alleles.

Q.28a Which of the following equations can be used to determine the genotype frequency

- (A) $p + q = 1$
- (B) $p^2 + 2pq + q^2 = 1$
- (C) $pp \times q = 1$
- (D) $(p+q)(p-q) = 1$

Q.28b In a population where 1% of people are homozygous recessive, the percentage of people with heterozygous genotype is _____.

- (A) 90%
- (B) 9%
- (C) 10%
- (D) 18%