



General Instructions

- (i) The test is of 1 hours duration.
- (ii) The Biology paper consists of two sections namely Botany & Zoology having 45 questions each. The maximum marks are 360.
- (iii) Each question carries +4 marks for correct answer and –1 mark for wrong answer.

Botany

91. In angiosperms, root hairs arise from which one of the following regions of the root ?

- (A) The root cap zone
- (B) The region of meristematic activity
- (C) The region of elongation
- (D) The region of maturation

92. In which one of the following, the ovules are *not* enclosed by an ovary wall and remain exposed ?

- (A) Funaria
 - (B) Pinus
 - (C) Selaginella
 - (D) Wolffia
-

93. In the *lac* operon, the *z* gene codes for :

- (A) permease
 - (B) transacetylase
 - (C) beta-galactosidase
 - (D) the repressor of *lac* operon
-

94. Exploring molecular, genetic and species-level diversity for products of economic importance is called :

- (A) Biofortification
 - (B) Bioremediation
 - (C) Bioprospecting
 - (D) Biomagnification
-

95. Match List I with List II :

List I

- A. Genetically modified organism
- B. Thermostable DNA polymerase
- C. Ti plasmid
- D. pBR322

List II

- I. *Agrobacterium tumefaciens*
- II. Bt cotton
- III. *Thermus aquaticus*
- IV. *Escherichia coli*

Choose the correct answer from the options given below :

- (A) A-II, B-III, C-I, D-IV
 - (B) A-II, B-I, C-IV, D-III
 - (C) A-I, B-IV, C-III, D-II
 - (D) A-I, B-II, C-IV, D-III
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96. Match List I with List II :

List I

- A. Productivity
- B. Net primary productivity
- C. Gross primary productivity
- D. Secondary productivity

List II

- I. Gross primary productivity minus respiration losses
 - II. Rate of formation of new organic matter by consumers
 - III. Rate of biomass production
 - IV. Rate of production of organic matter during photosynthesis
-

Choose the correct answer from the options given below :

- (A) A-III, B-I, C-IV, D-II
 - (B) A-I, B-II, C-III, D-IV
 - (C) A-I, B-III, C-IV, D-II
 - (D) A-III, B-I, C-II, D-IV
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97. Since the origin and diversification of life on Earth, there have been five episodes of mass extinction of species. How is the sixth extinction, which is in progress, different from the previous episodes ?

- (A) The present net species extinction rate is zero.
 - (B) The current species extinction rate is nearly 10 times faster than that in previous episodes.
 - (C) The present species extinction rates are 100 to 1000 times faster than in the pre-human times.
 - (D) The current species extinction rates are far lower than those in previous episodes.
-

98. Alpha-helix is found in which level of protein structure ?

- (A) Secondary structure
 - (B) Tertiary structure
 - (C) Primary structure
 - (D) Quaternary structure
-

99. The main function of bulliform cells in grasses is :

- (A) to make the leaf impermeable to fungal spores.
 - (B) to transport water.
 - (C) to perform photosynthesis.
 - (D) to minimize water loss during water stress.
-

100. Identify the correct sequence of steps in each cycle of Polymerase Chain Reaction :

- (A) Extension → Annealing → Denaturation
 (B) Annealing → Denaturation → Extension
 (C) Denaturation → Extension → Annealing
 (D) Denaturation → Annealing → Extension

101. Match List I with List II :

	List-I (Phase of cell cycle)		List-II (Activity)
A.	G ₁ phase	I.	Actual cell division occurs
B.	S phase	II.	Cell is metabolically active and continuously grows but does not replicate its DNA
C.	G ₂ Phase	III.	Synthesis of DNA occurs and the amount of DNA per cell doubles
D.	M phase	IV.	Proteins are synthesized while cell growth continues

Choose the correct answer from the options given below :

- (A) A-IV, B-I, C-II, D-III
 (B) A-I, B-II, C-III, D-IV
 (C) A-III, B-IV, C-I, D-II
 (D) A-II, B-III, C-IV, D-I

102. Which of the following statements are correct ?

- A. The Amazon rainforest being cut and cleared for cultivation of soyabeans is an example of habitat loss.
 B. Steller's sea cow and passenger pigeon became extinct due to over-exploitation by humans.
 C. The Nile perch introduced into Lake Victoria in East Africa helped in population growth of cichlid fish in the lake.
 D. Water hyacinth is an invasive species.
 E. When a species becomes extinct, the plant and animal species associated with it are not affected.

Choose the correct answer from the options given below :

- (A) A, B and E only
 - (B) A, B and D only
 - (C) C, D and E only
 - (D) B, C and D only
-

103. Which of the following statements are correct with reference to a transcription unit?

- A. A transcription unit in DNA is defined primarily by three regions : promoter, structural gene and terminator.
- B. The promoter is said to be located towards the 5'-end of the structural gene.
- C. The promoter is a DNA sequence that provides binding site for RNA polymerase .
- D. The promoter defines the template and coding strands.
- E. The terminator is located towards the 3'-end of the coding strand and it defines the end of the process of transcription.

Choose the correct answer from the options given below :

- (A) A, B, C and D only
 - (B) A, C, D and E only
 - (C) B, C, D and E only
 - (D) A, B, C, D and E
-

104. Which one of the following statements is *not* true about the universal rules of binomial nomenclature ?

- (A) Biological names are generally in Latin.
 - (B) Both the words in a biological name, when handwritten, are separately underlined or printed in italics.
 - (C) The specific epithet in the biological name starts with a small letter.
 - (D) The first word in the biological name represents the specific epithet, while the second component denotes the genus.
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105. Match List I with List II :

List I	List II
A. Decomposition	I. Accumulation of dark coloured amorphous colloidal substance
B. Detritus	II. Release of inorganic nutrients by the activity of microbes in soil
C. Mineralisation	III. Breaking down of complex organic matter into inorganic substances
D. Humification	IV. Dead remains of plants and animals including fecal matter

Choose the correct answer from the options given below :

- (A) A-IV, B-III, C-I, D-II
 - (B) A-III, B-IV, C-II, D-I
 - (C) A-I, B-II, C-III, D-IV
 - (D) A-III, B-II, C-I, D-IV
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106. Which one of the following is the site for active ribosomal RNA synthesis ?

- (A) Centrosome
 - (B) Chromatin
 - (C) Nucleolus
 - (D) Kinetochore
-

107. $2(\text{C}_{51}\text{H}_{98}\text{O}_6) + 145 \text{O}_2 \rightarrow 102 \text{CO}_2 + 98 \text{H}_2\text{O} + \text{energy}$ The Respiratory Quotient (RQ) of a biomolecule used for respiration, as per the above equation, would be :

- (A) Between 0.5 and 0.95
 - (B) Less than 0.5
 - (C) 1.0
 - (D) Between 1.25 and 2
-

108. Match List I with List II :

List I	List II
A. Incomplete dominance	I. Human skin colour
B. Co-dominance	II. Inheritance of flower colour in <i>Antirrhinum</i> sp.
C. Pleiotropy	III. Phenylketonuria disease in humans
D. Polygenic inheritance	IV. ABO blood groups

Choose the correct answer from the options given below :

- (A) A-II, B-IV, C-III, D-I
 - (B) A-I, B-III, C-II, D-IV
 - (C) A-I, B-IV, C-III, D-II
 - (D) A-II, B-I, C-III, D-IV
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109. Arrange the following steps of DNA fingerprinting in a correct sequence.

- A. Isolation of DNA and its digestion by restriction endonucleases.
- B. Hybridisation using a labelled VNTR probe.
- C. Transferring of separated DNA fragments to synthetic membranes.
- D. Detection of hybridised DNA fragments by autoradiography.
- E. Separation of DNA fragments by electrophoresis.

Choose the correct answer from the options given below :

- (A) A, B, D, C, E
 - (B) A, D, B, E, C
 - (C) A, E, C, B, D
 - (D) A, E, B, C, D
-

110. Which of the following statements are correct with reference to packaging of DNA helix ?

- A. Histones are organized to form a unit of eight molecules called histone octamer.
- B. Histones are negatively charged, basic proteins.
- C. Histones are rich in the basic amino acid residues – lysine and arginine.
- D. The positively charged DNA is wrapped around the histone octamer to form nucleosome.
- E. The packaging of chromatin at higher levels requires an additional set of proteins called non-histone chromosomal proteins.

Choose the correct answer from the options given below :

- (A) A, C and E only
 - (B) B, D and E only
 - (C) C, D and E only
 - (D) A, B and D only
-

111. Find the *incorrect* statement(s) about photosynthesis from the following :

- A. The water splitting complex is associated with PS II.
- B. C_4 plants use the C_3 pathway of CO_2 fixation as the main biosynthetic pathway.
- C. In C_4 plants, photorespiration does not occur.
- D. C_3 plants exhibit 'Kranz' anatomy.
- E. ATP synthesis in chloroplast occurs through chemiosmosis.

Choose the answer from the options given below :

- (A) B and C only
 - (B) B only
 - (C) B and E only
 - (D) A and D only
-

112. Arrange the following steps of *somatic hybridisation* in a correct sequence.

- A. Digestion of cell walls.
- B. Isolation of naked protoplasts.
- C. Fusion of protoplasts to get hybrid protoplast.
- D. Isolation of single cells from two different varieties of plants.
- E. Growing of hybrid protoplast to form a new plant.

Choose the correct answer from the options given below :

- (A) D, A, B, C, E
 - (B) E, B, A, D, C
 - (C) D, B, A, E, C
 - (D) E, A, B, C, D
-

113. Match List I with List II :

List I	List II
A. Conjunctive tissue	I. Specialised cells in the vicinity of guard cells
B. Casparian strips	II. Endodermal cells rich in starch
C. Subsidiary cells	III. Tissue between xylem and phloem
D. Starch sheath	IV. Endodermal cells with suberin deposition

Choose the correct answer from the options given below :

- (A) A-IV, B-III, C-I, D-II
 - (B) A-III, B-IV, C-II, D-I
 - (C) A-III, B-IV, C-I, D-II
 - (D) A-IV, B-III, C-II, D-I
-

114. Which one of the following is *not* a characteristic of plant cells in the phase of elongation

?

- (A) New cell wall deposition
 - (B) Cell enlargement
 - (C) Increased vacuolation
 - (D) Large conspicuous nuclei
-

115. Match List I with List II :

List I (Growth Regulator)	List II (Function/Effect)
A. 2,4-D	I. Brewing industry
B. GA ₃	II. Stimulation of stomatal closure
C. Kinetin	III. Herbicide
D. ABA	IV. Nutrient mobilisation

Choose the correct answer from the options given below :

- (A) A-III, B-I, C-IV, D-II
 - (B) A-IV, B-III, C-II, D-I
 - (C) A-I, B-IV, C-III, D-II
 - (D) A-I, B-II, C-IV, D-III
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116. The enzyme required for carboxylation in the Calvin cycle is :

- (A) Hexokinase
 - (B) PEP carboxylase
 - (C) RuBP carboxylase – oxygenase
 - (D) Carboxypeptidase
-

117. How many ATP and NADPH molecules are required to make one molecule of glucose through the Calvin pathway ?

- (A) 18 ATP and 12 NADPH

- (B) 12 ATP and 18 NADPH
(C) 24 ATP and 18 NADPH
(D) 6 ATP and 12 NADPH
-

118. Which of the following floral formula is the correct floral formula of Solanaceae family ?

- (A) $\oplus \text{ } \% \text{ } K_{(5)} \text{ } C_{(5)} \text{ } A_5 \text{ } \underline{G}_{(2)}$
(B) $\oplus \text{ } K_{(5)} \text{ } C_{(5)} \text{ } A_5 \text{ } \underline{G}_{(2)}$
(C) $\oplus \text{ } K_5 \text{ } C_5 \text{ } A_5 \text{ } \underline{G}_{(2)}$
(D) $\oplus \text{ } K_5 \text{ } C_{(5)} \text{ } A_5 \text{ } \underline{G}_{(2)}$
-

119. Which of the following is an *in situ* conservation method ?

- (A) Sacred Groves
(B) Wildlife Safari Parks
(C) Botanical Gardens
(D) Seed Banks
-

120. Which of the following statements are *not* true regarding restriction endonucleases ?

- A. They are called molecular scissors.
B. These are the enzymes responsible for restricting the growth of bacteriophages in *E. coli*.
C. They cut the DNA only at the centre of the palindromic sites.
D. They remove nucleotides only from the ends of DNA fragments.
E. They recognise specific palindromic base-pair sequences.

Choose the answer from the options given below :

- (A) A and B only
(B) A and E only
(C) D and E only
(D) C and D only
-

121. In racemose inflorescence, _____.

- (A) the main axis terminates in a flower
- (B) flowers are solitary
- (C) the growth is limited
- (D) flowers are borne in an acropetal succession

122. Arrange the following in the correct developmental sequence related to microsporogenesis :

- A. Microspore tetrads**
- B. Sporogenous tissue**
- C. Pollen grains**
- D. Pollen mother cells**

Choose the correct answer from the options given below :

- (A) D, A, C, B
- (B) B, D, A, C
- (C) B, D, C, A
- (D) A, D, C, B

123. Identify the correct statements about biomolecules.

- A. Lipids are generally water soluble.**
- B. Proteins are polypeptides.**
- C. Polysaccharides are long chains of sugars.**
- D. Adenine and guanine are substituted pyrimidines.**
- E. Almost all enzymes are proteins.**

Choose the correct answer from the options given below :

- (A) B, D and E only

- (B) B, C and E only
- (C) A, B and C only
- (D) C, D and E only

124. Which of the following statements are true with reference to the sex-determination in honeybees ?

- A. An offspring formed from the union of a sperm and an egg, develops as a female (queen or worker).**
- B. An unfertilized egg develops as a male by parthenogenesis.**
- C. A male has half the number of chromosomes than that of a female.**
- D. Males produce sperms by meiosis.**
- E. Honeybees have a haplodiploid sex-determination system.**

Choose the correct answer from the options given below :

- (A) A, B, C and E only
- (B) B, C, D and E only
- (C) A, B, C and D only
- (D) A, B, D and E only

125. Heterophyllous development in response to environment is an example of which of the following phenomena ?

- (A) Redifferentiation
- (B) Elasticity
- (C) Dedifferentiation
- (D) Plasticity

126. Which of the following statements are correct regarding amino acids ?

- A. They are substituted methanes.**
- B. Serine is an aromatic amino acid.**

C. Valine is a neutral amino acid.

D. Lysine is an acidic amino acid.

Choose the correct answer from the options given below :

(A) C and D only

(B) B and C only

(C) A and C only

(D) A and B only

127. "The Evil Quartet" of biodiversity loss includes which of the following ?

(A) Over-exploitation; Alien species invasions; Air pollution; Co-extinctions

(B) Habitat loss and fragmentation; Air pollution; Water pollution; Co-extinctions

(C) Habitat loss and fragmentation; over-exploitation; Alien species invasions; Co-extinctions

(D) Over-exploitation; Alien species invasions; Soil pollution; Co-extinctions

128. Match List I with List II :

List I (Process)

A. Glycolysis

B. ETS

C. Accumulation of protons

D. Krebs' cycle

List II (Location)

I. Inner mitochondrial membrane

II. Mitochondrial matrix

III. Cytoplasm

IV. Intermembrane space

Choose the correct answer from the options given below :

(A) A-IV, B-II, C-I, D-III

(B) A-II, B-III, C-IV, D-I

(C) A-III, B-I, C-IV, D-II

(D) A-I, B-IV, C-III, D-II

129. Which one of the following is a triploid cell ?

- (A) Synergid
 - (B) Central cell
 - (C) Zygote
 - (D) Primary endosperm cell
-

130. Which one of the following types of pollination brings genetically different types of pollen grains to the stigma ?

- (A) Autogamy
 - (B) Xenogamy
 - (C) Geitonogamy
 - (D) Cleistogamy
-

131. Match List I with List II :

List I (Placentation)	List II (Example)
A. Marginal	I. Mustard
B. Axile	II. Pea
C. Parietal	III. Marigold
D. Basal	IV. Lemon

Choose the correct answer from the options given below :

- (A) A-II, B-IV, C-I, D-III
 - (B) A-I, B-III, C-II, D-IV
 - (C) A-III, B-I, C-IV, D-II
 - (D) A-IV, B-II, C-I, D-III
-

132. The main criteria used for Five Kingdom Classification proposed by R.H. Whittaker (1969) included :

- A. Cell structure
- B. Body organization
- C. Presence of flagellum

D. Reproduction

E. Phylogenetic relationships

Choose the correct answer from the options given below :

- (A) A, B, C, D and E
- (B) B, C and D only
- (C) A, B, D and E only
- (D) A, B and E only

133. Match List I with List II :

List I	List II
A. Trypsin	I. Intercellular ground substance
B. Morphine	II. Lectin
C. Concanavalin A	III. Enzyme
D. Collagen	IV. Alkaloid

Choose the correct answer from the options given below :

- (A) A-III, B-IV, C-II, D-I
- (B) A-I, B-II, C-III, D-IV
- (C) A-IV, B-III, C-II, D-I
- (D) A-III, B-II, C-IV, D-I

134. Which of the following statements are correct with respect to DNA separation, isolation and visualization ?

- A. The cutting of DNA is done by molecular scissors.
- B. The DNA fragments separate according to their size in an agarose gel, upon electrophoresis.
- C. The separated DNA fragments can be seen without staining when exposed to UV light.
- D. The separated DNA fragments, when stained with ethidium bromide, can be seen in visible light.

Choose the correct answer from the options given below :

- (A) B and D only

- (B) A and B only
 - (C) B and C only
 - (D) A and D only
-

135. Which one of the following disorders is caused by the substitution of Glutamic acid (Glu) by Valine (Val) at the sixth position of the beta globin chain of the haemoglobin molecule ?

- (A) Thalassemia
 - (B) Sickle-cell anaemia
 - (C) Phenylketonuria
 - (D) Haemophilia
-