



# Very Similar

# PRACTICE PAPER

Time : 3 Hours

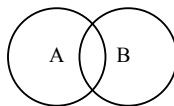
Max. Marks : 720

## BOTANY

### SECTION-A

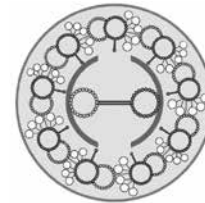
101. Which of the following plant hormones reduces transpiration rate by inducing stomatal closure?  
(a) ABA (b) Cytokinin (c) Ethylene (d) Gibberellin
102. Which one of the following nutrient elements is almost non-essential for plants?  
(a) Zn (b) Na (c) Ca (d) Mo
103. In order to lessen the suffering of phenylketonurics their diet should have  
(a) no phenylalanine and no tyrosine  
(b) little or no phenylalanine and normal requirement of tyrosine  
(c) high amount of phenylalanine  
(d) normal amount of both phenylalanine and tyrosine.
104. The first step in dark reaction of photosynthesis is  
(a) formation of ATP  
(b) ionization of water  
(c) attachment of CO<sub>2</sub> to a pentose sugar  
(d) excitement of electron of chlorophyll by a photon of light.
105. Which one of the following is correct expanded form of the acronym?  
(a) IPCC = International Panel for Climate Change  
(b) UNEP = United Nations Environmental Policy  
(c) EPA = Environmental Pollution Agency  
(d) IUCN = International Union for Conservation of Nature
106. Agar-agar which is extensively used in all microbiological studies and culture media is an important product of sea resources and is obtained from which group of algae?  
(a) Brown algae (b) Green algae  
(c) Red algae (d) Diatoms and dinoflagellates
107. In which cell organelles the genome system is autonomous?  
(a) Ribosomes and chloroplasts  
(b) Mitochondria and chloroplasts  
(c) Mitochondria and ribosomes  
(d) Golgi bodies and ribosomes
108. Sickle cell anaemia results due to  
(a) change of amino acid in  $\alpha$ -chain of haemoglobin  
(b) change of amino acid in  $\beta$ -chain of haemoglobin  
(c) change of amino acid in both  $\alpha$  and  $\beta$  chains of haemoglobin  
(d) change of amino acid in either  $\alpha$  or  $\beta$  chains of haemoglobin.
109. According to taxonomic hierarchy,  
(a) *Felis* and *Canis* are placed under the same family  
(b) potato and brinjal belong to the same genus  
(c) classes of plants with few similar characters are assigned to higher category called order  
(d) *Panthera leo* and *Felis domestica* are placed in different families.
110. When man eats fish which feeds on zooplanktons which have eaten small plants, the second trophic level in this chain is occupied by  
(a) small plants (b) fish  
(c) man (d) zooplankton.
111. Enzyme used in photorespiration is  
(a) phosphoglycerate kinase (b) aldolase  
(c) RuBisCO (d) decarboxylase.
112. The result of the following reaction/experiment carried out by Avery *et al.* on *Streptococcus pneumoniae* has proved that DNA is the genetic material.  
(a) Live 'R' strain + DNA from 'S' strain + DNase  
(b) Heat killed 'R' strain + DNA from 'S' strain + DNase  
(c) Live 'R' strain + DNA from 'S' strain + RNase  
(d) Live 'R' strain + DNA of 'S' strain + protease
113. Plants which produce an enormous diversity of substances that have no apparent role in growth and development processes are classified under the heading of  
(a) primary metabolites (b) secondary metabolites  
(c) necessary metabolites (d) tertiary metabolites.
114. A scrubber in the exhaust of a chemical industrial plant removes  
(a) gases like sulphur dioxide  
(b) particulate matter of the size 5 micrometer or above  
(c) gases like ozone and methane  
(d) particulate matter of the size 2.5 micrometer or less.
115. As a tree grows older, which of the following increases more rapidly in thickness?  
(a) Heartwood (b) Sapwood  
(c) Phloem (d) Cortex
116. O<sub>2</sub> evolution is directly associated with  
(a) PS I (b) PS II  
(c) phytochrome (d) phycocyanin.

117. Which of the following is considered a hotspot of biodiversity in India?  
 (a) Aravalli hills (b) Western ghats  
 (c) Indo-gangetic plain (d) Satpura range
118. Visible expression of the genetic phenomenon of crossing over is called  
 (a) linkage (b) condensation  
 (c) chiasmata (d) spiralisation.
119. VNTRs are identified during DNA profiling because  
 (a) the length of the regions having VNTRs is different in each individual  
 (b) the length of the regions having VNTRs is same in each individual  
 (c) they possess only exons  
 (d) VNTRs are same in all persons.
120. The equation of respiration is  
 (a)  $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 686 \text{ kcal}$   
 (b)  $C_6H_{12}O_6 + 2CO_2 \rightarrow 6CO_2 + 6H_2O + 686 \text{ kcal}$   
 (c)  $C_6H_{12}O_6 + 6CO_2 \rightarrow 6CO_2 + 6H_2O + 680 \text{ kcal}$   
 (d)  $C_6H_{12}O_6 + 6CO_2 \rightarrow 12CO_2 + 6H_2O + 686 \text{ kcal}$
121. Which of the following has maximum genetic diversity in India?  
 (a) Mango (b) Wheat  
 (c) Groundnut (d) Rice
122. Sub-class is an intermediate category which includes  
 (a) families (b) sub-families  
 (c) orders (d) sub-orders.
123. What is the value of regression coefficient Z when species area relationship is considered for a whole continent?  
 (a) 0.1 - 0.2 (b) 0.1 - 0.6 (c) 0.6 - 1.2 (d) 0.2 - 0.6
124. Cryopreservation is an (i) preservation technique in which seeds, embryos are stored at (ii) °C in (iii).  
 (i) (ii) (iii)  
 (a) *in situ* -186 liquid nitrogen  
 (b) *ex situ* -196 dry ice  
 (c) *in situ* -186 dry ice  
 (d) *ex situ* -196 liquid nitrogen
125. Which of the following statements regarding haplontic life cycle is incorrect?  
 (a) Sporophytic generation is represented only by the one-celled zygote.  
 (b) There is no free-living sporophyte.  
 (c) Mitosis in the zygote results in the formation of haploid spores.  
 (d) The haploid spores divide mitotically and form the gametophyte.
126. Which of the following can be correct with respect to the given figure?  
 (a) Some features may be common for two different species A and B.  
 (b) Niche overlapping  
 (c) Both species are capable of freely interbreeding.  
 (d) Both (a) and (b)
127. Match column I with the related column II and select the correct option from the given codes.



- | Column I        | Column II  |
|-----------------|--|
| A. Collenchyma  | (i) Pulp of guava  |
| B. Sclerenchyma | (ii) Protoxylem towards centre and metaxylem towards periphery |
| C. Exarch       | (iii) Deposition of cellulose and pectin                       |
| D. Endarch      | (iv) Arrangement of primary xylem in roots                     |
- (a) A-(iii), B-(iv), C-(i), D-(ii)  
 (b) A-(iii), B-(i), C-(iv), D-(ii)  
 (c) A-(iv), B-(ii), C-(iii), D-(i)  
 (d) A-(iv), B-(iii), C-(ii), D-(i)
128. Which of the following statements are correct?  
 (i) Golden colour of transgenic variety of *Oryza sativa* is due to  $\beta$ -carotene.  
 (ii) The enzyme polygalacturonase promotes hardening of transgenic tomatoes.  
 (iii) A protein hirudin is produced by transgenic *Brassica napus* which prevents blood clotting.  
 (iv) Insecticidal protein from *Bacillus thuringiensis* creates pores in midgut epithelial cells of insect and causes its death.  
 (a) (ii) and (iii) only (b) (i) and (ii) only  
 (c) (i), (iii) and (iv) only (d) (i) and (iii) only

129. Which of the following is correct for the given structure?

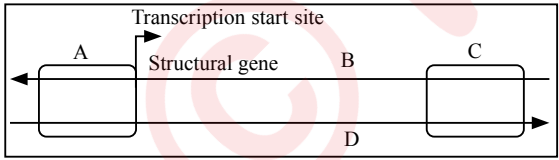


- (a) These are small hair like outgrowths of cell membrane.  
 (b) It works like oars and shows 9 + 2 arrangement of microtubules.  
 (c) Its core is called axoneme.  
 (d) All of these
130. The formation of recombination nodule and terminalisation of chiasmata occur respectively during  
 (a) pachytene and diakinesis (b) leptotene and zygotene  
 (c) zygotene and diakinesis (d) diplotene and diakinesis.
131. In a polygenic cross  $AaBbCc \times AaBbCc$ , the phenotypic ratio of offspring is 1 : 6 : 'X' : 20 : X : 6 : 1. What is the value of 'X'?  
 (a) 3 (b) 7 (c) 15 (d) 25
132. Select the common characters between Solanaceae and Liliaceae families.  
 A. Placentation in ovary B. Persistent calyx  
 C. Number of stamens D. Superior ovary  
 E. Endospermous seed  
 (a) A, C and D (b) A, D and E  
 (c) C, D and E (d) A, B and E

133. Read the following statements and select the correct option.  
**Statement A :** Anatomically, all the tissues present on the inner side of endodermis such as pericycle, vascular bundles and pith constitute the stele.  
**Statement B :** Endodermis is the innermost layer of cortex comprises of parenchymatous cells.
- (a) Both statements A and B are correct.  
 (b) Statement A is correct but statement B is incorrect.  
 (c) Statement A is incorrect but statement B is correct.  
 (d) Both statements A and B are incorrect.
134. Which pair is wrong?  
 (a) C<sub>3</sub> - maize  
 (b) C<sub>4</sub> - Kranz anatomy  
 (c) Calvin cycle - PGA  
 (d) Hatch and Slack cycle - OAA
135. Which of the following groups of plants possess cellular endosperm?  
 (a) Balsam, *Datura*, *Petunia*  
 (b) *Asphodelus*, *Datura*, *Petunia*  
 (c) *Triticum*, *Datura*, *Capsella*  
 (d) *Triticum*, *Petunia*, *Phoenix*

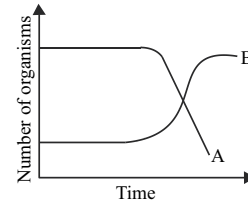
**SECTION-B**

Attempt any 10 questions out of 15.

136. How many kinds of given gametes would be expected from the cross AABBCc × aabbcc ?  
 I. P gametes  
 II. F<sub>1</sub> gametes  
 III. F<sub>2</sub> gametes  
 (a) I-16, II-24, III-16                      (b) I-8, II-27, III-8  
 (c) I-8, II-64, III-16                        (d) I-2, II-8, III-64
137. Refer to the given figure and consider the following statements regarding it.
- 
- I. A is present at 5' end of coding strand.  
 II. B is antisense strand having 3' → 5' polarity.  
 III. C may have AT rich region or palindromic sequences.  
 IV. D acts as non-template strand.
- Select the option which shows incorrect statement(s).  
 (a) I only    (b) II and III only  
 (c) III only    (d) III and IV only
138. Four different steps that occur during meiosis are given in the following list.  
 (i) Complete separation of chromatids  
 (ii) Pairing of homologous chromosomes  
 (iii) Lining up of paired chromosomes on equator  
 (iv) Crossing over between chromatids

- Select the correct sequential arrangement of the steps.  
 (a) (ii), (iii), (iv), (i)                      (b) (iii), (ii), (iv), (i)  
 (c) (ii), (iv), (iii), (i)                      (d) (iii), (i), (ii), (iv)

139. The following graph depicts changes in two populations A and B of herbivores in a grassy field. A possible reason for these changes is that



- (a) population A produced more offspring than population B  
 (b) population B consumed the members of population A  
 (c) plant population in this habitat decreased  
 (d) population B competed more successfully for food than population A.
140. Andalusian fowls have two pure forms — black and white. If black forms (BB) and white forms (WW) are crossed, F<sub>1</sub> individuals appear blue coloured (BW), due to incomplete dominance. Which of the following would be an outcome of a cross between black form and blue form?  
 (a) 1 Black : 2 Blue : 1 White  
 (b) 2 Black : 1 Blue  
 (c) 1 Black : 2 Blue  
 (d) 1 Black : 1 Blue

141. The given aestivation is \_\_\_\_\_ and is found in \_\_\_\_\_.



- (a) twisted, China rose                      (b) vexillary, pea  
 (c) valvate, *Calotropis*                      (d) imbricate, gulmohar
142. In plant X, both male and female flowers are present on same plant, however plant Y has either male or female flowers. Identify the examples of plant X and Y.
- | Plant X          | Plant Y  |
|------------------|----------|
| (a) Date palm    | Papaya   |
| (b) Coconut      | Maize    |
| (c) <i>Pinus</i> | Cucurbit |
| (d) Coconut      | Papaya   |
143. If the number of chromosomes in foot of bryophyte is 8, how many should be in its spores?  
 (a) 4                      (b) 8                      (c) 23                      (d) 16
144. Select the odd one w.r.t. stem tendrils.  
 (a) Pumpkins, *Vitis*                              (b) Cucumber, Watermelon  
 (c) *Pisum*, *Smilax*                                (d) Watermelon, *Vitis*
145. The deficiency of this micronutrient results in little leaf disease.  
 (a) Copper    (b) Zinc                      (c) Boron                      (d) Iron
146. The correct sequence of plants in a hydrosere is  
 (a) *Volvox* → *Hydrilla* → *Pistia* → *Scirpus* → *Lantana* → Oak

- (b) *Pistia* → *Volvox* → *Scirpus* → *Hydrilla* → Oak → *Lantana*  
 (c) Oak → *Lantana* → *Volvox* → *Hydrilla* → *Pistia* → *Scirpus*  
 (d) Oak → *Lantana* → *Scirpus* → *Pistia* → *Hydrilla* → *Volvox*.

147. Which of the following statements is incorrect?

- (a) Mitochondria, unless specifically stained are not easily visible under the microscope.  
 (b) Physiological activity of cells determines the number of mitochondria per cell.  
 (c) Mitochondrion, a power house of cell has DNA, RNA, ribosomes and enzymes, so it can survive outside the cell.  
 (d) Mitochondria divide by fission.

148. Read the given statements and select the correct option.

**Statement A :** The processing of *mRNA* transcript produced in eukaryotes in translation involves addition of poly A tail at 3' end.

**Statement B :** The *mRNA* transcript of eukaryotes has intervening sequences.

- (a) Statement A is correct but statement B is incorrect.  
 (b) Statement B is correct but statement A is incorrect.  
 (c) Both statements A and B are correct.  
 (d) Both statements A and B are incorrect.

149. For a plasmolysed cell, which equation is correct?

- (a)  $DPD = OP + TP$   
 (b)  $DPD = -TP$   
 (c)  $DPD = OP$   
 (d)  $DPD = OP - TP$

150. In *lac* operon if mutation occurs in the *lac y* 'structural gene', then

- (a)  $\beta$ -galactosidase will not be synthesised  
 (b) permease will not be synthesised  
 (c) transacetylase will not be synthesised  
 (d) lactose digestion will be rapid.

## ZOOLOGY

### SECTION-A

151. Read the given statements and select the correct option.

**Statement A :** All copulations do not lead to fertilisation and pregnancy.

**Statement B :** Fertilisation can only occur if about 1–2 million sperms are transported to the ampullary -isthmic region of female reproductive tract.

- (a) Both statements A and B are correct and statement B is the correct explanation of statement A.  
 (b) Both statements A and B are correct but statement B is not the correct explanation of statement A.  
 (c) Statement A is correct and statement B is incorrect.  
 (d) Both statements A and B are incorrect.

152. Complete the given table by correctly identifying A, B, C and D.

	Activity	Response
(i)	Blinking of eye	A
(ii)	Typing	B
(iii)	Breast feeding	C
(iv)	Peristalsis of alimentary canal	D

	A	B	C	D
(a)	Unconditioned reflex	Unconditioned reflex	Conditioned reflex	Cerebral reflex
(b)	Unconditioned reflex	Conditioned reflex	Unconditioned reflex	Unconditioned reflex
(c)	Conditioned reflex	Unconditioned reflex	Spinal reflex	Unconditioned reflex
(d)	Conditioned reflex	Conditioned reflex	Unconditioned reflex	Spinal reflex

153. If receptor molecules for hormone are removed from target organs, then the target organ will

- (a) not respond to the hormone  
 (b) continue to respond to the hormone but in the opposite way  
 (c) continue to respond to the hormone without any difference  
 (d) continue to respond to the hormone but will require higher concentration.

154. The reserve food in dinoflagellates is stored in the form of

- (a) leucosin and volutin (b) paramylum bodies  
 (c) starch and oils (d) pyrenoids.

155. The effect of competitive inhibitors can be overcome by

- (a) raising the concentration of the substrate  
 (b) raising the concentration of the enzyme  
 (c) raising the concentration of inhibitor  
 (d) raising the concentration of non-competitive inhibitor.

156. In the alveoli, formation of oxyhaemoglobin is not favoured by

- (a) low  $pCO_2$  (b) high  $pO_2$   
 (c) higher  $H^+$  concentration (d) lower temperature.

157. The matrix of mammalian bone can be distinguished by the presence of

- (a) Haversian canal (b) lacuna  
 (c) chromatophores (d) adipose cells.

158. If for some reason, the vasa efferentia in the human reproductive system gets blocked, the gametes will not be transported from

- (a) rete testis to epididymis (b) epididymis to vas deferens  
 (c) ovary to uterus (d) vagina to uterus.

159. Chancroid is caused by the infection of which of the following?

- (a) *Treponema pallidum* (b) *Neisseria gonorrhoeae*  
 (c) *Haemophilus ducreyi* (d) Hepatitis B virus

160. In some of the nephrons, the loop of Henle is very long and runs deep into the medulla. These nephrons are called

- (a) cortical nephrons (b) medullary nephrons  
 (c) juxtamedullary nephrons (d) juxtaglomerular nephrons.



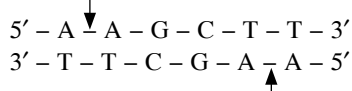
161. Which of the following is not an example of bony fish?  
 (a) *Labeo* (b) *Catla*  
 (c) *Clarias* (d) *Pristis*
162. Why is it difficult to differentiate between red and green colour objects in dark or in night?  
 (a) Rods work well only during daytime  
 (b) Cones work well only during daytime  
 (c) Rods work well only during night time  
 (d) Cones work well only during night time
163. Which of the following hormones are actually synthesised by the hypothalamus and are transported axonally to neurohypophysis?  
 (a) Gonadotropins (LH and FSH)  
 (b) Catecholamines (adrenaline and noradrenaline)  
 (c) TSH and ACTH  
 (d) Oxytocin and ADH
164. RNA interference causes silencing of a specific mRNA due to  
 (a) complementary dsRNA (b) complementary ssRNA  
 (c) complementary ssDNA (d) complementary dsDNA.
165. Find the odd one out.  
 (a) Terpene (b) Suberin  
 (c) Inulin (d) Cutin
166. Parthenogenesis is  
 (a) development of embryo without fertilization  
 (b) development of fruit without fertilization  
 (c) development of fruit without hormones  
 (d) development of embryo from fertilized egg.
167. In an ECG, the depolarisation of atria is indicated by  
 (a) P - wave (b) Q - wave  
 (c) R - wave (d) S - wave.
168. Which of the following statements holds true?  
 (a) Oxygen gets bound to haemoglobin in the tissue surface and gets dissociated at the lungs.  
 (b) When  $p\text{CO}_2$  is high and  $p\text{O}_2$  is low in the tissue, more binding of carbon dioxide occurs.  
 (c) At low  $p\text{CO}_2$  and high  $p\text{O}_2$  in the alveoli, binding of carbon dioxide takes place.  
 (d) RBCs contain a very low concentration of the enzyme, carbonic anhydrase.
169. Formation of recombinant insulin from proinsulin involves  
 (a) joining of C and A peptide with disulphide bridges  
 (b) removal of C peptide and joining of A and B peptides with disulphide bridge  
 (c) removal of disulphide bridge present between A and B peptides  
 (d) addition of disulphide bridge between B and C peptides.
170. Read the given examples of structural evidences and group them under the given appropriate columns.
- Fins of shark and flippers of dolphin
  - Mouthparts of cockroach and butterfly
  - Proteins in blood of man and apes
  - Stipules of *Lathyrus aphaca* and petiole of *Acacia auriculiformis*

5. Scales of *Asparagus* and spines of Barberrry

	Convergent evolution	Divergent evolution
(a)	1 and 3	2 and 4
(b)	1 and 4	2, 3 and 5
(c)	1, 2 and 3	4 and 5
(d)	1, 4 and 5	2 and 3

171. Which of the following is an opiate narcotic?  
 (a) Barbiturate (b) Morphine  
 (c) LSD (d) Amphetamines
172. Which of the following statements is incorrect regarding Cro-magnon man?  
 (a) He made ornaments from ivory and decorated his body.  
 (b) He had omnivorous diet.  
 (c) He used hides of animals to protect his body.  
 (d) He was not erect and bipedal.
173. Match the following and select the correct option.
- | Cerebral lobes    | Functions                                      |
|-------------------|--|
| A. Parietal lobe  | (i) Controls intellectual ability to abstract  |
| B. Occipital lobe | (ii) Sensory perception of heat and cold       |
| C. Frontal lobe   | (iii) Decodes and interprets sound             |
| D. Temporal lobe  | (iv) Decodes and interprets visual information |
- (a) A-(iii), B-(iv), C-(ii), D-(i)  
 (b) A-(ii), B-(iv), C-(i), D-(iii)  
 (c) A-(iv), B-(i), C-(iii), D-(ii)  
 (d) A-(i), B-(ii), C-(iv), D-(iii)
174. A person suffering from Addison's disease has  
 (a) high blood sugar level, and high  $\text{Na}^+$  and  $\text{K}^+$  in plasma  
 (b) low blood sugar level, low  $\text{Na}^+$  and high  $\text{K}^+$  in plasma  
 (c) high blood sugar level, low  $\text{Na}^+$  and  $\text{K}^+$  in plasma  
 (d) low blood sugar level, high  $\text{Na}^+$  and  $\text{K}^+$  in plasma.
175. What will happen if the stretch receptors of the urinary bladder wall are totally removed?  
 (a) There will be no voluntary control over micturition.  
 (b) Urine will continue to collect normally in the bladder.  
 (c) Frequency of expelling urine will decrease.  
 (d) Urine will collect in urethra.
176. Refer to the given figures and identify the statements correctly describing the process of selection.
- 
- (a) It describes the selection where population changes towards one particular direction.  
 (b) This selection also operates through differences in breeding potential, thus eliminating extremes from population.  
 (c) It increases variation and promotes evolutionary change.  
 (d) This type of selection favours both small sized and large sized individuals.

177. Which restriction enzyme recognises the given sequence?



- (a) *Hind* III (b) *Eco* RI (c) *Bam* HI (d) *Alu* I
178. Select the correctly matched pair.
- (a) Molecular glues - Restriction endonuclease  
 (b) Passenger DNA - Transposon  
 (c) Gene taxi - Plasmid  
 (d) Mobile genetic element - Foreign DNA
179. Which pair is not matched correctly?
- (a) Transgenic salmon - First transgenic animal for food production  
 (b) Transgenic pigs - Serve as bioreactors  
 (c) Transgenic sheep - "ANDI" carrying human gene for blood clotting factor IX  
 (d) Transgenic chicken - Resistant to avian leukosis virus
180. Identify the diseases caused by bioweapon agents.
- (i) Anthrax and plague (ii) Small pox and cholera  
 (iii) Botulinum and tularemia (iv) Typhoid and chicken pox  
 (a) (i) and (iii) only (b) (i) and (iv) only  
 (c) (ii) and (iv) only (d) (iii) and (iv) only
181. Match column I with column II and select the correct option.
- | Column I                           | Column II                              |
|------------------------------------|--|
| A. Microinjection                  | (i) Polyethylene glycol                |
| B. Electroporation                 | (ii) Used for oocytes, eggs and embryo |
| C. Biolistic method                | (iii) Calcium chloride                 |
| D. Chemical mediated gene transfer | (iv) High-velocity micro-projectiles   |
- (a) (i) (ii) (iv) (ii)  
 (b) (ii) (iv) (i) (iii)  
 (c) (ii) (iii) (iv) (i)  
 (d) (iv) (ii) (iii) (i)
182. Sphincter of Oddi found in human being guards
- (a) opening of hepato-pancreatic duct into duodenum  
 (b) opening of hepatic ducts before joining the cystic duct  
 (c) opening of stomach into duodenum  
 (d) opening of cystic duct into pancreatic duct.
183. Following are few characters of a disorder in human body.
- (i) Inflammation of the mucus membrane of nasal passage  
 (ii) Watery secretions by mucus glands  
 (iii) Continuous sneezing  
 (iv) Eye watering  
 (v) Rise in body temperature
- Identify the disorder from the choices given below.
- (a) Diphtheria (b) Rhinitis  
 (c) Bronchial carcinoma (d) Emphysema
184. Match column I with column II and select the correct option from the codes given below.
- | Column I                        | Column II          |
|---------------------------------|--------------------|
| A. <i>Aspergillus niger</i>     | (i) Acetic acid    |
| B. <i>Acetobacter aceti</i>     | (ii) Citric acid   |
| C. <i>Lactobacillus</i>         | (iii) Butyric acid |
| D. <i>Clostridium butylicum</i> | (iv) Lactic acid   |
- (a) A-(ii), B-(i), C-(iv), D-(iii)

- (b) A-(i), B-(iii), C-(iv), D-(ii)  
 (c) A-(ii), B-(iii), C-(i), D-(iv)  
 (d) A-(ii), B-(i), C-(iii), D-(iv)

185. Which one of the following pairs is not correctly matched?
- (a) *Streptomyces* - Antibiotic  
 (b) *Baculovirus* - Sewage treatment  
 (c) *Spirulina* - Single cell protein  
 (d) *Azotobacter* - Biofertilizer

## SECTION-B

Attempt any 10 questions out of 15.

186. Identify the correct pair.
- | Hormone          | Source            | Function                                   |
|------------------|-------------------|--|
| (a) Adrenaline   | Adrenal cortex    | Inhibition of gastrointestinal tract       |
| (b) Aldosterone  | Adrenal cortex    | Increase of sodium and water in blood      |
| (c) Serotonin    | Thymus            | Regulation of cyclic phenomena in the body |
| (d) Progesterone | Graafian follicle | Stimulates maturation of ova               |
187. In Lederberg's replica plating experiment what shall be used to obtain streptomycin resistant strain?
- (a) Minimal medium and streptomycin  
 (b) Complete medium and streptomycin  
 (c) Only minimal medium  
 (d) Only complete medium
188. In genetic engineering, a DNA segment (gene) of interest is transferred to the host cell through a vector. Consider the following four agents (i-iv) in this regard and select the correct option about which one or more of these can be used as a vector(s).
- (i) *Salmonella* (ii) Plasmid  
 (iii) *Escherichia* (iv) Bacteriophage  
 (a) (i), (ii) and (iv) only (b) (i) only  
 (c) (i) and (iii) only (d) (ii) and (iv) only
189. Which of the following is correct regarding cockroach?
- (a) Malpighian tubules are excretory organs projecting out from the colon.  
 (b) Oxygen is transported by haemoglobin in blood.  
 (c) Nitrogenous excretory product is urea.  
 (d) The food is ground by gizzard.
190. A flat, triangular bone of pectoral girdle, called \_\_\_\_ is located between \_\_\_\_ ribs.
- (a) scapula, 10<sup>th</sup> and 11<sup>th</sup> (b) clavicle, 2<sup>nd</sup> and 4<sup>th</sup>  
 (c) scapula, 2<sup>nd</sup> and 7<sup>th</sup> (d) clavicle, 8<sup>th</sup> and 10<sup>th</sup>
191. Radial symmetry is observed in
- |                    |                   |
|--------------------|-------------------|
| I. Platyhelminthes | II. Coelenterates |
| III. Aschelminthes | IV. Annelids      |
| V. Molluscs        |                   |
- (a) II, III and V only (b) I, II and V only  
 (c) IV only (d) II only.

192. Study the following statements and select the correct ones.

- (i) Methanogens are archaebacteria which produce methane in marshy areas.
  - (ii) *Nostoc* is a filamentous blue green alga which fixes atmospheric nitrogen.
  - (iii) Flexible body of *Euglena* is due to protein rich layer, called pellicle.
- (a) (i) and (ii) only                      (b) (i) and (iii) only  
 (c) (ii) and (iii) only                    (d) (i), (ii) and (iii)

193. Match column I with column II and select the correct option from the codes given below.

Column I	Column II
A. Structural and functional unit of a myofibril	(i) H-zone
B. Protein of thin filament	(ii) Myosin
C. Protein of thick filament	(iii) Sarcomere
D. The central part of thick filament not overlapped by thin filaments	(iv) Actin

(a) A-(i), B-(ii), C-(iii), D-(iv)  
 (b) A-(i), B-(iii), C-(ii), D-(iv)  
 (c) A-(i), B-(iv), C-(iii), D-(ii)  
 (d) A-(iii), B-(iv), C-(ii), D-(i)

194. Which of the following statements is incorrect?

- (a) Sympathetic neural system is also known as craniosacral division of autonomous neural system.
- (b) Deficiency of vitamin A can cause night blindness.
- (c) Malleus is the largest ear ossicle.
- (d) Cranial nerve IX is a mixed nerve.

195. Read the given statements and select the correct option.

- Statement A :** Colostrum provides passive immunity to the newborn.
- Statement B :** Colostrum is rich in immunoglobulin IgA.
- (a) Both statements A and B are correct.
  - (b) Statement A is incorrect but statement B is correct.
  - (c) Statement A is correct but statement B is incorrect.
  - (d) Both statements A and B are incorrect.

196. In five kingdom classification by Whittaker, the organisms which got no place are

- (a) unicellular algae
- (b) acellular algae and viruses
- (c) acellular slime moulds and viruses
- (d) viruses, viroids and lichens.

197. Read the following four statements (A-D) about certain mistakes in two of them.

- A. The first transgenic buffalo, Rosie produced milk which was human alpha-lactalbumin enriched.
- B. Restriction enzymes are used in isolation of DNA from other macromolecules.
- C. Downstream processing is one of the steps of rDNA technology.
- D. Disarmed pathogen vectors are also used in transfer of rDNA into the host.

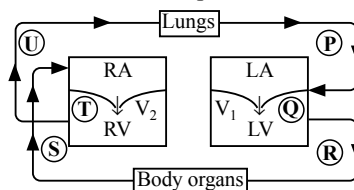
Which of the two statements have mistakes?

- (a) B and C    (b) C and D    (c) A and C    (d) A and B

198. The lining of intestinal wall from outside to inside is made up of

- (a) circular muscles → longitudinal muscles → mucosa → submucosa
- (b) longitudinal muscles → circular muscles → submucosa → mucosa
- (c) mucosa → submucosa → circular muscles → longitudinal muscles
- (d) submucosa → longitudinal muscles → circular muscles → mucosa.

199. Study the given flow diagram showing double circulation in humans and select the correct option.



- (a) P is the pulmonary vein and U is pulmonary artery carrying deoxygenated and oxygenated blood respectively.
- (b) R is the aorta, arising from left atrium and carries oxygen rich blood to body tissues.
- (c) Closure of valves Q and T produces first heart sound “lubb”.
- (d) Opening of S in right atrium is guarded by pulmonary semilunar valve.

200. Which of the following statements is incorrect regarding chordates?

- (a) Primitive chordates like urochordates and cephalochordates lack vertebral column.
- (b) All chordates are vertebrates but not all vertebrates are chordates.
- (c) In all vertebrates, a bony vertebral column is found.
- (d) In craniates, notochord is replaced by a vertebral column.

# Explanations

## BOTANY

**101. (a) :** ABA reduces transpiration rate by inducing stomatal closure, thus prevents further water loss from the leaves at times of less water availability.

**102. (b) :** Approximately 30 elements are universally present in all plants for their growth. Among these, 17 elements (C, O, H, N, K, Ca, Mg, P, S, Cl, Fe, Mn, B, Zn, Cu, Mo, Ni) are essential and the rest are non-essential. However, some of the non-essential elements have been found to be required in metabolic activities of certain plants. They include cobalt, silicon, sodium, vanadium, nickel, aluminium, etc. Sodium seems to be involved in membrane permeability though its essentiality has not been proved. These elements are called non-essential functional elements.

**103. (b) :** Phenylketonuria is an inborn error of metabolism in which an individual lacks an enzyme (phenylalanine hydroxylase, PAH) that converts amino acid phenylalanine into tyrosine. Phenylalanine gets accumulated and is converted into phenylpyruvic acid, which further results in mental retardation. In order to lessen the suffering of phenylketonurics, their diet should have low phenylalanine and normal amount of tyrosine.

**104. (c) :** The carbon dioxide in  $C_3$  plants combines with Ribulose 1, 5-bisphosphate (RuBP) and gives rise to a 3-C compound, phosphoglyceric acid. It is first stable product of  $C_3$  cycle. The process can be described as Calvin cycle.

**105. (d) :** IPCC – Intergovernmental Panel for Climate Change  
UNEP – United Nations Environment Programme  
EPA – Environmental Protection Act.

**106. (c) :** Agar is obtained from cell wall of *Gelidium* and *Gracilaria*, which are members of Rhodophyceae (Red algae).

**107. (b) :** Genome system is autonomous in mitochondria and chloroplasts. Both the organelles possess their own DNA, RNA and 70S ribosomes to have sufficient functional independence from cellular machinery. Hence, both of these organelles possess a great degree of functional autonomy.

**108. (b) :** Sickle cell anaemia is an autosomal hereditary disorder in which the erythrocytes become sickle shaped. The disorder or disease 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.

**109. (b)**

**110. (d) :** The transfer of food energy from producers to consumers through a series of organisms with repeated eating and being eaten is known as food chain. Green plants are the first link of food chain because they alone are capable of synthesising organic food by using light energy by photosynthesis. The sequence of given food chain is :

Small plants	→	Zooplanktons	→	Fish	→	Man
(Primary producer)		(Primary consumer)		(Secondary consumer)		(Tertiary consumer)

**111. (c) :** Photorespiration is light dependent process of oxygenation of RuBP and release of  $CO_2$  by photosynthetic organs of plant. The enzyme is RuBP - carboxylase - oxygenase (RuBisCO).

**112. (a)**

**113. (b) :** Secondary metabolites are not involved in primary metabolism (photosynthesis, respiration, etc.) and seem to have no direct function in growth and development of plants, e.g., rubber, gum, resin, tannins, flavonoids, etc.

**114. (a) :** Dust separation is carried out by scrubbers. They are of two types, dry and wet. Both can be used to separate particulate matter by passing through dry or wet packing material but more commonly they are employed in removing gaseous pollutants like  $SO_2$ .

**115. (a)**

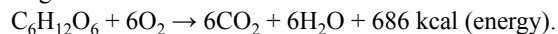
**116. (b) :** The liberation of  $O_2$  occur during photolysis of water and the splitting of water is associated with the PS II, where water splits into  $2H^+$ , oxygen and electrons.

**117. (b) :** Hotspots are areas with high density of biodiversity or megadiversity which are also the most threatened ones. Ecologically hotspots are determined by four factors – number of species/species diversity, degree of endemism, degree of threat to habitat due to its degradation and fragmentation, and degree of exploitation. India has three hotspots : Indo-Burma, Eastern Himalayas and Western Ghats.

**118. (c) :** Chiasmata is the point at which paired homologous chromosomes remain in contact as they begin to separate during the first prophase of meiosis, forming a cross shape (X-shaped structure). A number of chiasmata can usually be identified and at these points crossing over occurs.

**119. (a) :** VNTRs (Variable Number Tandem Repeats) are short nucleotide repeats in DNA and are very specific in each individual and vary in number from person to person but are inherited, and thus are the key factor in DNA profiling.

**120. (a) :** Respiration is the process by which the energy of the sun, captured during photosynthesis, is transferred to ATP and made available for the energy requirements of the cell *i.e.*, respiration is the release of energy by stepwise oxidation of organic substances (substrates). The overall reaction for the complete aerobic oxidation of glucose is



**121. (d) :** Genetic diversity is the diversity in the numbers and types of genes as well as chromosomes present in different species and the variations in the genes and their alleles in the same species. India has more than 50,000 genetically different strains of rice.

**122. (c)**

**123. (c)**

**124. (d)**

**125. (c) :** During haplontic life cycle, meiosis in the zygote results in the formation of haploid spores.

**126. (d) :** Niche overlapping occurs when two organisms use the same resource or other environmental variables.



127. (b)

128. (c) : In transgenic tomato, called Flavr savr, the gene coding for enzymes polygalacturonase is inactivated. The enzyme polygalacturonase promotes softening of the fruit. The non-availability of this enzyme prevents over-ripening of the fruit.

129. (d) : The given structure represents section of cilia/flagella. Cilia and flagella are hair-like outgrowths of the cell membrane. Cilia are small structures working like oars, causing the movement of either the cell or the surrounding fluid. Flagella in comparison are longer and responsible for cell movement. Both cilium and flagellum are covered with plasma membrane. Their core called axoneme, possesses a number of microtubules running parallel to the long axis.

130. (a) : Pachytene stage is characterised by the appearance of recombination nodules, the sites at which crossing over occurs between non-sister chromatids of the homologous chromosomes. In diakinesis, chiasmata shifts towards the end of chromosomes, this phenomenon is called terminalisation.

131. (c) : In polygenic inheritance, the number of phenotypes are 7 (1 : 6 : 15 : 20 : 15 : 6 : 1) when three polygene pairs are involved.

132. (b) : Both families Solanaceae and Liliaceae have axile placentation, superior ovary and endospermous seed. Persistent calyx is the characteristic of Family Solanaceae. Number of stamens in Solanaceae and Liliaceae are 5 and 6 respectively.

133. (a)

134. (a) : In maize  $C_4$  cycle takes place, so it is called  $C_4$  plant. Kranz anatomy is present in  $C_4$  plants. PGA is related to Calvin cycle and OAA to Hatch and Slack cycle as both are the first stable products in their corresponding cycles.

135. (a) : Cellular endosperm is present in balsam, *Datura* and *Petunia*.

136. (d) : From cross of  $AABBCC \times aabbcc$

P gametes will be ABC and abc = 2

$F_1$  gametes will ABC, AbC, Abc, aBC, aBc, abc = 8

Similarly

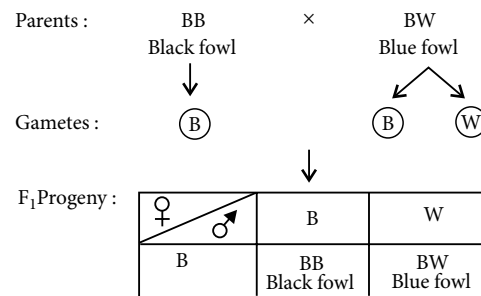
$F_2$  gametes can be calculated by formula  $2^n$  where n is the heterozygous loci, i.e.,  $2^8 = 64$

137. (c) : Promoter region represented by 'A' has AT rich region. C is terminator.

138. (c) : Pairing of homologous chromosomes occurs in zygotene and crossing over occurs in pachytene stage of prophase I of meiosis I. Paired chromosomes line up on equator in metaphase I. Then there is complete separation of chromatids in anaphase I of meiosis I.

139. (d) : Both the populations are herbivorous, thus they will not consume each other. If the food sources for these populations A and B have decreased, then both the populations A and B would have declined. If population A have produced more offspring then the graph A should have increased. Based on the graph, population B is more successful in competing with population A, that is why number of organisms in population B increased while that in population A decreased, as they get access to limited resources.

140. (d) : The cross between blue (BW) and black (BB) forms can be shown as follows :



Thus, black and blue individuals are produced in the ratio of 1 : 1.

141. (b)

142. (d)

143. (a)

144. (c) : In *Pisum*, leaflet is modified into tendril and in *Smilax*, stipules are modified into tendrils.

145. (b) : Deficiency of zinc results in leaf malformations like little leaf, leaf rosettes, interveinal chlorosis and several types of leaf distortions, white bud, stunted growth.

146. (a) : Hydrosere, succession in water (pond, pools, lakes, etc.) starts with the colonization of some phytoplanktons which form the pioneer plant community, and finally terminates into a forest, which is a climax community together with their chief components of vegetation.

The various stages together with their components of plant species of a hydrosere are phytoplankton stage, rooted submerged stage, rooted floating stage, reed swamp stage, marsh or sedge meadow stage, woodland stage and climax forest stage. *Volvox* is phytoplankton, *Hydrilla* is rooted submerged plant, *Pistia* is rooted floating plant, *Scirpus* is reed swamp plant, *Lantana* is sedge meadow plant and oak is woody tree.

147. (c)

148. (c) : Transcription in eukaryotes occurs within the nucleus and mRNA moves out of the nucleus into the cytoplasm for translation. The mRNA is processed from the primary RNA transcript. This is called post-transcriptional processing. This includes capping (7mG cap) at 5' end, tailing (poly A tail) at 3' end and splicing i.e., removal of introns (intervening sequences) and joining of exons (coding sequences) in a defined order.

149. (c) : If a plant cell is placed in hypertonic solution, plasmolysis occurs. As a result protoplast is reduced in size. This decreases turgor pressure. In a completely plasmolysed cell turgor pressure is zero. If the external solution does not cause any further exosmosis then,  $DPD = OP$ .

150. (b)

## ZOOLOGY

151. (c)

152. (b)

153. (a)

154. (c)

155. (a)

156. (c) : Increase in hydrogen ion concentration and decrease in pH (acidity) indicates dissociation of oxygen from haemoglobin.

157. (a) : The Haversian canal, a characteristic feature of the mammalian bones, are present in the matrix. Each Haversian canal contains an artery, a vein, a lymph vessel, a nerve and some bone cells, all packed in with connective tissue.

**158. (a)** : Vasa efferentia are fine ciliated ductules that arise from the seminiferous tubules of testis (where sperms are formed) and open into epididymis which is a mass of long narrow closely coiled tubule lying along the inner side of testis. Epididymis stores the sperms. Thus, if vasa efferentia gets blocked, sperms will not be transported from rete testis to epididymis.

**159. (c)**

**160. (c)** : In some of the nephrons, the loop of Henle is very long and runs deep into the medulla. These nephrons are called juxtamedullary nephrons.

**161. (d)** : *Pristis* (saw fish) is cartilaginous fish.

**162. (b)** : Cones operate only in bright light, hence the different type of cones (*i.e.*, blue, red or green-sensitive) are active during daytime or in presence of light. It is because of this reason, that the person is unable to differentiate between green and red colour in night time.

**163. (d)** : Oxytocin and ADH (vasopressin) hormones are actually synthesised by the hypothalamus and are transported axonally to neurohypophysis (posterior lobe of pituitary).

**164. (a)** : RNA interference (RNAi) takes place in all eukaryotic organisms as a method of cellular defense. This method involves silencing of a specific mRNA due to a complementary dsRNA molecule that binds to and prevents translation of the mRNA (silencing).

**165. (c)** : Inulin is a polysaccharide, while terpene, suberin and cutin are lipids.

**166. (a)** : Development of an organism from female gamete/egg without involving fertilization is parthenogenesis and when a fruit is developed by this technique, it is called parthenocary.

**167. (a)**

**168. (b)**

**169. (b)** : Human insulin is made up of 51 amino acids arranged in two polypeptide chains, A having 21 amino acids and B with 30 amino acids. The hormone develops from a storage product called pro-insulin. Pro-insulin has three chains, A, B and C. C – chain with 33 amino acids is removed prior to insulin formation. This C peptide is not present in the mature insulin and is removed during maturation into insulin. Chains A and B were produced separately, extracted and combined by creating disulphide bonds to form human insulin.

**170. (b)**

**171. (b)** : Morphine is an opiate narcotic. Opiate narcotics have strong analgesic and sedative effect and are extracted from the latex of poppy plant. They are useful during surgery.

**172. (d)** : Cro-magnon man is extinct modern man. He lived in caves with families. He made tools and weapons such as spear-heads, bows and arrows. He made ornaments from ivory and decorated his body. He had omnivorous diet and used hides of animals to protect his body.

**173. (b)**

**174. (b)**

**175. (a)** : Stretch receptors of the urinary bladder are responsible for stretch reflex. If these receptors are removed then autonomic nervous system control will not be there and bladder will always remain full and frequently pass urine into urethra.

**176. (b)**

**177. (a)**

**178. (c)** : Molecular glues - Ligase; Passenger DNA - Foreign DNA; Mobile genetic element - Transposon

**179. (c)** : ANDI is the first transgenic monkey.

**180. (a)**

**181. (c)**

**182. (a)** : The right and left hepatic ducts join to form the common hepatic duct which joins the cystic duct arising from gall bladder and forms common bile duct. The bile duct and pancreatic duct open together into duodenum as common hepato-pancreatic duct, guarded by sphincter of oddi.

**183. (b)**

**184. (a)**

**185. (b)** : Baculoviruses are pathogens that attack insects and other arthropods. These are used as biological control agents and have species - specific, narrow spectrum insecticidal applications.

**186. (b)**

**187. (a)** : To obtain streptomycin resistant mutants the material should be allowed to grow on a medium lacking streptomycin so that both mutant and wild types may grow. These colonies are imprinted on velvet dish to get a master plate replica by pressing the velvet on new agar plate. The exact replica of master plate were obtained. Replicas on the agar plates of minimal medium containing streptomycin were made, the replica colonies were not formed. The new colonies that did grow were naturally resistant to antibiotic.

**188. (d)**

**189. (d)** : Malpighian tubules are excretory organs present at junction of midgut and hindgut. Cockroach lacks respiratory pigment haemoglobin. It excretes uric acid as nitrogenous waste.

**190. (c)** : Scapula is large, triangular flat bone of pectoral girdle, situated in the dorsal part of thorax between second and seventh ribs.

**191. (d)** : In radial symmetry, body can be divided into similar halves by any plane passing through the central axis. Radial symmetry is found in coelenterates, ctenophores and echinoderms while annelids, aschelminthes, platyhelminthes, arthropods and molluscs exhibit bilateral symmetry. Sponges are mostly asymmetrical.

**192. (d)**

**193. (d)**

**194. (a)** : Parasympathetic neural system is known as craniosacral division of autonomous neural system.

**195. (a)**

**196. (d)** : Viruses, viroids and lichens are not given any place in five kingdom system of classification by Whittaker. The kingdoms defined by Whittaker are Monera, Protista, Fungi, Plantae and Animalia.

**197. (d)** : In 1997, the first transgenic cow, Rosie, produced human protein enriched milk. The milk contained the human alpha-lactalbumin and was nutritionally a more balanced product for human babies than natural cow-milk. Isolation of DNA from other macromolecule is achieved by treating the bacterial cells/plant or animal tissue with enzymes such as lysozyme (bacteria), cellulase (plant cells), chitinase (fungus).

**198. (b) :** The lining of intestine from outside to inside is made up of outermost serosa, muscularis consisting of outer longitudinal and inner circular muscle fibres, submucosa and innermost mucosa.

**199. (c) :** P–Pulmonary vein - carries oxygenated blood from lungs to left atrium. U is pulmonary artery, carries deoxygenated blood from right ventricle to lungs. Q and T are bicuspid and tricuspid

valves respectively. R is aorta, arising from left ventricle. S can be superior or inferior vena cava or coronary sinus.

**200. (c) :** Vertebrates possess notochord during the embryonic period and notochord is replaced by a cartilaginous or bony vertebral column.

---

