

**SOLVED
PAPER**

**NEET (UG)
07th May 2023**

**Code
F3**

Important Instructions :

- The test is of **3 hours 20 minutes** duration and Test Booklet contains **200** multiple choice questions (four options with a single correct answer) from **Physics, Chemistry and Biology (Botany and Zoology)**. **50** questions in each subject are divided into two **Section (A and B)** as per details given below:
 - Section A** shall consist of **35 (Thirty-five)** Questions in each subject (Question Nos- 1 to 35, 51 to 85, 101 to 135 and 151 to 185). All questions are compulsory.
 - Section B** shall consist of **15 (Fifteen)** Questions in each subject (Question Nos- 36 to 50, 86 to 100, 136 to 150 and 80 to 200). In Section B, a candidate needs to **attempt any 10 (Ten)** questions out of **15 (Fifteen)** in each subject.

Candidates are advised to read all 15 questions in each subject of Section B before they start attempting the question paper. In the event of a candidate attempting more than ten questions, the first ten questions answered by the candidate shall be evaluated.
- Each question carries **4** marks. For each correct response, the candidate will get **4** marks. For each incorrect response, one mark will be deducted from the total scores. **The maximum marks are 720.**
- Use **Blue/Black Ball Point Pen only** for writing particulars on this page/markings responses on Answer Sheet.
- Use of Electronic/Manual Calculator is prohibited.
- No part of the Test Booklet and Answer Sheet shall be detached under any circumstances.**
- The candidates will write the Correct Test Booklet Code as given in the Test Booklet/Answer Sheet in the Attendance Sheet.
- Compensatory time of one hour five minutes will be provided for the examination of three hours and 20 minutes duration, whether such candidate (having a physical limitation to write) uses the facility of scribe or not.

BOTANY

Section A

- Q. 101.** The phenomenon of pleiotropism refers to
- presence of two alleles, each of the two genes controlling a single trait.
 - a single gene affecting multiple phenotypic expression.
 - more than two genes affecting a single character.
 - presence of several alleles of a single gene controlling a single crossover.
- Q. 102.** In tissue culture experiments, leaf mesophyll cells are put in a culture medium to form callus. This phenomenon may be called as :
- Dedifferentiation
 - Development
 - Senescence
 - Differentiation
- Q. 103.** Movement and accumulation of ions across a membrane against their concentration gradient can be explained by
- Facilitated Diffusion
 - Passive Transport
 - Active Transport
 - Osmosis.
- Q. 104.** Among The Evil Quartet', which one is considered the most important cause driving extinction of species?
- Over exploitation for economic gain
 - Alien species invasions
 - Co-extinctions
 - Habitat loss and fragmentation
- Q. 105.** Upon exposure to UV radiation, DNA stained with ethidium bromide will show
- Bright blue colour
 - Bright yellow colour

- (1) S phase (2) G₁ phase
(3) G₁ phase (4) M phase
- Q. 119.** The process of appearance of recombination nodules occurs at which sub stage of prophase I in meiosis?
(1) Pachytene (2) Diplotene
(3) Diakinesis (4) Zygotene
- Q. 120.** How many ATP and NADPH₂ are required for the synthesis of one molecule of glucose during calvin cycle?
(1) 18 ATP and 12 NADPH₂
(2) 12 ATP and 16 NADPH₂
(3) 18 ATP and 16 NADPH₂
(4) 12 ATP and 12 NADPH₂
- Q. 121.** In the equation

$$\boxed{GPP - R = NPP}$$
 GPP is Gross Primary Productivity
 NPP is Net Primary Productivity
 R here is _____.
 (1) Respiratory quotient
 (2) Respiratory loss
 (3) Reproductive allocation
 (4) Photosynthetically active radiation
- Q. 122.** Large, colourful, fragrant flowers with nectar are seen in:
 (1) bird pollinated plants
 (2) bat pollinated plants
 (3) wind pollinated plants
 (4) insect pollinated plants
- Q. 123.** Spraying of which of the following phytohormone on juvenile conifers helps in hastening the maturity period, that leads to early seed production?
 (1) Gibberellic Acid
 (2) Zeatin
 (3) Abscisic Acid
 (4) Indole-3-butyric Acid
- Q. 124.** Which micronutrient is required for splitting of water molecule during photosynthesis?
 (1) molybdenum (2) magnesium
 (3) copper (4) manganese
- Q. 125.** Expressed Sequence Tags (ESTs) refers to
 (1) All genes that are expressed as proteins.
 (2) All genes whether expressed or unexpressed.
 (3) Certain important expressed genes.
 (4) All genes that are expressed as RNA.
- Q. 126.** Frequency of recombination between gene pairs on same chromosome as a measure of the distance between genes to map their position on chromosome, was used for the first time by
 (1) Sutton and Boveri
 (2) Alfred Sturtevant
 (3) Henking
 (4) Thomas Hunt Morgan
- Q. 127.** Given below are two statements:
Statement I: The forces generated by transpiration can lift a xylem-sized column of water over 130 meters height.
Statement II: Transpiration cools leaf surfaces sometimes 10 to 15 degrees, by evaporative cooling.
 In the light of the above statements, choose the **most appropriate** answer from the options given below:
 (1) Both **Statement I** and **Statement II** are incorrect.
 (2) **Statement I** is correct but **Statement II** is incorrect.
 (3) **Statement I** is incorrect but **Statement II** is correct.
 (4) Both **Statement I** and **Statement II** are correct.
- Q. 128.** In gene gun method used to introduce alien DNA into host cells, microparticles of _____ metal are used.
 (1) Zinc
 (2) Tungsten or gold
 (3) Silver
 (4) Copper
- Q. 129.** Given below are two statements: One is labelled as **Assertion A** and the other is labelled as **Reason R:**
Assertion A: Late wood has fewer xylary elements with narrow vessels.
Reason R: Cambium is less active in winters.
 In the light of the above statements, choose the **correct** answer from the options given below:
 (1) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.
 (2) **A** is true but **R** is false.
 (3) **A** is false but **R** is true.
 (4) Both **A** and **R** are true and **R** is the correct explanation of **A**.
- Q. 130.** What is the function of tassels in the corn cob?
 (1) To trap pollen grains
 (2) To disperse pollen grains
 (3) To protect seeds
 (4) To attract insects
- Q. 131.** In angiosperm, the haploid, diploid and triploid structures of a fertilized embryo sac sequentially are:
 (1) Antipodals, synergids, and primary endosperm nucleus
 (2) Synergids, zygote and primary endosperm nucleus
 (3) Synergids, antipodals and polar nuclei
 (4) Synergids, primary endosperm nucleus and zygote
- Q. 132.** Which hormone promotes internode/ptiole elongation in deep water rice?
 (1) Kinetin (2) Ethylene
 (3) 2, 4-D (4) GA₃
- Q. 133.** Which of the following stages of meiosis involves division of centromere?
 (1) Metaphase II (2) Anaphase II
 (3) Telophase (4) Metaphase I

- Q. 134. Unequivocal proof that DNA is the genetic material was first proposed by
- (1) Alfred Hershey and Martha Chase
 - (2) Avery, Macleoid and McCarthy
 - (3) Wilkins and Franklin
 - (4) Frederick Griffith
- Q. 135. Cellulose does not form blue colour with Iodine because
- (1) It is a helical molecule.
 - (2) It does not contain complex helices and hence cannot hold iodine molecules.
 - (3) It breaks down when iodine reacts with it.
 - (4) It is a disaccharide.

Section B

- Q. 136. Match List I with List II:

List I		List II	
A.	Oxidative decarboxylation	I.	Citrate synthase
B.	Glycolysis	II.	Pyruvate dehydrogenase
C.	Oxidative phosphorylation	III.	Electron transport system
D.	Tricarboxylic acid cycle	IV.	EMP pathway

Choose the correct answer from the option given below:

- (1) A-II, B-IV, C-I, D-III
 - (2) A-III, B-I, C-II, D-IV
 - (3) A-II, B-IV, C-III, D-I
 - (4) A-III, B-IV, C-II, D-I
- Q. 137. Which of the following combinations required for chemiosmosis?
- (1) Membrane, proton pump, proton gradient, NADP synthase
 - (2) Proton pump, electron gradient, ATP synthase
 - (3) Proton pump, electron gradient, NADP synthase
 - (4) Membrane, proton pump, proton gradient, ATP synthase
- Q.138. Melonate inhibits the growth of pathogenic bacteria by inhibiting the activity of
- (1) Amylase
 - (2) Lipase
 - (3) Dinitrogenase
 - (4) Succinic dehydrogenase
- Q. 139. Given below are two statements : One labelled as **Assertion A** and the other labelled as **Reason R**:
Assertion A: In gymnosperms the pollen grains are released from the microsporangium and carried by air currents.
Reason R: Air currents carry the pollen grains to the mouth of the archegonia where the male gametes are discharged and pollen tube is not formed.

In the light of the above statements, choose the **correct** answer from the options give below:

- (1) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.
 - (2) **A** is true but **R** is false.
 - (3) **A** is false but **R** is true.
 - (4) Both **A** and **R** are true and **R** is the correct explanation of **A**.
- Q. 140. Main steps in the formation of Recombinant DNA are given below. Arrange these steps in a correct sequence.
- A. Insertion of recombinant DNA into the host cell.
 - B. Cutting of DNA at specific location by restriction enzyme.
 - C. Isolation of desired DNA fragment. D. Amplification of gene of interest using PCR.
- Choose the correct answer from the options given below:
- (1) C, A, B, D
 - (2) C, B, D, A
 - (3) B, D, A, C
 - (4) B, C, D, A

- Q. 141. Match List I with List II :

List I		List II	
A.	Cohesion	I.	More attraction in liquid phase
B.	Adhesion	II.	Mutual attraction among water molecules
C.	Surface tension	III.	Water loss in liquid phase
D.	Guttation	IV.	Attraction towards polar surfaces

Choose the **correct** answer from the options given below:

- (1) A-IV, B-III, C-II, D-I
 - (2) A-III, B-I, C-IV, D-II
 - (3) A-II, B-I, C-IV, D-III
 - (4) A-II, B-IV, C-I, D-III
- Q. 142. Which one of the following statements is **NOT** correct?
- (1) Algal blooms caused by excess of organic matter in water improve water quality and promote fisheries.
 - (2) Water hyacinth grows abundantly in eutrophic water bodies and leads to an imbalance in the ecosystem dynamics of the water body.
 - (3) The amount of some toxic substances of industrial waste water increases in the organisms at successive trophic levels.
 - (4) The micro-organisms involved in biodegradation of organic matter in a sewage polluted water body consume a lot of oxygen causing the death of aquatic organisms.
- Q. 143. How many different proteins does the ribosome consist of?
- (1) 60
 - (2) 40
 - (3) 20
 - (4) 80

Q. 144. Match List I with List II:

List I (Interaction)		List II (Species A and B)	
A.	Mutualism	I.	+ (A), O(B)
B.	Commensalism	II.	- (A), O(B)
C.	Amensalism	III.	+ (A), -(B)
D.	Parasitism	IV.	+ (A), +(B)

Choose the **correct** answer from the options given below:

- (1) A-IV, B-I, C-II, D-III
- (2) A-IV, B-III, C-I, D-II
- (3) A-III, B-I, C-IV, D-II
- (4) A-IV, B-II, C-I, D-III

Q. 145. Given below are two statements : One is labelled as **Assertion A** and the other is labeled as **Reason R**:

Assertion A: A flower is defined as modified shoot wherein the shoot apical meristem changes to floral meristem.

Reason R: Internode of the shoot gets condensed to produce different floral appendages laterally at successive nodes instead of leaves.

In the light of the above statements, choose the **correct** answer from the options given below:

- (1) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.
- (2) **A** is true but **R** is false.
- (3) **A** is false but **R** is true.
- (4) Both **A** and **R** are true and **R** is the correct explanation of **A**.

Q. 146. Identify the **correct** statements:

- A. Lenticels are the lens-shaped openings permitting the exchange of gases.
- B. Bark formed early in the season is called hard bark.
- C. Bark is a technical term that refers to all tissues exterior to vascular cambium.
- D. Bark refers to periderm and secondary phloem.
- E. Phellogen is single-layered in thickness.

Choose the **correct** answer from the options given below:

- (1) A and D only
- (2) A, B and D only
- (3) B and C only
- (4) B, C and E only

Q. 147. Given below are two statements :

Statement I: Gause's 'Competitive Exclusion Principle states that two closely related species competing for the same resources cannot co-exist indefinitely and competitively inferior one will be eliminated eventually.

Statement II: In general, carnivores are more adversely affected by competition than herbivores. In the light of the above statements, choose the

correct answer from the options given below:

- (1) Both **Statement I** and **Statement II** are false.
- (2) **Statement I** is correct but **Statement II** is false.
- (3) **Statement I** is incorrect but **Statement II** is true.
- (4) Both **Statement I** and **Statement II** are true.

Q. 148. Which of the following statements are correct about Klinefelter's Syndrome?

- A. This disorder was first described by Langdon Down (1866).
- B. Such an individual has overall masculine development. However, the feminine development is also expressed.
- C. The affected individual is short statured.
- D. Physical, psychomotor and mental development is retarded.
- E. Such individuals are sterile.

Choose the **correct** answer from the options given below:

- (1) C and D only
- (2) B and E only
- (3) A and E only
- (4) A and B only

Q. 149. Match List I with List II:

List I		List II	
A.	M Phase	I.	Proteins are synthesized
B.	G ₂ Phase	II.	Inactive phase
C.	Quiescent stage	III.	Interval between mitosis and initiation of DNA replication
D.	G ₁ Phase	IV.	Equational division

Choose the correct answer from the options given below:

- (1) A-IV, B-II, C-I, D-III
- (2) A-IV, B-I, C-II, D-III
- (3) A-II, B-IV, C-I, D-III
- (4) A-III, B-II, C-IV, D-I

Q. 150. Match List I with List II:

List I		List II	
A.	Iron	I.	Synthesis of auxin
B.	Zinc	II.	Component of nitrate reductase
C.	Boron	III.	Activator of catalase
D.	Molybdenum	IV.	Cell elongation and differentiation

Choose the correct answer from the options given below:

- (1) A-II, B-III, C-IV, D-I
- (2) A-III, B-I, C-IV, D-II
- (3) A-II, B-IV, C-I, D-III
- (4) A-III, B-II, C-I, D-IV

ZOOLOGY

Section A

Q. 151. Given below are two statements:

Statement I: In prokaryotes, the positively charged DNA is held with some negatively charged proteins in a region called nucleoid.

Statement II: In eukaryotes, the negatively charged DNA is wrapped around the positively charged histone octamer to form nucleosome.

In the light of the above statements, the **correct** answer from the options given below:

- (1) Both the **statements I** and **Statement II** are false.
- (2) **Statement I** is correct but **Statement II** is false.
- (3) **Statement I** incorrect but **Statement II** is true.
- (4) Both **Statement I** and **Statement II** are true.

Q. 152. In which blood corpuscles, the HIV undergoes replication and produces progeny viruses?

- (1) B-lymphocytes (2) Basophils
- (3) Eosinophils (4) T_H cells

Q. 153. Which of the following statements is correct?

- (1) Biomagnification refers to increase in concentration of the toxicant at successive trophic levels.
- (2) Presence of large amount of nutrients in water restricts 'Algal Bloom'.
- (3) Algal Bloom decreases fish mortality.
- (4) Eutrophication refers to increase in domestic sewage and waste water in lakes.

Q. 154. Match **List I** with **List II**.

	List I		List II
A.	P-wave	I.	Beginning of systole
B.	Q-wave	II.	Repolarisation of ventricles
C.	QRS complex	III.	Depolarisation of atria
D.	T-wave	iv.	Depolarisation of ventricles

Choose the **correct** answer from the options given below:

- (1) A-IV, B-III, C-II, D-1
- (2) A-II, B-IV, C-I, D-III
- (3) A-1, B-II, C-III, D-IV
- (4) A-III, B-I, C-IV, D-II

Q. 155. Broad palm with single palm crease is visible in a person suffering from-

- (1) Turner's syndrome
- (2) Klinefelter's syndrome
- (3) Thalassaemia
- (4) Down's syndrome

Q. 156. Given below are two statements:

Statement I: RNA mutates at a faster rate.

Statement II: Viruses having RNA genome and shorter life span mutate and evolve faster.

In the light of the above statements, choose the **correct** answer from the options given below:

- (1) Both **Statement I** and **Statement II** are false.
- (2) **Statement I** is true but **Statement II** is false.
- (3) **Statement I** false but **Statement II** is true.
- (4) Both **Statement I** and **Statement II** are true.

Q. 157. Given below are statements:

Statement I: Ligaments are dense irregular tissue.

Statement II: Cartilage is dense regular tissue.

In the light of the above statements, choose the **correct** answer from the options given below:

- (1) Both **Statement I** and **Statement II** are false.
- (2) **Statement I** is true but **Statement II** is false.
- (3) **Statement I** false but **Statement II** is true.
- (4) Both **Statement I** and **Statement II** are true.

Q. 158. Given below are statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**.

Assertion A: Nephrons are of two types: Cortical & Juxta medullary, based on their relative position in cortex and medulla.

Reason R: Juxta medullary nephrons have short loop of Henle whereas, cortical nephrons have longer loop of Henle.

In the light of the above statements, choose the **correct** answer from the options given below:

- (1) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.
- (2) **A** is true but **R** is false.
- (3) **A** is false but **R** is true.
- (4) Both **A** and **R** are true and **R** is the correct explanation of **A**.

Q. 159. Which of the following is not a cloning vector?

- (1) YAC (2) pBR322
- (3) Probe (4) BAC

Q. 160. Given below are two statements:

Statement I: A protein is imagined as a line, the left end represented by first amino acid (C-terminal) and the right end represented by last amino acid (N-terminal).

Statement II: Adult human haemoglobin, consist of 4 subunits (two subunits of α type and two subunits of β type).

In the light of the above statements, choose the **correct** answer from the options given below:

- (1) Both **Statement I** and **Statement II** are false.
- (2) **Statement I** is true but **Statement II** is false.
- (3) **Statement I** is false but **Statement II** is true.
- (4) Both **Statement I** and **Statement II** are true.

Q. 161. Once the undigested and unabsorb substances center the caecum, their back is prevented by-

- (1) Ileo-caecal valve
- (2) Gastro-oesophageal sphincter
- (3) Pyloric sphincter
- (4) Sphincter of Oddi

Q. 162. Match List I with List II.

	List I		List II
A.	Vasectomy	I.	Oral method
B.	Coitus	II.	Barrier method
C.	Cervical caps	III.	Surgical method
D.	Saheli	IV.	Natural method

Choose the **correct** answer from the option given below:

- (1) A-III, B-IV, C-II, D-I
- (2) A-II, B-III, C-I, D-IV
- (3) A-IV, B-II, C-I, D-III
- (4) A-III, B-I, C-IV, D-II

Q. 163. Which of the following functions is carried out by cytoskeleton in a cell?

- (1) Protein synthesis
- (2) Motility
- (3) Transportation
- (4) Nuclear division

Q. 164. Which one of the following common sexually transmitted diseases is completely curable when detected early and treated properly?

- (1) Gonorrhoea
- (2) Hepatitis-B
- (3) HIV Infection
- (4) Genital herpes

Q. 165. Vital capacity of lung is _____.

- (1) IRV + ERV + TV + RV
- (2) IRV + ERV + TV - RV
- (3) IRV + ERV + TV
- (4) IRV + ERV

Q. 166. Which of the following are NOT considered as the part of endomembrane system?

- A. Mitochondria
- B. Endoplasmic Reticulum
- C. Chloroplasts
- D. Golgi complex

Choose the **most appropriate** answer from the options below:

- (1) A, C and E only
- (2) A and D only
- (3) A, D and E only
- (4) B and D only

Q. 167. Match List I with List II.

	List I		List II
A.	CCK	I.	Kidney
B.	GIP	II.	Heart
C.	ANF	III.	Gastric gland
D.	ADH	IV.	Pancrease

Choose the **correct** answer from the options given below:

- (1) A-III, B-II, C-IV, D-I
- (2) A-II, B-IV, C-I, D-III
- (3) A-IV, B-II, C-III, D-I
- (4) A-IV, B-III, C-II, D-I

Q. 168. Match List I with List II.

	List I		List II
A.	Gene 'a'	I.	β -galactosidase
B.	Gene 'y'	II.	Transacetylase
C.	Gene 'i'	III.	Permease
D.	Gene 'z'	IV.	Repressor protein

Choose the **correct** answer from the options given below:

- (1) A-II, B-III, C-IV, D-I
- (2) A-III, B-IV, C-I, D-II
- (3) A-III, B-I, C-IV, D-II
- (4) A-II, B-I, C-IV, D-III

Q. 169. Match List I with List II with respect to human eye.

	List I		List II
A.	Fovea	I.	Visible coloured portion of eye that regulates diameter of pupil.
B.	Iris	II.	External layer of eye formed of dense connective tissue.
C.	Blind spot	III.	Point of greatest visual acuity or resolution.
D.	Sclera	IV.	Point where optic nerve leaves the eyeball and photoreceptor cells are absent.

Choose the **correct** answer from the options given below:

- (1) A-IV, B-III, C-II, D-I
- (2) A-I, B-IV, C-III, D-II
- (3) A-II, B-I, C-III, D-IV
- (4) A-III, B-I, C-IV, D-II

Q. 170. Select the correct group/set of Australian Marsupials exhibiting adaptive radiation.

- (1) Numbat, Spotted cuscus, Flying phalanger
- (2) Mole, Flying squirrel, Tasmanian tiger cat
- (3) Lemur, Anteater, Wolf
- (4) Tasmanian wolf, Bobcat, Marsupial mole

Q. 171. Given below are two statements:

Statements I: Vas deferens receives a duct from seminal vesicle and opens into urethra as the ejaculatory duct.

Statements II: The cavity of the cervix is called cervical canal which along with vagina forms birth canal.

In the light of the above statements, choose the **correct** answer from the options given below:

- (1) Both **Statements I** and **Statements II** are false.
- (2) **Statements I** is correct but **Statements II** is false.
- (3) **Statements I** incorrect but **Statement II** is true.
- (4) Both **Statement I** and **Statement II** are true.

Q. 172. Match **List I** with **List II**.

	List I		List II
A.	Heroin	I.	Effect on cardiovascular system
B.	Morphine	II.	Slow down body function
C.	Cocaine	III.	Painkiller
D.	Morphine	IV.	Interfere with transport of dopamine

Choose the **correct** answer from the options given below:

- (1) A-I, B-II, C-III, D-IV
- (2) A-IV, B-III, C-II, D-I
- (3) A-III, B-IV, C-I, D-II
- (4) A-II, B-I, C-IV, D-III

Q. 173. Match **List I** with **List II**.

	List I		List II
A.	Ringworm	I.	<i>Haemophilus influenzae</i>
B.	Filariasis	II.	<i>Trichophyton</i>
C.	Malaria	III.	<i>Wuchereria bancrofti</i>
D.	Pneumonia	IV.	<i>Plasmodium vivax</i>

Choose the **correct** answer from the options given below:

- (1) A-II, B-III, C-I, D-IV
- (2) A-III, B-II, C-I, D-IV
- (3) A-III, B-II, C-IV, D-I
- (4) A-II, B-II, C-IV, D-I

Q. 174. Given below are two statements: one is labelled as **Assertion A** and the other is labelled as **Reason R**. **Assertion A**: Amniocentesis for sex determination is one of the strategies of Reproductive and Child Health Care Programme.

Reason R: Ban on amniocentesis checks increasing menace of female foeticide.

In the light of the above statements, choose the **correct** answer from the options given below:

- (1) Both **A** and **R** are true and **R** is NOT the correct explanation of **A**.
- (2) **A** is true but **R** is false.
- (3) **A** is false but **R** is true.
- (4) Both **A** and **R** are true and **R** is the correct explanation of **A**.

Q. 175. Radial symmetry is not found in adults of phylum_____.

- (1) Hemichordate
- (2) Coelenterata
- (3) Echinodermata
- (3) Ctenophora

Q. 176. Given below are two statements:

Statement I: Low temperature preserves the enzyme in a temporarily inactive state activity because proteins are denatured by whereas high temperature destroys enzymatic activity because proteins are denatured by heat.

Statement II: When the inhibitor closely resembles the substrate in its molecular structure and inhibits the activity of the enzyme, it is known as competitive inhibitor.

In the light of the above statements, choose the **correct** answer from the options given below:

- (1) Both **Statements I** and **Statements II** are false.
- (2) **Statements I** is true but **Statements II** is false.
- (3) **Statements I** is false but **statements II** is true.
- (4) Both **Statements I** and **statements II** are true.

Q. 177. Match **List I** and **List II**.

	List I		List II
A.	Taenia	I.	Nephridia
B.	<i>Paramoecium</i>	II.	Contractile vacuole
C.	<i>Periplaneta</i>	III.	Flame cells
D.	<i>Pheretima</i>	IV.	Urecose gland

Choose the **correct** answer from the options give below:

- (1) A-1, B-II, C-IV, D-III
- (2) A-III, B-II, C-IV, D-I
- (3) A-II, B-I, C-IV, D-III
- (4) A-I, B-II, C-III, D-IV

Q. 178. Which of the following statements are correct regarding female reproductive cycle?

- A. In non-primate mammals cyclical changes during reproduction are called oestrus cycle.
- B. First menstrual cycle begins at puberty and is called menopause.
- C. Lack of menstruation may be indicative of pregnancy.
- D. Cyclic menstruation extends between menarche and menopause.

Choose the **most appropriate** answer from the options given below:

- (1) A and B only
- (2) A, B and C only
- (3) A, C and D only
- (4) A and D only

Q. 179. Given below are two statements:

Statements I: Electrostatic precipitator is most widely used in thermal power plant.

Statement II: Electrostatic precipitator in thermal power plant removes ionising radiations

In the light of the above statements, choose the **most appropriate** answer from the options given

below:

- (1) Both **Statement I** and **Statement II** are incorrect.
- (2) **Statement I** is correct but **Statement II** is incorrect.
- (3) **Statement I** incorrect but **Statement II** is correct.
- (4) Both **Statement I** and **Statement II** are correct.

Q. 180. Match List I and List II.

	List I (Cells)		List II (Secretion)
A.	Peptic cells	I.	Mucus
B.	Goblet cells	II.	Bile juice
C.	Oxyntic cells	III.	Proenzyme pepsinogen
D.	Hepatic cells	IV.	HCl and intrinsic factor for absorption of vitamin B ₁₂

Choose the **correct** answer from the options give below:

- (1) A-II, B-I, C-III, D-IV
- (2) A-III, B-I, C-IV, D-II
- (3) A-II, B-IV, C-I, D-III
- (4) A-IV, B-III, C-II, D-I

Q. 181. Given below are two statements: one labelled as **Assertion A** and the other is labelled as **Reason R**. **Assertion A**: Endometrium is necessary for implantation of blastocyst.

Reason R: In the absence of fertilization, the corpus luteum degenerates that causes disintegration of endometrium.

In the light of the above statements, choose the **correct** answer from the options given below:

- (1) Both **A** and **R** are true but **R** is NOT the correct explanation of **A**.
- (2) **A** is true but **R** is false.
- (3) **A** is false but **R** is true.
- (4) Both **A** and **R** are true and **R** is the correct explanation of **A**.

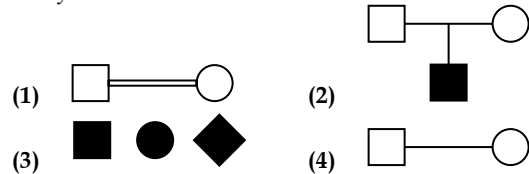
Q. 182. Match List I with List II.

	List I (Type of Joint)		List II (Found between)
A.	Cartilaginous	I.	Between flat skull bones
B.	Ball and Socket Joint	II.	Between adjacent vertebrae in vertebral column
C.	Fibrous Joint	III.	Between carpal and metacarpal of thumb
D.	Saddle Joint	IV.	Between humerus and pectoral girdle

Choose the **correct** answer from the options given below:

- (1) A-II, B-IV, C-I, D-III
- (2) A-I, B-IV, C-III, D-II
- (3) A-II, B-IV, C-III, D-I
- (4) A-III, B-I, C-II, D-IV

Q. 183. Which one of the following symbols represents mating between relatives in human pedigree analysis?



Q. 184. Which one of the following techniques does not serve the purpose of early diagnosis of a disease for its early treatment?

- (1) Serum and Urine analysis
- (2) Polymerase Chain Reaction (PCR) technique
- (3) Enzyme Linked Immuno-Sorbent Assay (ELISA) technique
- (4) Recombinant DNA Technology

Q. 185. Match List I with List II.

	List I (Interacting species)		List II (Name of interaction)
A.	A leopard and a lion in a forest/grassland	I.	Competition
B.	A cuckoo laying egg in a crow's nest	II.	Brood parasitism
C.	Fungi and root of a higher plant in mycorrhizae	III.	Mutualism
D.	A cattle egret and a cattle in a field	IV.	Commensalism

Choose the **correct** answer from the options given below:

- (1) A-I, B-II, C-IV, D-III
- (2) A-III, B-IV, C-I, D-II
- (3) A-II, B-III, C-I, D-IV
- (4) A-I, B-II, C-III, D-IV

Section B

Q. 186. Given below are two statements:

Statement I: During G₀ phase of cell cycle, the cell is metabolically inactive.

Statement II: The centrosome undergoes duplication during S phase of interphase.

In the light of the above statements, choose the **most appropriate** answer from the options given below:

- (1) Both **Statement I** and **Statement II** are incorrect.

- (2) **Statement I** is correct but
 (3) **Statement I** is incorrect but **Statement II** is correct.
 (4) Both **Statement I** and **Statement II** are correct.

Q. 187. Match **List I** with **List II**.

List I		List II	
A.	Logistic growth	I.	Unlimited resource availability condition
B.	Exponential	II.	Limited resource availability condition
C.	Expanding age pyramid	III.	The percent individuals of pre reproductive age is largest followed by reproductive and post reproductive age groups
D.	Stable age pyramid	IV.	The percent individuals of pre-reproductives and reproductive age group are same

Choose the **correct** answer from the options given below:

- (1) A-II, B-III, C-I, D-IV
 (2) A-II, B-IV, C-I, D-III
 (3) A-II, B-IV, C-III, D-I
 (4) A-II, B-I, C-III, D-IV

Q. 188. In cockroach, excretion is brought about by-

- A. Phallic gland B. Ureose gland
 C. Nephrocytes D. Fat body
 E. Collateral glands

Choose the **correct** answer from the options given below:

- (1) A, B and E only (2) B, C and D only
 (3) B and D only (4) A and E only

Q. 189. Select the correct statements.

- A. Tetrad formation is seen during leptotene.
 B. During anaphase, the centromeres split and chromatids separate.
 C. Terminalization takes place during pachytene.
 D. Nucleolus, golgi complex and ER are reformed during telophase.
 E. Crossing over takes place between sister chromatids of homologous chromosome.

Choose the **correct** answer from the options given below:

- (1) B and D only
 (2) A, C and E only
 (3) B and E only
 (4) A and C only

Q. 190. Which of the following are NOT under the control of thyroid hormone?

- A. Maintenance of water and electrolyte balance.
 B. Regulation of basal metabolic rate.
 C. Normal rhythm of sleep-wake cycle.
 D. Development of immune system.
 E. Support the process of R.B.Cs formation.

Choose the **correct** answer from the options given below:

- (1) B and C only
 (2) C and D only
 (3) D and E only
 (4) A and D only

Q. 191. which of the following is characteristic feature of cockroach regarding sexual dimorphism?

- (1) Presence of anal styles
 (2) Presence of sclerites
 (3) Presence of anal cerci
 (4) Dark brown body colour and anal cerci

Q. 192. Which of the following statements are correct?

- A. Basophils are most abundant cells of the total WBCs.
 B. Basophils secrete histamine, serotonin and heparin.
 C. Basophils are involved in inflammatory response.
 D. Basophils have kidney shaped nucleus.
 E. Basophils are agranulocytes.

Choose the **correct** answer from the options given below:

- (1) C and E only (2) B and C only
 (3) A and B only (4) D and E only

Q. 193. Which of the following statements are correct?

- A. An excessive loss of body fluid from the body switches off osmoreceptors.
 B. ADH facilitates water reabsorption to prevent diuresis.
 C. ANF causes vasodilation.
 D. ADH causes increase in blood pressure.
 E. ADH is responsible for decrease in GFR.

Choose the **correct** answer from the options given below:

- (1) B, C and D only
 (2) A, B and E only
 (3) C, D and E only X
 (4) A and B only

Q. 194. Match **List I** with **List II**.

List I		List II	
A.	Mast cells	I.	Ciliated epithelium
B.	Inner surface of bronchiole	II.	Areolar
C.	Blood.	III.	Cuboidal epithelium
D.	Tubular parts	IV.	specialised connective tissue

Choose the **correct** answer from the options give below:

- (1) A-II, B-III, C-I, D-IV
- (2) A-II, B-I, C-IV, D-III
- (3) A-III, B-IV, C-II, D-I
- (4) A-I, B-II, C-IV, D-III

Q. 195. Select the correct statements with reference to chordates.

- A. Presence of a mid-dorsal, solid and double nerve cord.
- B. Presence of closed circulatory system.
- C. Presence of paired pharyngeal gillslits.
- D. Presence of dorsal heart
- E. Triploblastic pseudocoelomate animals.

Choose the **correct** answer from the options given below:

- (1) B and C only
- (2) B, D and E only
- (3) C, D and E only
- (4) A, C and D only

Q. 196. The unique mammalian characteristics are:

- (1) hairs, pinna and mammary glands
- (2) hairs, pinna and indirect development
- (3) pinna, monocondylic skull and mammary glands
- (4) hairs, tympanic membrane and mammary glands

Q. 197. The parts of human brain that helps in regulation of sexual behaviour, expression of excitement, pleasure, rage, fear etc. are :

- (1) Corpora quadrigemina & hippocampus
- (2) Brain stem & epithalamus
- (3) Corpus callosum and thalamus
- (4) Limbic system & hypothalamus

Q. 198. Which one of the following is the sequenate on corresponding coding strand, if the sequence on *mRNA* formed follows

5'AUCGAUCGAUCGAUCG AUGG AUCG AUCG 3'?

- (1) 3' UAGCUAGCUAGCUAGCUA GCUAGCUAGC 5'
- (2) 5' ATCGATCGATCGATCGATCG ATCGATCG 3'
- (3) 3' ATCGATCGATCGATCGATG ATCGATCG 5'
- (4) 5' UAGCUAGCUAGCUAGCUA GCUAGC UAGC 3'

Q. 199. Which of the following statements are correct regarding skeletal muscle?

- A. Muscle bundles are held together by collagenous connective tissue layer called fascicle.
- B. Sarcoplasmic reticulum of muscle fiber is a store house of calcium ions.
- C. Striated appearance of skeletal muscle fibre is due to distribution pattern actin and myosin proteins.
- D. M line is considered as functional of contraction called sarcomere.

Choose the **most appropriate** answer from the options given below:

- (1) B and C only
- (2) A, C and D only
- (3) C and D only
- (4) A, B and C only

Q. 200. Which one of the following is NOT an advantage of inbreeding?

- (1) It exposes harmful recessive genes that are eliminated by selection.
- (2) Elimination of less desirable genes and accumulation of superior genes takes place due to it.
- (3) It decreases the productivity of inbred population, after continuous inbreeding.
- (4) It decreases homozygosity.



Q. No.	Answer Key	Topic's Name	Chapter Name
BOTANY			
101	2	Pleiotropism	Principles of Inheritance and Variation
102	1	Tissue culture	Strategies for Enhancement in Food Production
103	3	Movement of ions	Transport in Plants
104	4	Loss of biodiversity	Biodiversity and Conservation
105	3	Recombinant DNA Technology	Biotechnology : Principles and Processes
106	4	Bryophytes	Plant Kingdom
107	1	Transcription	Molecular basis of inheritance
108	1	Conservation	Biodiversity and Conservation
109	4	Glycolysis	Respiration in Plant
110	4	Ozone	Environmental Issues
111	3	Vascular tissue	Anatomy of Flowering plants
112	1	Pteridophytes	Plant Kingdom
113	4	Food Chain	Organisms and Populations
114	3	Placentation	Morphology of Flowering Plant
115	4	Families	Morphology of Flowering Plant
116	4	Photosystems	Photosynthesis in Higher Plants
117	1	DNA Purification	Biotechnology and its Applications
118	1	Replication	Molecular basis of inheritance
119	1	Cell cycle	Cell Cycle and Cell Division
120	1	Glycolysis	Respiration in Plant
121	2	Productivity	Organisms and Populations
122	1	Pollination	Morphology of Flowering plants
123	1	Hormones	Plant growth and development
124	4	Photosynthesis	Photosynthesis in Higher Plants
125	4	Gene expression	Molecular basis of inheritance
126	2	Recombination	Principles of inheritance and variation
127	4	Transpiration	Transport in plants
128	2	Transformation technique	Biotechnology: Principles and processes
129	4	Tissue System	Anatomy of flowering plants
130	1	Pollination	Morphology of flowering plants
131	2	Female Reproductive System	Respiration in plants
132	2	Hormones	Plants growth and development
133	2	Cell Cycle	Cell cycle and cell division
134	1	Genetic Material	Principles of inheritance and variation
135	2	Plant Tissues	Anatomy of flowering plants
136	3	Respiration	Respiration in plants
137	4	Atp Synthesis	Respiration in plants
138	4	Microbes	Microbes in human welfare
139	2	Gymnosperms	Photosynthesis in higher plants
140	2	Recombinant DNA technology	Biotechnology and its Applications
141	4	Transport	Transport in plants
142	1	Algal blooms	Environmental issues
143	4	Ribosomes	Cell: the unit of life
144	1	Biotic interactions	Ecosystem

Q. No.	Answer Key	Topic's Name	Chapter Name
145	4	Structure of flower	Sexual Reproduction in Flowering Plants
146	1	Secondary growth	Plant growth and development
147	2	Biotic interactions	Ecosystem
148	2	Genetic Variation	Principles of inheritance and variation
149	2	Cell cycle	Cell cycle and cell division
150	2	Nutrition	Plant growth and development
ZOOLOGY			
151	3	Nucleus	Cell: The Unit of Life
152	4	HIV	Reproductive Health
153	1	Eutrophication	Environmental Issues
154	4	Heart	Body fluids and Circulation
155	4	Down's Syndrome	Principles of Inheritance and Variation
156	4	Mutation	Molecular Basis of Inheritance
157	1	Bones	Locomotion and Movement
158	2	Nephrons	Excretory Products and their Elimination
159	3	Vectors	Biotechnology : Principles and Processes
160	3	Proteins	Biomolecules
161	1	Digestive system	Digestion and Absorption
162	1	STDs	Reproductive Health
163	2	Cytoskeleton	Locomotion and Movement
164	1	STDs	Reproductive Health
165	3	Lungs	Breathing and Exchange of Gases
166	1	Endomembrane system	Cell: The Unit of Life
167	4	Hormones	Chemical Coordination and Integration
168	1	Lac Operon	Molecular Basis of Inheritance
169	4	Eye Structure	Neural Control and Coordination
170	1	Adaptive Radiation	Evolution
171	4	Female reproductive system	Human Reproduction
172	4	Chemicals	Human Health and Disease
173	4	Diseases	Human Health and Disease
174	3	Sex determination	Reproductive Health
175	1	Phylums	Animal Kingdom (Part- I) Invertebrata
176	4	Enzymes	Biomolecules
177	2	Excretion	Animal Kingdom (Part- I) Invertebrata
178	3	Mensuration	Human Reproduction
179	2	Pollution	Environmental Issues
180	2	Digestive enzymes	Digestion and Absorption
181	1	Mensuration	Human Reproduction
182	1	Joints	Locomotion and Movement
183	1	Pedigree Analysis	Principles of Inheritance and Variation
184	1	Diagnostic techniques	Biotechnology and its Applications
185	4	Biotic interactions	Ecosystem

Q. No.	Answer Key	Topic's Name	Chapter Name
186	3	Cell Cycle	Cell Cycle and Cell Division
187	4	Population growth	Organisms and Populations
188	2	Cockroach	Animal Kingdom (Part- I) Invertebrata
189	1	Cell Cycle	Cell Cycle and Cell Division
190	2	Hormones	Chemical Coordination and Integration
191	1	Cockroach	Animal Kingdom (Part- I) Invertebrata
192	2	Blood cells	Body Fluids and Circulation
193	1	Hormones	Chemical Coordination and Integration
194	2	Nephrons	Excretory Products and their Elimination
195	1	Chordates	Animal Kingdom (Part -II) Vertebrata
196	1	Ear	Neural Control and Coordination
197	4	Brain	Neural Control and Coordination
198	2	Transcription	Molecular Basis of Inheritance
199	1	Muscles	Locomotion and Movement
200	3	Inbreeding	Strategies for Enhancement in Food Production

NEET (UG) Examination

7th May 2023

ANSWERS WITH EXPLANATION

BOTANY

Section A

101. **Option (2) is correct.**

Explanation: In pleiotropism, a single gene affects multiple phenotypic expressions and the gene is called a pleiotropic gene.

102. **Option (1) is correct.**

Explanation: In tissue culture experiments, when leaf mesophyll cells are put in a culture medium, it will result in the formation of an undifferentiated mass of cells called callus. This phenomenon in which living plant cells that are differentiated by now and have lost the capacity to divide, regain the property of division is known as dedifferentiation.

103. **Option (3) is correct.**

Explanation: Active transport involves the movement and accumulation of ions across a membrane against the concentration gradient. It requires energy and special carrier proteins to transport molecules from their lower concentration to their higher concentration.

104. **Option (4) is correct.**

Explanation: The evil quartet is the term used for four major reasons for biodiversity loss. They include: a) habitat loss and fragmentation, b) alien species invasion, c) co-extinction, d) over-exploitation. Among these habitat loss and fragmentation is the most important cause driving plants and animals to extinction.

105. **Option (3) is correct.**

Explanation: Ethidium Bromide (EtBr) is added to the running buffer during the separation of DNA fragments by agarose gel electrophoresis. It is used because upon binding with the DNA molecule and subsequent illumination with a UV light source, the DNA will appear in bright orange. in colour.

As a result, DNA banding pattern can be visualised.

106. **Option (4) is correct.**

Explanation: The main stage of the life cycle of a moss is the gametophyte which consists of two

stages. The first stage is the protonema stage, which develops directly from a spore. Capsule of the sporophyte contains spore which gives rise to protonema. The second stage is the leafy stage, which develops from the protonema.

107. **Option (1) is correct.**

Explanation: In eukaryotes, there are three major types of RNA polymerases.

RNA polymerase I help in the transcription of 5.8S, 18S, and 28S rRNAs.

RNA polymerase II helps in the transcription of hnRNAs (precursor of mRNA).

RNA polymerase III helps in the transcription of tRNAs, ScRNA, 5S rRNA and snRNA.

108. **Option (1) is correct.**

Explanation: The historic convention on Biological Diversity, also called "The Earth Summit" was held in Rio de Janeiro in the year 1992. It called upon all nations to take the required measures for the conservation of biodiversity.

109. **Option (4) is correct.**

Explanation: ATP in glycolysis is used in two steps in the first or preparatory phase.

(i) Glucose → Glucose-6-phosphate

(ii) Fructose-6-phosphate → Fructose-1,6-bisphosphate

110. **Option (4) is correct.**

Explanation: The thickness of the ozone in a column of air is measured in terms of Dobson units (DU). The average amount of ozone in the atmosphere is roughly 300 Dobson Units, equivalent to a layer 3 millimeters (0.12 inches) thick.

111. **Option (3) is correct.**

Explanation: Endarch and exarch are the terms often used for describing the position of the primary xylem and not the secondary xylem in the plant body.

The primary xylem is of two types. protoxylem and metaxylem. The position of the protoxylem and metaxylem defines endarch or exarch conditions. In endarch type of primary xylem, the

protoxylem lies towards the centre and metaxylem lies towards the periphery while in exarch type of primary xylem, the protoxylem lies towards the periphery and metaxylem lies towards the centre. Exarch type is the most common feature seen in the root system.

112. Option (1) is correct.

Explanation: Heterosporous pteridophyte produces two different kinds of spores. Examples include *Selaginella* and *Salvinia*. While homosporous pteridophytes produce a single type of spores. Examples include *Psilotum*, *Lycopodium* and *Equisetum*.

113. Option (4) is correct.

Explanation: Earthworms and other detritivores contribute to decomposition by fragmentation of detritus in which a part of detritus is eaten by them and comes out in highly pulverised state in their faeces. Mineralization is the process in which humus is degraded to release inorganic nutrients. Leaching is the process in which water-soluble inorganic substances such as fertilizers or pesticides are washed out from the soil, go down and get precipitated. The detritus food chain starts with dead organic matter. The saprotrophic bacteria and fungi break down detritus into simpler inorganic substances by a process called catabolism. Earthworms do fragmentation not catabolism.

114. Option (3) is correct.

Explanation: China rose, Tomato, Petunia and Lemon show axile placentation. In axile placentation, the ovary is partitioned into two or more chambers by septa. The placenta is formed in the central axial column where all the septa meet.

Dianthus and *Primrose* show free central placentation.

Peas, Lupin and Beans show marginal placentation. Cucumbers and mustard show parietal placentation.

115. Option (4) is correct.

Explanation: Fabaceae → Diadelphous and ditheous anther.

Solanaceae → Polyandrous, epipetalous and ditheous anther.

Liliaceae → Polyandrous, epiphyllous and ditheous anther.

116. Option (4) is correct.

Explanation: In Photosystem-I, the reaction centre chlorophyll a has an absorption peak at 700 nm, while in Photosystem-II, the reaction centre has an absorption maxima at 680 nm.

117. Option (1) is correct.

Explanation: On addition of chilled ethanol, purified DNA precipitates out. It can be seen as a collection of fine threads in the suspension.

118. Option (1) is correct.

Explanation: Replication of DNA takes place in the S-phase of the cell cycle in eukaryotes while other cell organelles duplicate in the G₁ phase of the cell cycle.

119. Option (1) is correct.

Explanation: The process of recombination occurs at the pachytene stage of prophase I. It is characterised by the appearance of recombination nodules.

120. Option (1) is correct.

Explanation: For one turn in the Calvin cycle:

ATP used = 3 molecules

NADPH used = 2 molecules

Thus for six cycles:

ATP used = 3×6 = 18 molecules

NADPH used = 2×6 = 12 molecules

Therefore number of total ATP and NADPH required to produce one molecule of glucose during the Calvin cycle is 18 and 12 respectively.

121. Option (2) is correct.

Explanation: A considerable amount of GPP is utilised by plants in respiration. Gross primary productivity minus respiratory losses (R), is the net primary productivity.

So R = Respiratory loss

122. Option (1) is correct.

Explanation: Colourful fragrant flowers with nectar help to attract biotic pollinators (insects, birds, bats, etc.), Bird pollinated plants are larger, and have more nectar. Insect pollinated plants can be small in size. Bat pollinated flowers are pale and nocturnal.

123. Option (1) is correct.

Explanation: Spraying of gibberellins (GAs) on juvenile conifers hastens the maturity period, thus leading to early seed production.

124. Option (4) is correct.

Explanation: Manganese plays a major role in the splitting of water to release oxygen during photosynthesis.

Copper is required for the overall metabolism in plants.

Molybdenum helps in nitrogen metabolism.

Magnesium activates enzymes involved in photosynthesis and respiration.

125. **Option (4) is correct.**

Explanation: All the genes that are expressed as RNA are known as Expressed Sequence Tags (ESTs).

126. **Option (2) is correct.**

Explanation: Alfred Sturtevant for the first time used the frequency of recombination between gene pairs on the same chromosome as a measure of the distance between genes and for mapping of their position on the chromosome.

Sutton and Boveri gave the chromosomal theory of inheritance.

Henking discovered X-chromosome.

Thomas Hunt Morgan proved the chromosomal theory of inheritance.

127. **Option (4) is correct.**

Explanation: Various measurements reveal that the force that is produced by transpiration can generate pressures sufficient to lift a xylem-sized column of water up to 130 meters high. Transpiration is also known as a process that cools leaf surfaces, sometimes 10 to 15 degrees, by evaporative cooling.

128. **Option (2) is correct.**

Explanation: A gene gun is a method of recombinant DNA technology where the DNA, RNA, genes, or proteins are transferred to the target cells without the help of any vectors. In this method, microparticles of gold or tungsten are used. Gold and tungsten are inert so they do not react with the chemicals of cells.

129. **Option (4) is correct.**

Explanation: In winter, the activity of cambium is less and forms a lesser number of xylary elements that have narrow vessels, and the resulting wood is called autumn wood or latewood.

130. **Option (1) is correct.**

Explanation: Tassels in the corn cob are elongated exerted stigmas and styles which help to trap pollen grains.

131. **Option (2) is correct.**

Explanation: Synergids are the cells of gametophytes and so these are haploid. Zygote is formed by the fusion of two gametes and thus it is diploid. On the other hand primary endosperm nucleus is formed by the fusion of a diploid secondary nucleus with a male gamete. Therefore, it is triploid.

132. **Option (2) is correct.**

Explanation: Ethylene helps in rapid internode/petiole elongation in deep-water rice plants.

133. **Option (2) is correct.**

Explanation: Anaphase II of meiosis involves the splitting of centromere. During Metaphase I and II, chromosomes align at the equator. During telophase, chromosomes reach the respective poles.

134. **Option (1) is correct.**

Explanation: The proof that DNA is the genetic material came first time from the experiment of Alfred Hershey and Martha Chase. Avery, Macleod and McCarty gave the biochemical characterisation of the Transforming Principle. The transformation experiments using *Pneumococcus* were conducted by Frederick Griffith. Wilkins and Franklin produced X-ray diffraction data of DNA.

135. **Option (2) is correct.**

Explanation: Cellulose does not form a blue colour with iodine because cellulose does not have a helical structure so it does not bind to iodine to form a coloured product.

Section B

136. **Option (3) is correct.**

Explanation: Pyruvate is formed by catabolism of glucose in the cytosol. After it enters the mitochondria, it undergoes oxidative decarboxylation with the help of complex set of reactions that are catalysed by pyruvate dehydrogenase. The scheme of glycolysis is often referred to as the EMP pathway. In an electron transport system, the energy produced is utilised for the production of the proton gradient required for phosphorylation. So, this process is also called oxidative phosphorylation. The TCA (tricarboxylic acid cycle) starts with the condensation of the acetyl group with oxaloacetic acid (OAA) and water to produce citric acid. The reaction uses the enzyme citrate synthase.

137. **Option (4) is correct.**

Explanation: The process of ATP synthesis using 'free energy' obtained when electrons are passed to several carriers (ETC) is known as chemiosmosis. Chemiosmosis requires a membrane, a proton pump, a proton gradient and ATP synthase.

138. **Option (4) is correct.**

Explanation: Melonate acts as an antibiotic which inhibits the growth of pathogenic bacteria by inhibiting the activity of Succinic dehydrogenase. Thus, it affects TCA cycle and hampers cellular respiration.

139. **Option (2) is correct.**

Explanation: In gymnosperms, the pollen grains are released from the microsporangium and

they are carried in air currents. They come in touch with the opening of the ovules borne on megasporophylls. The *pollen tube* having the male gametes grows towards archegonia in the ovules and empties its contents near the mouth of the archegonia.

140. Option (2) is correct.

Explanation: Recombinant DNA technology involves several steps in specific sequences like isolation of DNA then fragmentation of DNA by restriction endonucleases followed by isolation of desired DNA fragment and then ligation of the DNA fragment into a vector following transferring the recombinant DNA into the host and finally culturing the host cells in a medium at large scale and extraction of the desired product.

141. Option (4) is correct.

Explanation: Cohesion involves mutual attraction between water molecules. Adhesion represents the attraction of water molecules to polar surfaces. Surface tension involves the attraction of water molecules towards each other in the liquid phase more than to water in the gas phase. Guttation represents the loss of water in the liquid phase.

142. Option (1) is correct.

Explanation: Algal blooms are caused by the increase of inorganic pollutants in water. It gives a distinct colour to the water bodies. It decreases water quality and promotes fish mortality.

143. Option (4) is correct.

Explanation: The ribosome consists of about 80 different proteins.

144. Option (1) is correct.

Explanation: (+, +) Mutualism: In this interaction, both the interacting species are benefitted.

(+, 0) Commensalism: Only one species is benefitted and the other species remains unaffected.

(-, 0) Amensalism: One species is harmed and other is unaffected.

(+, -) Parasitism: One species is benefitted and the other is negatively affected.

145. Option (4) is correct.

Explanation: A flower is a modified shoot wherein the shoot apical meristem changes to a floral meristem. Internodes do not get elongated and as a result the axis gets condensed. The apex produces many kinds of floral appendages

laterally at the successive nodes instead than of leaves.

146. Option (1) is correct.

Explanation: Lenticels are lens-shaped openings that help in the exchange of gases between the outer atmosphere and the internal tissue of the stem. A bark formed early in the season is called early or soft bark. Later on at the end of the season, late or hard bark is formed. The bark is a non technical term for all tissues exterior to the vascular cambium. Bark includes periderm and secondary phloem. Phellogen is a double layered ring-shaped structure made up of narrow, thin-walled and nearly rectangular cells.

147. Option (2) is correct.

Explanation: Gause's 'Competitive Exclusion Principle' states that two species that are closely related and competing for the same resources cannot co-exist indefinitely and the species which is competitively inferior will get eliminated. Herbivores and plants appear to be more affected by competition than carnivores.

148. Option (2) is correct.

Explanation: Klinefelter's syndrome is the result of presence of an additional copy of the X-chromosome resulting in a karyotype of 47, XXY. Such an individual has overall masculine development, however, the feminine development is also expressed in these individuals. Such individuals are sterile.

149. Option (2) is correct.

Explanation: M phase or mitosis is the phase where the actual cell division occurs. Mitosis is also called equational division. During the G₂ phase DNA synthesis stops but the cell synthesises of RNA, proteins, etc. for the next phase. The quiescent stage is the inactive phase in which non-dividing cells enter. The G₁ phase represents the stage between mitosis and initiation of DNA replication.

150. Option (2) is correct.

Explanation: Iron activates the catalase enzyme. Zinc is required in the synthesis of auxin.

Boron is required for cell elongation and cell differentiation.

Molybdenum is a component of nitrogenase and nitrate reductase enzyme.

ZOOLOGY

Section A

151. Option (3) is correct.

Explanation: In prokaryotes, the negatively charged DNA is held by some positively charged non-histone proteins in a region known as the nucleoid. In eukaryotes, nucleosome represents the structure that is formed by the negatively charged DNA wrapped around the positively charged histone octamer.

152. Option (4) is correct.

Explanation: HIV enters into helper T-lymphocytes (T_H), undergoes replication and produces progeny viruses.

153. Option (1) is correct.

Explanation: An increase in the concentration of the toxicant at successive trophic levels is called biomagnification. Large amounts of inorganic nutrients in water lead to the growth of algae thus algal blooms occur. It increases fish deaths in the water body. Eutrophication is a process in which water bodies become nutrient rich. Releasing sewage into rivers introduces a large amount of nutrients into the water also causes eutrophication is a process in which water bodies become nutrient rich.

154. Option (1) is correct.

Explanation: In an ECG:

P-wave represents the depolarisation of the atria. Q-wave represents the beginning of systole. QRS complex represents the depolarisation of ventricles.

T-wave represents the repolarisation of the ventricles.

155. Option (4) is correct.

Explanation: Down's syndrome is the result of an additional copy of chromosome number 21. Its symptoms are:

- a. Broad palm with characteristic palm crease
- b. Short statured with small round head
- c. Furrowed tongue and partially open mouth, etc.

156. Option (4) is correct.

Explanation: RNA being unstable and single-stranded, mutates at a faster rate. So viruses having RNA genome and shorter life span mutate and evolve very fast.

157. Option (1) is correct.

Explanation: A ligament is an example of dense regular connective tissue. Cartilage is a specialised connective tissue.

158. Option (2) is correct.

Explanation: Assertion is true as there are two types of nephrons, i.e., cortical nephrons and juxtamedullary nephrons based on their relative position in the cortex and medulla. The reason is incorrect as the loop of Henle in juxtamedullary nephrons is long.

159. Option (3) is correct.

Explanation: A probe is a radioactive molecule that helps in the identification of mutated genes. YAC, BAC, and pBR322 are vectors.

160. Option (3) is correct.

Explanation: A protein is imagined as a line, the left end represented by the first amino acid also called as N-terminal amino acid and the right end is represented by the last amino acid also called the C-terminal amino acid. Adult haemoglobin consists of 4 subunits.

161. Option (1) is correct.

Explanation: When the undigested food (faeces) enters into the caecum of the large Intestine, the ileo-caecal valve prevents the backflow of the faecal matter.

162. Option (1) is correct.

Explanation:

- (i) Vasectomy is a surgical technique of contraception.
- (ii) Coitus interruptus is a natural technique of contraception.
- (iii) Cervical cap is a barrier technique of contraception.
- (iv) Saheli pill is an oral method of contraception.

163. Option (2) is correct.

Explanation: Cytoskeleton which consists of microtubules, microfilaments and intermediate filaments is involved in many functions such as motility, mechanical support, and maintenance of the shape of the cell.

164. Option (1) is correct.

Explanation: Gonorrhoea is a bacterial STD that can be treated and cured completely. All others are viral diseases which can be managed but have no cure.

165. Option (3) is correct.

Explanation: Vital capacity is the maximum volume of air a person can inhale after a forced expiration. It is calculated as the sum of inspiratory reserve volume (IRV), tidal volume (TV), and expiratory reserve volume (ERV), i.e., $VC = IRV + TV + ERV$.

166. **Option (1) is correct.**

Explanation: Endoplasmic reticulum (ER), Golgi complex, lysosomes and vacuoles together are known as the endomembrane system. Mitochondria, Chloroplasts and peroxisomes are not included in it.

167. **Option (4) is correct.**

Explanation: Cholecystokinin (CCK) acts on both the pancreas and gall bladder and helps in the secretion of pancreatic and bile enzymes respectively. GIP inhibits gastric secretion and motility. Atrial Natriuretic Factor (ANF) is released from the atrial wall of the heart. Anti-diuretic hormone (ADH) acts mainly on the kidney.

168. **Option (1) is correct.**

Explanation: In a *lac* operon,
Gene a codes for enzyme transacetylase.
Gene y codes for enzyme permease.
Gene i codes for a repressor protein
Gene z codes for enzyme beta-galactosidase.

169. **Option (4) is correct.**

Explanation:

- (i) **Fovea:** Point of greatest visual acuity or resolution.
- (ii) **Iris:** Visible coloured portion of the eye that regulates the diameter of the pupil.
- (iii) **Blind spot :** Optic nerve leaves the eye-ball and photoreceptor cells are absent.
- (iv) **Sclera:** External layer of the eye formed of dense connective tissue.

170. **Option (1) is correct.**

Explanation: Numbat, spotted cuscus and flying phalanger are Australian marsupials exhibiting adaptive radiation.

171. **Option (4) is correct.**

Explanation: The Vas deferens receives a duct from the seminal vesicle and opens into the urethra as the ejaculatory duct. The cavity of the cervix is called the cervical canal which along with the vagina forms the birth canal.

172. **Option (4) is correct.**

Explanation: Heroin is an opioid and a depressant that slows down body functions. Marijuana produces effects on the cardiovascular system of the body. Cocaine interferes with the transport of the neurotransmitter dopamine. Morphine is used as a sedative and painkiller.

173. **Option (4) is correct.**

Explanation: (i) Ringworm is caused by *Trichophyton*.

(ii) Filariasis is caused by *Wuchereria bancrofti*.

(iii) Malaria is caused by *Plasmodium* species.

(iv) Pneumonia is caused by *Haemophilus influenzae*.

174. **Option (3) is correct.**

Explanation: Amniocentesis is used to test for the presence of certain genetic disorders such as Down's syndrome, and haemophilia, or to determine the survivability of the foetus but it is often misused as a tool for the detection of the sex of the child which results into increase in cases of female foeticide. Ban on this technique helps in preventing female foeticide.

175. **Option (1) is correct.**

Explanation: Radial symmetry is not found in adults of hemichordates as these are bilaterally symmetrical animals.

176. **Option (4) is correct.**

Explanation: Both statements are correct as low temperature preserves the enzyme in a temporarily inactive state whereas high temperature destroys enzymatic activity because proteins are denatured by heat. A competitive inhibitor is structurally similar to the substrate and it competes with the same for the binding site of the enzyme.

177. **Option (2) is correct.**

Explanation: Flame cells are the excretory structures in Platyhelminthes like *Taenia*. *Paramoecium* uses contractile vacuoles for excretion. Nephridia are the excretory structures of annelids like *Pheretima*. Ureose glands are present in the cockroach.

178. **Option (3) is correct.**

Explanation: First menstrual cycle that begins at puberty is called menarche. Menopause is the stoppage of the menstrual cycle.

179. **Option (2) is correct.**

Explanation: Electrostatic precipitator is most widely used in thermal power plants. It can remove over 99 per cent of particulate matter present in the exhaust from a thermal power plant.

180. **Option (2) is correct.**

Explanation: Mucus neck cells secrete mucus. Peptic or chief cells secrete the proenzyme pepsinogen. Parietal or oxyntic cells secrete HCl and intrinsic factors for absorption of vitamin B₁₂. Hepatic cells secrete bile juice.

181. **Option (1) is correct.**

Explanation: Cells present on the outer layer of the blastocyst get attached to the outer layer of the

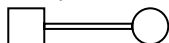
endometrium for pregnancy to occur. They release a protein called L-selectin. The Corpus luteum secretes a large amount of progesterone which is required for the maintenance of the endometrium of the uterus. In the absence of fertilisation, the corpus luteum degenerates resulting in a decrease in the level of progesterone hormone that will cause the disintegration of endometrium followed by menstruation.

182. **Option (1) is correct.**

Explanation: A cartilaginous joint is present in between the adjacent vertebrae in the vertebral column. The ball and socket joint is present between the humerus and pectoral girdle. A fibrous joint is present between flat skull bones. The saddle joint is present between the carpal and metacarpal of the thumb.

183. **Option (1) is correct.**

Explanation: The symbol representing mating between relatives (consanguineous mating) in the human pedigree analysis is:



184. **Option (1) is correct.**

Explanation: Conventional methods of diagnosis like serum and urine analysis, etc, do not help in early diagnosis. While Recombinant DNA technology, Polymerase Chain Reaction [PCR] and Enzyme-Linked Immuno-Sorbent Assay (ELISA) are some of the techniques that help in early diagnosis.

185. **Option (4) is correct.**

Explanation: A leopard and a lion in a forest/grassland are an example of competition where both species are competing for the same resources. A cuckoo laying an egg in a crow's nest is an example of brood parasitism where the cuckoo is the bird that lays its egg in the nest of a crow.

Fungi and root of a higher plant in mycorrhizae is an example of mutualism where both species are benefitted. A cattle egret and cattle in a field is an example of commensalism where one species benefits and the other remains unaffected.

Section B

186. **Option (3) is correct.**

Explanation: Cells in the G_0 phase of the cell cycle remain metabolically active but no longer proliferate. In animal cells, DNA replication begins in the nucleus during the S phase and the centriole duplicates in the cytoplasm.

187. **Option (4) is correct.**

Explanation: Logistic growth occurs in case of limited resource availability conditions. Exponential growth occurs in case of unlimited resources. Expanding age pyramid shows a growing population where the per cent of individuals of pre-reproductive age is the largest followed by reproductive and post-reproductive age groups. A stable age pyramid shows a stable population where number of pre reproductive and reproductive age individuals is almost same.

188. **Option (2) is correct.**

Explanation: In cockroaches, excretion is brought about by Malpighian tubules, fat body, nephrocytes and urecose glands.

189. **Option (1) is correct.**

Explanation: Tetrad formation can be seen during the zygotene stage. Centromeres split and chromatids separate during Anaphase. Terminalisation of chiasmata takes place during diakinesis. Nucleolus, Golgi complex and ER are reformed during telophase. Crossing over takes place between non-sister chromatids.

190. **Option (2) is correct.**

Explanation: Thyroid hormones play an important role in the regulation of basal metabolic rate, maintenance of water and electrolyte balance and support the process of RBCs formation, whereas this hormone is not involved in regulating the normal rhythm of the sleep-wake cycle and development of the immune system.

191. **Option (1) is correct.**

Explanation: Cockroaches show sexual dimorphism because males and females have slightly different morphology. One of the main features is the presence of anal styles only in males. Females lack anal styles.

192. **Option (2) is correct.**

Explanation: Basophils secrete histamine, serotonin, heparin etc. and are involved in inflammatory responses. Basophils are granulocytes. Neutrophils are the most abundant cells (60–65 %) of the total WBCs. Basophils are the least (0.5–1%) abundant of all WBCs. Monocytes have a kidney-shaped nucleus.

193. **Option (1) is correct.**

Explanation: ADH helps in water reabsorption from the DCT of the nephron to prevent diuresis, which increases blood pressure. It causes constriction of blood vessels thus increases the GFR. ANF is secreted by the heart and it is a vasodilator. Excessive loss of body fluid from the body switches on the osmoreceptors.

194. **Option (2) is correct.**

Explanation: Areolar connective tissue contains mast cells, fibroblasts and macrophages. The inner surface of bronchioles is marked by ciliated epithelium. Blood is a specialised connective tissue. Tubular parts of the nephron are covered by cuboidal epithelium.

195. **Option (1) is correct.**

Explanation: Chordates have closed circulatory systems and pharyngeal gill slits. The nerve cord is dorsal, hollow and single. The heart is ventral. They are triploblastic and coelomate.

196. **Option (1) is correct.**

Explanation: The presence of hairs, pinna and mammary glands are unique features of mammals. Monocondylic skull is present in Aves and reptiles. Mammals have a dicondylic skull. The tympanic membrane is present in amphibians also. Indirect development is not seen in mammals.

197. **Option (4) is correct.**

Explanation: The limbic system along with the hypothalamus regulates sexual behaviour, expression of excitement, pleasure, rage, fear, etc.

198. **Option (2) is correct.**

Explanation: The sequence of the coding strand is the same as transcribed mRNA except for thymine at the place of uracil.

Template strand → 3'-TAGCTAGCTAGCTAGC-TAGCTAGCTAGC-5'

Coding strand → 5'-ATCGATCGATCG ATCGATCGATCGATCG-3'

mRNA → 5' AUCGAUCGAUCGAUCGAUC-GAUCG AUCG 3'

199. **Option (1) is correct.**

Explanation: Muscle bundles are joined together by a collagenous connective tissue layer called fascia. Muscle bundles are known as fascicles. The portion of the myofibril present between two successive 'Z' lines is the main functional unit of contraction called a sarcomere.

200. **Option (3) is correct.**

Explanation: A decrease in the productivity of the inbred population is not an advantage of inbreeding.

