DATE : 03/05/2026

Test Booklet Code

12

KAILASH

Aakash
Medical | IIT-JEE | Foundations

Corporate Office : 3rd Floor, Incuspaze Campus-2, Plot No. 13,
Sector-18, Udyog Vihar, Gurugram, Haryana - 122015.

Answers & Solutions for NEET (UG)-2026

Time : 3 hrs.

M.M. : 720

Important Instructions:

1. The test is of **3 hours** duration and the Test Booklet contains **180** multiple choice questions (Four options with a single correct answer) from **Physics, Chemistry and Biology (Botany and Zoology).**
2. Each question carries **4 marks**. For each correct response, the candidate will get **4 marks**. For every wrong response, **1 mark** shall be deducted from the total scores. The maximum marks are **720**.
3. Use **Blue / Black Ball Point Pen only** for writing particulars on this page / marking responses on Answer Sheet.
4. Rough work is to be done in the space provided for this purpose in the Test Booklet only.
5. On completion of the test, the candidate must handover the Answer Sheet to the Invigilator before leaving the Room / Hall. The candidates are allowed to take away this Test Booklet with them.
6. The CODE for this Booklet is **12**.
7. The candidates should ensure that the Answer Sheet is not folded. Do not make any stray marks on the Answer Sheet. Do not write your Roll No. anywhere else except in the specified space in the Test Booklet/Answer Sheet. Use of white fluid for correction is **NOT** permissible on the Answer Sheet.
8. Each candidate must show on demand his/her Admission Card to the Invigilator.
9. No candidate, without special permission of the Centre Superintendent or Invigilator, would leave his/her seat.
10. Use of Electronic/Manual Calculator is prohibited.
11. The candidates are governed by all Rules and Regulations of the examination with regard to their conduct in the Examination Hall. All cases of unfair means will be dealt with as per Rules and Regulations of this examination.
12. No part of the **Test Booklet** and **Answer Sheet** shall be detached under any circumstances.
13. The candidates will write the Correct Test Booklet Code as given in the Test Booklet / Answer Sheet in the Attendance Sheet.

BIOLOGY

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

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

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

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

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

Answer (2)

Sol. 'The Evil Quartet' is the Sobriquet used to describe the four major causes of biodiversity loss which includes Habitat loss and fragmentation, over-exploitation; Alien species invasions and Co-extinctions.

92. Which one of the following is the site for active ribosomal RNA synthesis?

(1) Nucleolus

(2) Chromatin

(3) Centrosome

(4) Kinetochore

Answer (1)

Sol. Nucleolus is the site for active ribosomal RNA synthesis.

93. Match List I with List II :

	List-I (Phase of cell cycle)		**List-II (Activity)**
A.	G_1 phase	I.	Actual cell division occurs
B.	S phase	II.	Cell is metabolically active and continuously grows but does not replicate its DNA
C.	G_2 Phase	III.	Synthesis of DNA occurs and the amount of DNA per cell doubles
D.	M phase	IV.	Proteins are synthesized while cell growth continues

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

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

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

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

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

Answer (1)

Sol. During G_1 phase the cell is metabolically active and continuously grows but does not replicate its DNA.

S-phase marks the phase during which DNA synthesis or replication takes place and amount of DNA per cell doubles.

During the G_2 phase, proteins are synthesised in preparation for mitosis while cell growth continues.

During M phase the actual cell division takes place.

94. Match List I with List II :

	List I		List II
A.	Productivity	I.	Gross primary productivity minus respiration losses
B.	Net primary productivity	II.	Rate of formation of new organic matter by consumers
C.	Gross primary productivity	III.	Rate of biomass production
D.	Secondary productivity	IV.	Rate of production of organic matter during photosynthesis

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

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

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

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

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

Answer (2)

Sol. Productivity is the rate of biomass production.

Net primary productivity is the Gross primary productivity (GPP) minus respiration losses (R).

Gross primary productivity is the rate of production of organic matter during photosynthesis.

Secondary productivity is the rate of formation of new organic matter by consumers.

95. Which of the following statements are correct?

A. The Amazon rainforest being cut and cleared for cultivation of soyabeans is an example of habitat loss.

B. Steller's sea cow and passenger pigeon became extinct due to over-exploitation by humans.

C. The Nile perch introduced into Lake Victoria in East Africa helped in population growth of cichlid fish in the lake.

D. Water hyacinth is an invasive species.

E. When a species becomes extinct, the plant and animal species associated with it are not affected.

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

(1) B, C and D only

(2) A, B and D only

(3) A, B and E only

(4) C, D and E only

Answer (2)

Sol. The Nile Perch introduced into Lake Victoria in East Africa led eventually to extinction of an ecologically unique assemblage of more than 200 species of cichlid fish in the lake.

When a species become extinct, the plant and animal species associated with it in an obligatory way also become, extinct.

Statements, A, B and D are correct.

96. Identify the correct statements about biomolecules.

A. Lipids are generally water soluble.

B. Proteins are polypeptides.

C. Polysaccharides are long chains of sugars.

D. Adenine and guanine are substituted pyrimidines.

E. Almost all enzymes are proteins.

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

(1) C, D and E only

(2) B, C and E only

(3) B, D and E only

(4) A, B and C only

Answer (2)

Sol. Statements B, C and E are correct.

Statements A and D are not true.

Lipids are not water soluble. Adenine and guanine are substituted purines.

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

(1) 18 ATP and 12 NADPH

(2) 6 ATP and 12 NADPH

(3) 24 ATP and 18 NADPH

(4) 12 ATP and 18 NADPH

Answer (1)

Sol. Each turn of Calvin pathway utilizes 3ATP and $NADPH+H^+$ molecules for fixation of 1 CO_2 molecule.

So for 1 Glucose 6 turns are required, hence 18 ATP and 12 $NADPH+H^+$ are required for glucose synthesis.

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

A. They are called molecular scissors.

B. These are the enzymes responsible for restricting the growth of bacteriophages in *E. coli.*

C. They cut the DNA only at the centre of the palindromic sites.

D. They remove nucleotides only from the ends of DNA fragments.

E. They recognise specific palindromic base-pair sequences.

Choose the answer from the options given below :

(1) A and B only

(2) D and E only

(3) C and D only

(4) A and E only

Answer (3)

Sol. Statements C and D are incorrect. Restriction endonucleases usually cut the DNA slightly away from the centre of palindrome sites. They cannot remove nucleotides from the ends of the DNA fragment, which is function of restriction exonuclease.

99. Match List I with List II:

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

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

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

Answer (3)

Sol. **Decomposition** is the process of breaking down of complex organic matter into inorganic substance.

Detritus includes dead remains of plants and animals including fecal matter and acts as the raw material for decomposition.

Degradation of humus by activity of microbes leading to release of inorganic nutrients is called **Mineralisation**.

Accumulation of the dark coloured amorphous substance called humus, is called **humification**.

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

(1) *Selaginella*
(2) *Funaria*
(3) *Pinus*
(4) *Wolffia*

Answer (3)

Sol. The gymnosperms are plants in which the ovules are not enclosed by any ovary wall and remain exposed, both before and after fertilisation.

Pinus is a gymnosperm.

Funaria is a moss.

Selaginella is a pteridophyte.

101. Match List I with List II :

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

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

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

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

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

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

Answer (3)

Sol. Marginal placentation is found in pea, axile placentation is found in lemon, parietal placentation is found in mustard and basal placentation is found in marigold.

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

(1) The root cap zone

(2) The region of meristematic activity

(3) The region of elongation

(4) The region of maturation

Answer (4)

Sol. From the region of maturation, some epidermal cells form very fine and delicate, thread like structures called root hairs.

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

(1) Increased vacuolation

(2) Large conspicuous nuclei

(3) Cell enlargement

(4) New cell wall deposition

Answer (2)

Sol. Phase of elongation is characterised by new cell wall deposition, increased vacuolation and enlargement of cell. Presence of large conspicuous nuclei is a feature of cells in the meristematic phase.

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

A. A transcription unit in DNA is defined primarily by three regions : promoter, structural gene and terminator.

B. The promoter is said to be located towards the 5′-end of the structural gene.

C. The promoter is a DNA sequence that provides binding site for RNA polymerase.

D. The promoter defines the template and coding strands.

E. The terminator is located towards the 3′-end of the coding strand and it defines the end of the process of transcription.

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

(1) A, B, C , D and E

(2) B, C, D and E only

(3) A, C, D and E only

(4) A, B, C and D only

Answer (1)

Sol. The promoter and terminator flank the structural gene in a transcription unit.

The promoter is said to be located towards 5′-end of the structural gene.

It is a DNA sequence that provides binding site for RNA polymerase and it is the presence of promoter in a transcription unit that also defines the template and coding strands.

The terminator is located towards 3′-end of the coding strand and it usually defines the end of transcription.

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

(1) Quaternary structure
(2) Tertiary structure
(3) Primary structure
(4) Secondary structure

Answer (4)

Sol. Alpha-helix is shown by secondary structure of protein as it has right handed helices.

Primary structure is linear and tertiary structure is a hollow ball-like structure. Quaternary structures are formed by more than one polypeptide chains.

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

A. They are substituted methanes.
B. Serine is an aromatic amino acid.
C. Valine is a neutral amino acid.
D. Lysine is an acidic amino acid.

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

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

Answer (3)

Sol. Statements A and C are correct while statements B and D are incorrect. Serine is an alcoholic amino acid and lysine is a basic amino acid.

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

(1) to make the leaf impermeable to fungal spores.
(2) to perform photosynthesis.
(3) to minimize water loss during water stress.
(4) to transport water.

Answer (3)

Sol. Bulliform cells are large empty colourless cells that lose water and become flaccid in water scarce condition. Hence they curl the leaf inwards to minimise water loss by reducing the exposed surface area.

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

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

Choose the answer from the options given below:

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

Answer (2)

Sol. The water splitting complex is associated with PS-II. C_3 pathway is the main biosynthetic pathway for CO_2 fixation in both C_3 and C_4 plants.

C_3 plants do not exhibit 'kranz' anatomy.

ATP synthesis in chloroplast (Photophosphorylation) occurs by chemiosmosis.

109. Match List-I with List-II :

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

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

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

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

Answer (3)

Sol. (A) Conjunctive tissue is the tissue between xylem and phloem.

(B) Casparian strips are found in endodermal cells, they are suberin depositions in the cell wall.

(C) Subsidiary cells are specialised cells in the vicinity of guard cells.

(D) Starch sheath is another name for endodermal cells rich in starch.

110. Match List I with List II:

	List-I		List-II
A.	Genetically modified organism	(I)	*Agrobacterium tumefaciens*
B.	Thermostable DNA polymerase	(II)	Bt cotton
C.	Ti plasmid	(III)	*Thermus aquaticus*
D.	pBR322	(IV)	*Escherichia coli*

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

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

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

Answer (3)

Sol. Genetically modified organism – Bt cotton

Thermostable DNA polymerase – *Thermus aquaticus.*

Ti plasmid – *Agrobacterium tumefaciens*

pBR322 – *Escherichia coli*

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

(1) Dedifferentiation
(2) Elasticity
(3) Redifferentiation
(4) Plasticity

Answer (4)

Sol. Plants follow different pathways in response to environment or phases of life to form different kinds of structures. This ability is called plasticity, e.g., heterophylly in cotton, coriander and larkspur.

112. In racemose inflorescence, _____.

(1) The main axis terminates in a flower
(2) The growth is limited
(3) Flowers are borne in an acropetal succession
(4) Flowers are solitary

Answer (3)

Sol. In racemose type of inflorescence, the main axis continues to grow and the flowers are borne laterally in an acropetal succession. On the contrary, in cymose type of inflorescence, the main axis terminates into a flower and hence, is limited in growth.

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

(1) Haemophilia
(2) Thalassemia
(3) Sickle-cell anaemia
(4) Phenylketonuria

Answer (3)

Sol. Sickle cell anaemia is an autosome linked recessive trait that can be transmitted from parents to offsprings when both partners are carrier for the gene. The defect is caused by the substitution of Glutamic acid (Glu) by Valine (Val) at sixth position of beta globin chain of haemoglobin molecule.

114. Match List I with List II :

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

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

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

Answer (1)

Sol. Inheritance of flower colour in snapdragon (*Antirrhinum* sp.) is an example of incomplete dominance.

ABO blood groups exhibit codominance in case of individuals having AB blood group (I^AI^B)

Phenylketonuria in humans is an example of pleiotropy since the gene responsible for it leads to multiple phenotypic effects.

Human skin colour is controlled by three pairs of non allelic genes, hence it is an example of polygenic inheritance.

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

A. Microspore tetrads

B. Sporogenous tissue

C. Pollen grains

D. Pollen mother cells

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

(1) D, A, C, B (2) B, D, C, A

(3) B, D, A, C (4) A, D, C, B

Answer (3)

Sol. The process of formation of microspores from a pollen mother cell (PMC) through meiosis is called microsporogenesis.

The correct developmental sequence related to microsporogenesis will be –

Sporogenous tissue (B) $\rightarrow$ Pollen mother cell (D) $\rightarrow$ Microspore tetrads (A) $\rightarrow$ Pollen grains (C)

116. Arrange the following steps of DNA fingerprinting in a correct sequence.

A. Isolation of DNA and its digestion by restriction endonucleases.

B. Hybridisation using a labelled VNTR probe.

C. Transferring of separated DNA fragments to synthetic membranes.

D. Detection of hybridised DNA fragments by autoradiography.

E. Separation of DNA fragments by electrophoresis.

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

(1) A, E, C, B, D (2) A, E, B, C, D

(3) A, B, D, C, E (4) A, D, B, E, C

Answer (1)

Sol. The following is the correct sequence of steps of DNA fingerprinting.

A. Isolation of DNA and its digestion by restriction endonuclease.

B. Probes made complementary to the VNTR locus are allowed to hybridise with the DNA fragments.

C. The separated DNA fragments are transferred to synthetic membranes made of nylon or nitrocellulose.

D. Finally, the hybridised DNA fragments are detected under X-rays in a technique called autoradiography.

E. DNA fragments are separated based on their size by the technique of gel electrophoresis.

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

(1) Biomagnification

(2) Biofortification

(3) Bioremediation

(4) Bioprospecting

Answer (4)

Sol. Exploring molecular, genetic and species – level diversity for products of economic importance is called as bioprospecting.

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

A. An offspring formed from the union of a sperm and an egg, develops as a female (queen or worker).

B. An unfertilized egg develops as a male by parthenogenesis.

C. A male has half the number of chromosomes than that of a female.

D. Males produce sperms by meiosis.

E. Honeybees have a haplodiploid sex-determination system.

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

(1) B, C, D and E only

(2) A, B, C and D only

(3) A, B, D and E only

(4) A, B, C and E only

Answer (4)

Sol. In case of honeybees, males have half the number of chromosomes than that of females. The females are diploid, having 32 chromosomes and males are haploid, i.e., having 16 chromosomes. This is called as haplodiploid sex-determination system and has special characteristic features, such as, the males produce sperms by mitosis.

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

(1) Denaturation → Annealing → Extension

(2) Denaturation → Extension → Annealing

(3) Extension → Annealing → Denaturation

(4) Annealing → Denaturation → Extension

Answer (1)

Sol. The correct sequence of steps in PCR is

Denaturation → Annealing → Extension

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

A. The cutting of DNA is done by molecular scissors.

B. The DNA fragments separate according to their size in an agarose gel, upon electrophoresis.

C. The separated DNA fragments can be seen without staining when exposed to UV light.

D. The separated DNA fragments, when stained with ethidium bromide, can be seen in visible light.

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

(1) A and D only

(2) B and D only

(3) B and C only

(4) A and B only

Answer (4)

Sol.
- The cutting of DNA is possible by the use of restriction enzymes that results in the fragments of DNA. These fragments of DNA can be separated by a technique known as gel electrophoresis.
- The DNA fragments separate (resolve) according to their size through sieving effect provided by the agarose gel.
- The separated DNA fragments can be visualised only after staining the DNA with a compound known as ethidium bromide followed by exposure to UV radiation.

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

A. Cell structure

B. Body organization

C. Presence of flagellum

D. Reproduction

E. Phylogenetic relationships

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

(1) A, B, D and E only

(2) A, B, C, D and E

(3) A, B and E only

(4) B, C and D only

Answer (1)

Sol. The main criteria for five kingdom classification used by (R.H. Whittaker) includes cell structure, body organization, mode of nutrition, reproduction and phylogenetic relationships.

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

(1) Central cell

(2) Primary endosperm cell

(3) Zygote

(4) Synergid

Answer (2)

Sol. Synergid is haploid, Zygote is diploid, Central cell initially contains two polar nuclei which fuse just before fertilization to form a secondary nucleus (2n).

Primary endosperm cell (PEC) is triploid.

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

A. Histones are organized to form a unit of eight molecules called histone octamer.

B. Histones are negatively charged basic proteins.

C. Histones are rich in the basic amino acid residues - lysine and arginine.

D. The positively charged DNA is wrapped around the histone octamer to form nucleosome.

E. The packaging of chromatin at higher levels requires an additional set of proteins called non-histone chromosomal proteins.

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

(1) A, B and D only

(2) A, C and E only

(3) C, D and E only

(4) B, D and E only

Answer (2)

Sol. Eight Histones are combined to form a histone octamer. Histones are positively charged basic proteins that are rich in basic amino acids (lysine and arginine). The negatively charged DNA is wrapped around the histone octamer to form nucleosome. The packaging of chromatin at higher levels require NHC (non histone chromosomal) proteins.

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

(1) Sacred Groves
(2) Wildlife Safari Parks
(3) Botanical Gardens
(4) Seed Banks

Answer (1)

Sol. *In-situ* conservation is exemplified by sacred groves. Wildlife Safari parks, Botanical gardens, seed banks are examples of *in-situ* conservation.

125. In the *lac* operon, the *z* gene codes for

(1) transacetylase
(2) the repressor of *lac* operon
(3) permease
(4) beta-galactosidase

Answer (4)

Sol. In *lac* operon,

i gene codes for – regulator protein

z gene codes for – beta-galactosidase

y gene codes for – Permease

a gene codes for – transacetylase

126. Match List-I with List-II

	List-I (Growth Regulator)		**List-II (Function/Effect)**
A.	2,4-D	I.	Brewing industry
B.	GA_3	II.	Stimulation of stomatal closure
C.	Kinetin	III.	Herbicide
D.	ABA	IV.	Nutrient mobilisation

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

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

Answer (3)

Sol.

	List-I (Growth Regulator)		**List-II (Function/Effect)**
A.	2,4-D (Auxin)	III.	Herbicide
B.	GA_3 (Gibberellic Acid)	I.	Brewing industry
C.	Kinetin (Cytokinin)	IV.	Nutrient mobilisation
D.	ABA (Abscisic Acid)	II.	Stimulation of stomatal closure

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

A. Digestion of cell walls.

B. Isolation of naked protoplasts.

C. Fusion of protoplasts to get hybrid protoplast.

D. Isolation of single cells from two different varieites of plants.

E. Growing of hybrid protoplast to form a new plant.

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

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

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

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

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

Answer (2)

Sol. Scientist have even isolated single cell protoplasts from two different varieties of plants each having a desirable character and after digesting their cell walls have been able to isolate naked protoplasts (surrounded by plasma membrane) that can be fused to get hybrid protoplast, which can be further grown to form a new plant. These hybrids are called somatic hybrids, while the process is called somatic hybridization.

So the correct sequence for the formation of somatic hybrids is D, A, B, C, E.

128. $2(C_{51}H_{98}C_6) + 145\ O_2 \rightarrow 102\ CO_2 + 98\ H_2O$ + energy

The Respiratory Quotient (RQ) of a biomolecule used for respiration, as per the above equation would be :

(1) Less than 0.5

(2) Between 0.5 and 0.95

(3) Between 1.25 and 2

(4) 1.0

Answer (2)

Sol. $R.Q = \dfrac{\text{Volume of } CO_2 \text{ evolved}}{\text{Volume of } O_2 \text{ consumed}}$

As per the given equation,

$2(C_{51}H_{98}O_6) + 145\ O_2 \rightarrow 102\ CO_2 + 98\ H_2O$ + Energy

Hence the RQ can be calculated as,

$$R.Q = \frac{102}{145} = 0.7$$

This value lies between 0.5 and 0.95.

129. Since the origin and diversification of life on Earth, there have been five episodes of mass extinction of species. How is the sixth extinction, which is in progress, different from the previous episodes?

(1) The current species extinction rates are far lower than those in previous episodes.

(2) The present species extinction rates are 100 to 1000 times faster than in the pre-human times.

(3) The present net species extinction rate is zero.

(4) The current species extinction rate is nearly 10 times faster than in previous episodes.

Answer (2)

Sol. The current, sixth episode of mass extinction is estimated to be 100 to 1000 times faster than the ones in the pre-human times and our activities are responsible for the faster rates.

130. Match List I with List II :

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

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

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

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

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

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

Answer (1)

Sol.
- Trypsin is a proteolytic enzyme.
- Morphine is a secondary metabolite that belongs to the category of alkaloid.
- Concanavalin A is a lectin.
- Collagen acts as an intercellular ground substance.

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

(1) Both the words in a biological name, when handwritten, are separately underlined or printed in italics

(2) The specific epithet in the biologial name starts with a small letter

(3) The first word in the biological name represents the specific epithet, while the second component denotes the genus

(4) Biological names are generally in Latin

Answer (3)

Sol. According to universal rules of nomenclature, the first word denoting the genus starts with a capital letter with the second components denotes the specific epithet and starts with small letter.

132. The enzyme required for carboxylation in the Calvin cycle is

(1) PEP carboxylase

(2) RuBP carboxylase - oxygenase

(3) Carboxypeptidase

(4) Hexokinase

Answer (2)

Sol. RuBisCO (RuBP carboxylase -oxygenase) is the enzyme required for carboxylation in the Calvin cycle.

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

(1) $\oplus\ \male\female\ K_{(5)}\overset{\frown}{C_{(5)}}A_5\ \underline{G}_{(2)}$

(2) $\oplus\ \male\female\ K_5\overset{\frown}{C_{(5)}}A_5\ \underline{G}_{(2)}$

(3) $\oplus\ \male\female\ K_{(5)}C_{(5)}A_5\ \underline{G}_{(2)}$

(4) $\oplus\ \male\female\ K_5\ C_5\ A_5\ \underline{G}_{(2)}$

Answer (1)

Sol. $\oplus\ \male\female\ K_{(5)}\overset{\frown}{C_{(5)}}A_5\ \underline{G}_{(2)}$

Is the floral formula for Solanaceae.

It shows actinomorphic, bisexual, pentamerous flower with epipetalous condition

Generally in Solanaceae, calyx (K) and Corolla (C) shows fusion in sepals and petals respectively. Hence the floral formula must exhibit gamosepalous and gamopetalous condition.

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

(1) Geitonogamy
(2) Autogamy
(3) Xenogamy
(4) Cleistogamy

Answer (3)

Sol. Transfer of pollen grains from anther to stigma of a different plant is known as Xenogamy. This is the only type of pollination which brings genetically different types of pollen grains to stigma. Cleistogamy flowers are invariably autogamous.

135. Match List-I with List-II:

	List-I (Process)		**List-II (Location)**
A.	Glycolysis	I.	Inner mitochondrial membrane
B.	ETS	II.	Mitochondrial matrix
C.	Accumulation of protons	III.	Cytoplasm
D.	Krebs' cycle	IV.	Intermembrane space

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

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

Answer (2)

Sol. The site of glycolysis is the cytoplasm in all living organisms. Electron transport system is localized in inner mitochondrial membrane. Accumulation of protons occur in intermembrane space and Kreb's Cycle takes place in mitochondrial matrix.

136. Insertion of a foreign DNA at BamHI site in an *E.coli* cloning vector pBR322 results in the loss of antibiotic resistance towards:

(1) Gentamycin
(2) Ampicillin and tetracycline
(3) Tetracycline
(4) Ampicillin

Answer (3)

Sol. If one ligate a foreign DNA at the BamHI site of tetracycline resistance gene in the vector pBR322, the recombinant plasmid will lose tetracycline resistance due to insertion of foreign DNA.

137. The sixth mutant codon of beta globin gene causing polymerization of Haemoglobin and change in RBC shape is _____.

(1) CAG
(2) GUG
(3) AUG
(4) GAG

Answer (2)

Sol. Sickle cell anaemia is an autosomal recessive disorder which is caused by the substitution of Glutamic acid by Valine, at the sixth position of the beta globin chain of the haemoglobin molecule. The substitution of amino acid in the globin protein results due to the single base substitution from GAG to GUG. Hence, GUG is responsible for the change in the shape of RBC.

138. Choose the correct statement regarding GIFT to overcome infertility.

(1) Ova collected from a female donor are transferred to the uterus of an infertile female.
(2) It is the transfer of an ovum collected from a donor into the fallopian tube of another female who cannot produce ovum but can provide suitable envoronment for fertilization and development.
(3) Early embryos with up to 8 blastomeres are transferred to the uterus of an infertile female.
(4) Early embryos with up to 8 blastomeres are transferred into the fallopian tube of an infertile female.

Answer (2)

Sol. GIFT is an *in-vivo* technique used to assist infertility

GIFT: Gamete Intra Fallopian Transfer technique facilitates the transfer of an ovum collected from a donor into the fallopian tube of another female who cannot produce one, but can provide suitable environment for fertilization and further development.

ZIFT : Zygote Intra Fallopian Transfer is an *in-vitro* technique in which zygote or early embryo upto 8 blastomeres is transferred in fallopian tube.

139. Which one of the following is an appropriate example of sexual deceit?

(1) Female wasp and fig
(2) Cuckoo and crow
(3) Ophrys and bumblebee
(4) Sea anemone and clown fish

Answer (3)

Sol. Female wasp and fig – Mutualism

Ophrys and bumblebee – Sexual deceit

Sea anemone and clown fish – Commensalism

Cuckoo and crow – Brood Parasitism

140. Evolution of human appears parallel to the progressive development of brain and language skills. As such, the evolution of individual species in the sequence of their appearance is:

(1) *Homo habilis* → *Homo erectus* → *Ramapithecus* → *Neanderthal* → *Homo sapiens*

(2) *Ramapithecus* → *Homo habilis* → *Homo erectus* → *Neanderthal* → *Homo sapiens*

(3) *Homo sapiens* → *Ramapithecus* → *Homo habilis* → *Neanderthal* → *Homo erectus*

(4) *Neanderthal* → *Ramapithecus* → *Homo habilis* → *Homo erectus* → *Homo sapiens*

Answer (2)

Sol.
- Evolution of human appears parallel to the progressive development of brain and language skills.
- The correct chronological order in which human evolution took place is :

  Ramapithecus → *Australopithecines* → *Homo habilis* → *Homo erectus* → *Neanderthalensis* → *Homo sapiens*

141. Match **List I** with **List II** related to embryonic development at various months of pregnancy:

	List-I		**List-II**
A.	The foetus movement starts and hair appears on the head	(I)	24 weeks of pregnancy
B.	The foetus develops limbs and digits	(II)	20 weeks of pregnancy
C.	The foetus develops external genital organs	(III)	8 weeks of pregnancy
D.	The foetus body is covered with fine hair; eyelids separate and eyelashes are formed	(IV)	12 weeks of pregnancy

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

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

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

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

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

Answer (4)

Sol.

- By the end of second month of pregnancy (8 weeks), the foetus develops limbs and digits
- By the end of 12 weeks (first trimester) of pregnancy, most of the major organ system are formed. The limbs and external genital organs are also well developed.
- During the fifth month (20 weeks) of pregnancy, the first movements of the foetus and appearance of hair on the head are usually observed.
- By the end of about 24 weeks (ends of second trimester) of pregnancy, the body is covered with fine hair, eye lids separate and eyelashes are formed.

So, the correct match is A-II, B-III, C-IV, D-I

142. A group of researchers procured some fish like animals and upon investigation the following characters were observed:

A. Endoskeleton was made of cartilage.

B. Ectoparasitic; as they were found attached on fish skin with their circular sucking mouth.

C. Paired fins and scales were absent, but 7 pairs of gill slits were present.

Which of the following species of animals did they consider to fit best with these characters?

(1) *Exocoetus sp.*

(2) *Branchiostoma sp.*

(3) *Petromyzon sp.*

(4) *Scoliodon sp.*

Answer (3)

Sol. *Petromyzon sp.* have cartilaginous endoskeleton. They have circular sucking mouth. They are ectoparasites on some fishes. Their body is devoid of scales and paired fins. They have 7 pairs (6-15 pairs) of gill slits.

Scoliodon and *Exocoetus* are not parasites.

143. Spermatogonia undergo a series of cell divisions statements to produce sperms. Select the correct from the following :

A. Spermatogonia always undergo meiotic cell division.

B. Primary spermatocytes divide mitotically to produce secondary spermatocytes.

C. Secondary spermatocytes, through their second meiotic division, produce haploid spermatids.

D. Spermatids produce spermatozoa through mitosis.

E. Spermatids transform into spermatozoa by spermiogenesis.

Choose the correct answer from the options given below:

(1) C and E only

(2) A, C and E only

(3) B, C and D only

(4) A and E only

Answer (1)

Sol. (A) Incorrect : Spermatogonia undergo mitotic differentiation.

(B) Incorrect : Primary spermatocytes undergo 1st meiotic division to form secondary spermatocytes.

(C) Correct : Secondary spermatocytes undergo 2nd meiotic division to form the haploid spermatids.

(D) Incorrect : Spermatids form spermatozoa through a differentiation process called spermiogenesis.

(E) Correct : Spermatids produce spermatozoa *via* spermiogenesis.

Thus, the correct statements are (C) and (E) only.

144. What is the probability of having children with 'O' blood group, where both mother and father are heterozygous for 'A' and 'B' blood group, respectively?

(1) 50%

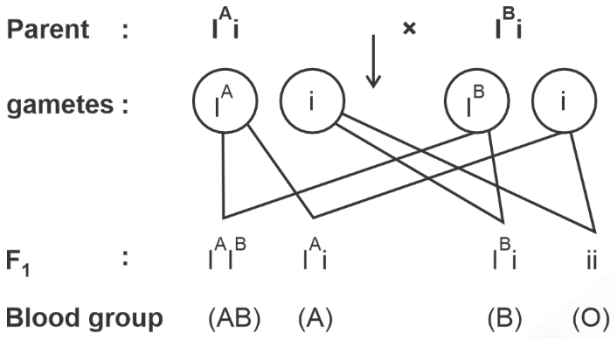
(2) 0%

(3) 75%

(4) 25%

Answer (4)

Sol.



$\because$ Out of four children, one is with blood group 'O'.

$\therefore$ The probability of having children with 'O' blood group will be 25%

145. Arrange the following events occuring in Renin-Angiotensin mechanism in the correct order:

A. Increase in blood pressure and Glomerular filtration rate

B. Reabsorption of Na^+ and water from distal parts of tubule due to Aldosterone

C. Fall in Glomerular filtration rate

D. Vasoconstriction by Angiotensin II and release of Aldosterone.

E. Renin converts Angiotensinogen into Angiotensin I, followed by Angiotensin II.

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

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

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

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

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

Answer (4)

Sol. The JGA plays a complex regulatory role

- A fall in glomerular blood flow/GFR can activate the JG cells to release renin which converts angiotensinogen in blood to angiotensin I and further to angiotensin II
- Angiotensin II, being a powerful vasoconstrictor, increases the glomerular blood pressure and thereby GFR.
- Angiotensin II activates the adrenal cortex to release aldosterone.
- Aldosterone causes reabsorption of Na^+ and H_2O from the distal parts of the tubule. This leads to an increase in blood pressure and GFR.

146. Match List-I with List-II.

	List-I (Respiratory Volume)		List-II (Capacity in mL)
A.	ERV (Expiratory Reserve Volume)	I.	2500 – 3000 mL
B.	RV (Residual Volume)	II.	500 mL
C.	IRV (Inspiratory Reserve Volume)	III.	1000 – 1100 mL
D	TV (Tidal Volume)	IV.	1100 – 1200 mL

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

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

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

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

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

Answer (3)

Sol. ERV (Expiratory Reserve Volume) – 1000 – 1100 mL

RV (Residual Volume) – 1100–1200 mL

IRV (Inspiratory Reserve Volume) – 2500–3000 mL

TV (Tidal Volume) – 500 mL

147. Match List I and List II

	List-I		List-II
A.	Progestasert	I.	Barrier made of rubber used by females
B.	Multiload 375	II.	Oral contraceptive
C.	Diaphragm	III.	Hormone releasing IUD
D	Saheli	IV.	Copper releasing IUD

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

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

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

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

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

Answer (1)

Sol.

Progestasert – Hormone releasing IUD

Multiload 375 – Copper releasing IUD

Diaphragm – Barrier made of rubber used by females

Saheli – Oral contraceptive

148. Non-membrane bound cell organelles found in both prokaryotic and eukaryotic cells are _____.

(1) Centrosomes (2) Ribosomes

(3) Lysosomes (4) Mitochondria

Answer (2)

Sol. Ribosome is a non-membrane bound cell organelle, found in both prokaryotic and eukaryotic cells.

149. Ecological pyramids represent the relationship between the organisms at different trophic levels and they are generally inverted for:

(1) Pyramid of energy in pond ecosystem (2) Pyramid of biomass in sea

(3) Pyramid of number in grassland (4) Pyramid of biomass in grassland

Answer (2)

Sol.
- Pyramid of number in grassland ecosystem is upright
- Pyramid of energy in pond ecosystem is upright
- Pyramid of biomass in grassland is upright
- Pyramid of biomass in sea is inverted

150. The flightless bird with forelimbs modified as paddle-like structures suited for swimming is known as:

(1) *Struthio* (2) *Psittacula*

(3) *Neophron* (4) *Aptenodytes*

Answer (4)

Sol.
- *Neophron* is vulture and *Psittacula* is a parrot. Both perform flight.
- *Struthio* is ostrich and *Aptenodytes* is penguin. Both are flightless birds.
- In penguins, forelimbs are modified into flippers (paddle like structure) and are used for swimming. In ostriches, forelimbs are small and used for balance while running, not for swimming.

151. Match List I with List II:

	List I (Bioactive molecules)		**List II (Importance)**
A.	Streptokinase	I.	Immunosuppressive agent
B.	Statins	II.	Removal of clots from the blood vessels
C.	Lipases	III.	Blood cholesterol-lowering agent
D	Cyclosporin A	IV	Detergent formulations

Choose the correct answer from the options given below:

(1) A–II, B–III, C–IV, D–I (2) A–IV, B–III, C–II, D–I

(3) A–II, B–III, C–I, D–IV (4) A–III, B–II, C–IV, D–I

Answer (1)

Sol. Streptokinase → Used as 'clot buster' for removing clots from the blood vessels

Statins → Blood cholesterol lowering agent, produced by *Monascus purpureus*

Lipases → Used in detergent formulation

Cyclosporin A → Used as immunosuppressive agent in organ transplant patients and produced by *Trichoderma polysporum*

152. Choose the correct statements regarding cell organelles and their inclusions.

A. The endomembrane system includes Golgi complex, endoplasmic reticulum and mitochondria.

B. Rough endoplasmic reticulum bears ribosomes on its surface.

C. Both mitochondria and plastids have circular DNA.

D. A network of microtubules, microfilaments and intermediate filaments present in the cytoplasm is called cytoskeleton.

E. Mitochondrion is a single membrane-bound structure.

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

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

Answer (4)

Sol. The endomembrane system does not include mitochondria. Mitochondria is a double membrane bound cell organelle.

153. Select the set of fishes which belong to the class Osteichthyes:

(1) Devil fish, Cuttlefish and Hagfish
(2) Starfish, Hagfish and Cuttlefish
(3) Flying fish, Angel fish and Fighting fish
(4) Saw fish, Fighting fish and Dog fish

Answer (3)

Sol. The correct answer is option (3).

Flying fish (*Exocoetus*) is a marine bony fish. Angel fish (*Pterophyllum*) and fighting fish (*Betta*) are aquarium bony fishes.

Option (1) is incorrect as:-

Devil fish (*Octopus*) and cuttlefish (*Sepia*) are molluscs.

Hag fish (*Myxine*) is a cyclostome.

Option (4) is incorrect as:-

Saw fish (*Pristis*) and dog fish (*Scoliodon*) are cartilaginous fishes.

Option (2) is incorrect as:-

Starfish (*Asterias*) is an echinoderm.

154. In a population of a grasshopper species, the chromosome number of some members is 23 and some other members possess 24 chromosomes. The 23 and 24 chromosome-bearing members in this species are _____.

(1) all males
(2) all females
(3) females and males, respectively
(4) males and females, respectively

Answer (4)

Sol.

In grasshopper sex determination is XX – XO type, in which, males have only one X-chromosome besides the autosome (XO), whereas females have a pair of X-chromosome, besides autosomes (XX).

Therefore, the individual with 23 chromosomes is a male grasshopper and the one with 24 chromosomes is a female grasshopper.

155. The WBC count of a person's blood sample is 8000/cu mm. How many eosinophils and lymphocytes would be in the same blood sample approximately?

(1) 160 – 240/cu mm and 1600 – 2000/cu mm respectively

(2) 100 – 120/cu mm and 160 – 200/cu mm respectively

(3) 300 – 500/cu mm and 500 – 700/cu mm respectively

(4) 300 – 500/cu mm and 1200 – 1500/cu mm respectively

Answer (1)

Sol. Eosinophils constitute 2-3% of total WBCs. Hence its value is approximately 2 to 3% of 8000/cu mm = 160 – 240/cu mm

Lymphocytes constitute 20-25% of total WBCs. Hence its value is approximately 20 to 25% of 8000/cu mm = 1600 – 2000/cu mm

156. The toxin proteins isolated from *Bacillus thuringiensis*, coded by which of the following genes would control cotton bollworms and corn borer, respectively?

(1) *cryIAc* and *cryIIIAb*

(2) *cryIAc* and *cryIIAb*

(3) *cryIAc* and *cryIAb*

(4) *cryIIAb* and *cryIAc*

Answer (3)

Sol. Specific Bt toxin genes were isolated from *Bacillus thuringiensis* and incorporated into the several crop plants such as cotton. The choice of genes depends upon the crop and the targeted pest, as most Bt toxins are insect-group specific. The toxin is coded by a gene named *cry*. The proteins encoded by the genes *cryIAc* and *cryIIAb* control the cotton bollworms, that of *cryIAb* controls corn borer. So, the correct answer is *cryIAc* for cotton bollworms and *cryIAb* for corn borer that is represented in option (3).

157. Match List I with List II:

	List I (Drug)		**List II (Effect)**
A.	Nicotine	I.	Causes sense of euphoria and increased energy
B.	Morphine	II.	Stimulates adrenal gland to release catecholamines into blood circulation
C.	Heroin	III.	Effective sedative and painkiller
D.	Cocaine	IV.	A depressant; slows down body function

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

(1) A–III, B–II, C–IV, D–I

(2) A–II, B–III, C–IV, D–I

(3) A–II, B–III, C–I, D–IV

(4) A–III, B–II, C–I, D–IV

Answer (2)

Sol. The correct answer is option (2) as

Nicotine is present in tobacco and it activates adrenal medulla to release catecholamines into blood circulation, so (A) → II

Morphine acts as an effective sedative and painkiller. It is an opioid, so (B) → III

Heroin acts as a depressant and slows down body function, so (C) → IV

Cocaine acts as a stimulant and causes a sense of euphoria and increased energy, so (D) → I

Thus, (A) → II, (B) → III, (C) → IV, (D) → I

158. Match List I with List II related to muscular/skeletal system:

	List I		List II
A.	Tetany	(I)	Inflammation of joints
B.	Arthritis	(II)	Autoimmune disorder affecting neuromuscular junction
C.	Myasthenia gravis	(III)	Wild contraction in muscle due to low Ca^{++} in body fluid
D.	Muscular dystrophy	(IV)	Progressive degeneration of skeletal muscle

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

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

Answer (1)

Sol.
- Arthritis is an inflammation of joints.
- Tetany is rapid spasms (wild contractions) in muscle due to low Ca^{++} in body fluids.
- Muscular dystrophy is progressive degeneration of skeletal muscle mostly due to genetic disorder
- Myasthenia gravis is an autoimmune disorder affecting neuromuscular junction leading to fatigue, weakening and paralysis of skeletal muscle.

Hence, A-III, B-I, C-II, D-IV is the correct match.

159. In which animal do haploid cells divide mitotically to produce gametes?

(1) Male honeybees
(2) Male grasshoppers
(3) Male earthworms
(4) Male frogs

Answer (1)

Sol. The male honeybee is haploid and females are diploid. The gamete formation in female honey bee is by meiosis, whereas male honeybee form gametes by mitosis. Thus haploid cell undergoes mitosis in male honeybees.

160. In humans, respiration occurs in the following steps. Arrange these steps in the correct order.

A. Diffusion of O_2 and CO_2 between blood and tissues
B. Diffusion of O_2 and CO_2 across alveolar membrane
C. Pulmonary ventilation by which atmospheric air is drawn in and CO_2 rich alveolar air is released out
D. Cellular respiration
E. Transport of gases by the blood

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

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

Answer (4)

Sol. Respiration involves the following steps:

(i) Breathing or pulmonary ventilation by which atmospheric air is drawn in and CO_2 rich alveolar air is released out.

(ii) Diffusion of gases across alveolar membrane.

(iii) Transport of gases by the blood

(iv) Diffusion of O_2 and CO_2 between blood and tissues

(v) Utilisation of O_2 by the cells for catabolic reactions and resultant release of CO_2

161. Arrange the following cell layers/structures around the female gamete, from outer to inner side :

A. Zona pellucida

B. Perivitelline space

C. Corona radiata

D. Plasma membrane of ovum

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

(1) C, A, D, B (2) C, A, B, D

(3) D, B, A, C (4) A, C, B, D

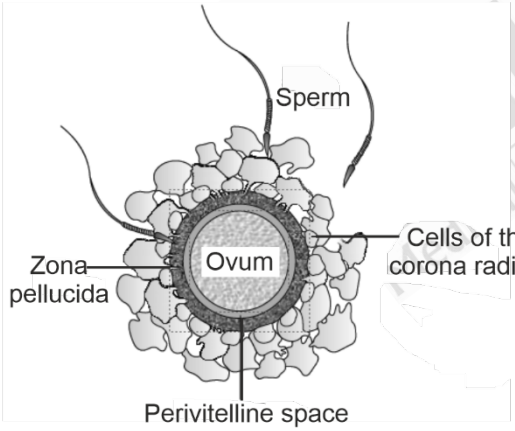
Answer (2)

Sol.

The cell layer/structure around the female gamete from outer to inner side is :

Corona radiata → zona pellucida → perivitelline space → plasma membrane of ovum.

So the correct answer is C, A, B, D.



162. The human protein named α-1-antitrypsin, obtained from transgenic animals, is used for the treatment of _____.

(1) Alzheimer's disease (2) Emphysema

(3) Rheumatoid arthritis (4) Cystic fibrosis

Answer (2)

Sol. The correct answer is option (2).

The human protein named α-1-antitrypsin, obtained from transgenic animals, is used for the treatment of emphysema.

Transgenic models exist for the study of other diseases, such as Alzheimer's disease, rheumatoid arthritis and cystic fibrosis.

163. Select the correct statements regarding cell membrane in eukaryotic cell.

A. Membrane of human RBCs has approximately 52% protein.

B. Major phospholipids are arranged in a bilayer.

C. Extensions of the plasma membrane into the cell form mesosomes.

D. Tails towards the inner part of lipids are hydrophobic and thus protected from aqueous medium.

E. Glycocalyx is present on the outer surface of the plasma membrane.

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

(1) A, C and E only (2) B, C and E only

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

Answer (4)

Sol.
- In prokaryotes, extensions of plasma membrane into the cell form mesosomes. Eukaryotes lack such structure.
- Glycocalyx is present on the outer surface of the plasma membrane in prokaryotes. Eukaryotes do not have glycocalyx.

Hence, only statement A, B and D are correct.

164. Male frogs can be distinguished from female frogs due to the presence of

A. Bulging eyes

B. Vocal sacs

C. Webbed digits in feet

D. Copulatory pad on first digit of fore limbs

E. Olive green-coloured skin with dark irregular spots

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

(1) B and D only (2) B and C only

(3) A and B only (4) C and E only

Answer (1)

Sol. Male frogs can be distinguished from female frogs due to the presence of vocal sacs and copulatory pad on first digit of fore limbs.

Bulging eyes, webbed digit in feet and olive green-coloured skin with dark irregular spots are common in both male and female frogs.

165. Which of the following equations depicts Verhulst-Pearl logistic population growth?

(1) $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$ (2) $\frac{dN}{dt} = rN\left(\frac{K+N}{K}\right)$

(3) $\frac{dN}{dt} = rN\left(\frac{K}{K-N}\right)$ (4) $\frac{dN}{dt} = rN\left(\frac{K-N}{N}\right)$

Answer (1)

Sol. Verhulst-Pearl logistic population growth is depicted by the equation $\frac{dN}{dt} = rN\left(\frac{K-N}{K}\right)$

Where

- K = Carrying capacity
- r = Intrinsic rate of natural increase
- N = Population density at time 't'

166. Choose the correct statements regarding frog's anatomy:

A. Hepatic portal system is the special venous connection between liver and intestine.

B. There are twelve pairs of cranial nerves arising from the brain.

C. The ureters and oviducts open separately into the cloaca in female frogs.

D. Hind-brain consists of cerebellum, medulla oblongata and optic lobes.

E. Sinus venosus joins the right atrium of heart.

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

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

Answer (2)

Sol.

A. Correct → In frogs, the special venous connection between liver and intestine is called the hepatic portal system.

B. Incorrect → There are ten pairs of cranial nerves arising from the brain of frog.

C. Correct → In female frogs, the uterus and oviduct open separately in the cloaca.

D. Incorrect → In frogs, the midbrain consists of the optic lobes.

• The hindbrain consists of cerebellum, and medulla oblongata.

E. Correct → In frogs, a triangular structure called sinus venosus joins the right atrium.

Thus, correct statements are (A), (C) and (E)

167. Select the **incorrect** statement with reference to Rh grouping.

A. Erythroblastosis foetalis is a condition observed having foetus with Rh^{-ve} blood and mother with Rh^{+ve} blood.

B. Rh antigen is observed on RBCs in the majority of human beings.

C. Before blood transfusion, Rh group should also be matched.

D. Rh incompatibility is observed when a pregnant mother is Rh^{-ve} and the foetus is Rh^{+ve}.

E. Erythroblastosis foetalis can be avoided by administering anti-Rh antibodies to the mother immediately after the delivery of the second child.

Choose the answer from the options given below :

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

Answer (1)

Sol.

(A) Incorrect → A special case of Rh incompatibility has been observed between the Rh^{-ve} blood of a pregnant mother with Rh^{+ve} blood of the foetus.

(B) Correct → Rh antigen is observed on the surface of RBCs of majority (nearly 80 percent) of humans.

(C) Correct → Before blood transfusion, Rh group should also be matched to avoid severe problems of destruction of RBCs.

(D) Correct → Rh incompatibility (Erythroblastosis foetalis) is observed when a pregnant mother is Rh^{-ve} and the foetus is Rh^{+ve}.

(E) Incorrect → Erythroblastosis foetalis can be avoided by administering anti-Rh antibodies to the mother immediately after the delivery of the first child.

Thus, the incorrect statements are (A) and (E).

168. Which of the following statements are correct with reference to human endoskeleton?

A. Human skull is monocondylic.

B. The joint between any two adjoining vertebrae is a cartilaginous joint.

C. In human beings, the number of cervical vertebrae is seven.

D. All ribs except the last 2 pairs are bicephalic.

E. The occipital bone of skull is articulated with atlas vertebra.

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

(1) A, B and D only

(2) B and E only

(3) B, C and E only

(4) C, D and E only

Answer (3)

Sol. (A) Incorrect : Human skull is dicondylic. The skull region articulates with the superior region of the vertebral column (Atlas) with the help of two occipital condyles.

(B) Correct : The joint present between the adjacent vertebrae of vertebral column is cartilaginous joints.

(C) Correct : There are 7 cervical vertebrae in human beings.

(D) Incorrect : All ribs of humans are bicephalic, *i.e.,* they have two articulation surfaces on their dorsal end.

(E) Correct : The occipital bone of the skull articultes with the atlas vertebra *via* occipital condyles, forming the atlanto-occiptal joint.

169. Match List I with List II:

	List-I		**List-II**
A.	Cortisol	I.	Stimulates the formation of alveoli in mammary glands
B.	Aldosterone	II.	Produces anti-inflammatory reactions
C.	Cholecystokinin	III.	Stimulates reabsorption of Na^+ and water from renal tubule
D	Progesterone	IV.	Stimulates secretion of pancreatic enzymes and bile juice

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

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

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

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

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

Answer (2)

Sol. The correct answer is option (2) as

- Cortisol produces anti-inflammatory reactions and suppresses the immune response.
- Aldosterone acts mainly at the renal tubules and stimulates the reabsorption of Na^+ and water and excretion of K^+ and phosphate ions.
- Cholecystokinin (CCK) acts on both pancreas and gall bladder and stimulates the secretion of pancreatic enzymes and bile juice, respectively.
- Progesterone acts on the mammary glands and stimulates the formation of alveoli.

170. The following are the stages of life cycle of *Plasmodium.* Arrange the stages in the proper order.

A. The parasites reproduce asexually in RBCs, bursting the cells.

B. The parasites reproduce asexually in liver cells, bursting the cells and releasing into blood.

C. Gametocytes develop in RBCs.

D. Sporozoites reach the liver through the blood.

E. Female mosquito injects sporozoites into humans during bite.

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

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

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

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

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

Answer (2)

Sol. *Plasmodium* enters the human body as sporozoites through the bite of an infected female *Anopheles* mosquito. The parasites initially multiply asexually within the liver cells and then attack the RBCs resulting in their rupture.

- Sexual stages (gametocytes) develop in red blood cells.
- When a female *Anopheles* mosquito bites an infected person, these parasites enter the mosquito's body and undergo further development.

171. Select the **incorrect** statements from the following:

A. Digestive system in Platyhelminthes is incomplete.

B. Bilateral symmetry is a characteristic feature of adult Echinoderms.

C. Pseudocoelom is possessed by Aschelminthes.

D. Notochord is persistent throughout life in the class Chondrichthyes.

E. Members of class Reptilia maintain a constant body temperature.

Choose the answer from the options given below:

(1) B and E only

(2) C and D only

(3) A and C only

(4) B and D only

Answer (1)

Sol. The correct answer is option (1)

(A) → correct → Platyhelminthes have an incomplete digestive system.

(B) → incorrect → Bilateral symmetry is a characteristic feature of larvae of echinoderms. In adult echinoderms, radial symmetry is seen.

(C) → correct → Aschelminthes are characterised by the presence of pseudocoelom.

(D) → correct → Notochord is persistent throughout life in the Chondrichthyes.

(E) → incorrect → Reptiles are cold-blooded organisms and thus, they cannot maintain a constant body temperature.

Warm-blooded organisms like birds and mammals can maintain a constant body temperature.

Thus, as the incorrect statements are indicated by (B) and (E) only, the correct answer is option (1)

172. The specific receptors for neurotransmitters in a synapse are present on _____.

(1) Post-synaptic membrane
(2) Pre-synaptic membrane
(3) Myelin sheath
(4) Schwann cell

Answer (1)

Sol. The specific receptors for neurotransmitters in a synapse are present on post-synaptic membrane.

173. Choose the correct statements regarding muscle contraction.

A. A motor neuron carries a signal sent by the Central Nervous System (CNS) to the sarcolemma of the muscle fibre.
B. The neural signal generates an action potential which causes the release of Ca++ into sarcoplasm.
C. Increase in Ca++ inactivates the actin for breaking cross bridges.
D. Actin binds to the myosin head to form a cross bridge.
E. Shortening of sarcomere takes place, by pulling actin filaments towards the centre of 'A' band.

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

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

Answer (1)

Sol. Statements A, B, D and E are correct while statement C is incorrect.

A neural signal reaching neuromuscular junction releases a neurotransmitter (Acetylcholine) which generates an action potential in the sarcolemma. This spreads through muscle fibre and causes the release of Ca^{++} into the sarcoplasm. This Ca^{++} binds to the subunit of troponin on actin filaments and thereby remove the masking of active site for myosin on actin and hence facilitates the formation of cross bridge.

174. Which of the following is **not** an example of convergent evolution?

(1) Eyes of octopuses and mammals
(2) Fore limbs of whales and bats
(3) Wings of butterflies and birds
(4) Flippers of penguins and dolphins

Answer (2)

Sol. Fore limbs of whales and bats are examples of divergent evolution that show homology.

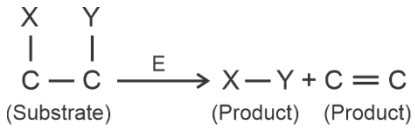
175. The JGA (Juxta Glomerular Apparatus) is a special sensitive region formed by cellular modifications in _____ related to the same nephron.

(1) Distal convoluted tubule and efferent renal arteriole
(2) Proximal convoluted tubule and afferent renal arteriole
(3) Distal convoluted tubule and afferent renal arteriole
(4) Proximal convoluted tubule and efferent renal arteriole

Answer (3)

Sol. JGA is a special sensitive region formed by cellular modifications in the distal convoluted tubule and the afferent arteriole at the location of their contact.

176. The following reaction depicts the activity of a particular class of enzymes :



Identify the enzymes class 'E' from the following options :

(1) Ligases
(2) Lyases
(3) Isomerases
(4) Transferases

Answer (2)

Sol. Lyases are the enzymes that catalyse removal of groups from substrates by mechanisms other than hydrolysis leaving double bonds.

- Transferases are the enzymes that catalyse a transfer of a group between a pair of substrates.
- Isomerases catalyse inter-conversion of optical, geometric or positional isomers.
- Ligases catalyse the linking together of 2 compounds.

177. Match List I with List II:

	List I		List II
A.	Molluscs	I.	Pulmonary respiration only
B.	Reptiles	II.	Branchial respiration
C.	Adult amphibians	III.	Cellular respiration
D	Amoeba	IV	Pulmonary and cutaneous respiration

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

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

Answer (2)

Sol. (A) Molluscs → (II) Perform branchial respiration by using feather-like gills

(B) Reptiles → (I) Perform pulmonary respiration only *via* lungs

(C) Adult amphibians → (IV) Perform pulmonary and cutaneous respiration *via* lungs and moist skin, respectively

(D) Amoeba → (III) Performs cellular respiration to generate ATP for survival

Thus, (A) – II, (B) – I, (C) – IV, (D) – III

178. What is the reason behind production of large holes in 'Swiss Cheese'?

(1) The production of large amount of CO_2 by *Clostridium butylicum*
(2) The production of large amount of CO_2 and H_2 by *Trichoderma polysporum*
(3) The production of large amount of CO_2 and H_2 by lactic acid bacteria called *Lactobacillus*
(4) The production of large amount of CO_2 by *Propionibacterium sharmanii*

Answer (4)

Sol. The large holes in swiss cheese are due to production of large amount of CO_2 by the bacterium *Propionibacterium sharmanii*.

- *Clostridium butylicum* is commercially utilised for butyric acid production.
- Curd is formed by *Lactobacillus*.

179. Match List I with List II with respect to chronology of evolution of life forms

	List-I		List-II
A.	About 65 mya	(I)	Jawless fish probably evolved
B.	About 500 mya	(II)	The dinosaurs suddenly disappeared from the earth
C.	About 350 mya	(III)	Seaweeds and few plants probably existed
D	About 320 mya	(IV)	Invertebrates were formed and became active

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

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

Answer (1)

Sol.

About 65 mya – The dinosaurs suddenly disappeared from the earth.

About 500 mya – Invertebrates were formed and became active.

About 350 mya – Jawless fish probably evolved.

About 320 mya – Seaweeds and few plants probably existed.

180. Choose the correct statements regarding population interactions between two species.

A. In both parasitism and commensalism, only one species benefits and the other species is harmed.

B. Both species benefit in mutualism.

C. Both species benefit in commensalism.

D. In parasitism, only one species benefits and the other species is harmed.

E. In amensalism, one species is harmed and the other is unaffected.

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

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

Answer (4)

Sol. In parasitism, one species is benefitted and the other is harmed. Whereas, in commensalism one species gets benefitted and the other remains unaffected.

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