



91. Match List I with List II :

**List-I**

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

**List-II**

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

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

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

**Ans. (2)**

**Sol.** A-II, B-III, C-I, D-IV

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

- (1) Bioprospecting
- (2) Biofortification
- (3) Biomagnification
- (4) Bioremediation

**Ans. (1)**

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



93. 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) A, B, C and E only | (2) A, B, C and D only |
| (3) B, C, D and E only | (4) A, B, D and E only |

**Ans. (1)**

**Sol.** Honeybee have haploid diploid sex-determination system. Here males are haploid and females (Queen and Worker) are diploid.

Male honeybee is formed by unfertilised egg through parthenogenesis and female honeybee is formed by union of male and female gamete.

94. Match List-I with List-II :

**List-I**

**(Growth Regulator)**

- A. 2,4-D
- B.  $GA_3$
- C. Kinetin
- D. ABA

**List-II**

**(Function/Effect)**

- I. Brewing industry
- II. Stimulation of stomatal closure
- III. Herbicide
- IV. Nutrient mobilisation

Choose the correct answer from the options given below :

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

**Ans. (4)**

**Sol.** A-III, B-I, C-IV, D-II

95. In racemose inflorescence, \_\_\_\_\_ :

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

**Ans. (3)**

**Sol.** In racemose inflorescence the main axis do not terminate into flower and new flowers are born in acropetal succession.

96. 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 that in previous episodes.

**Ans. (2)**

**Sol.** The present species extinction rates are 100 to 1000 times faster than in the pre-human times.

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

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

**Ans. (1)**

98. The enzyme required for carboxylation in the Calvin cycle is :

- (1) PEP carboxylase
- (2) RuBP carboxylase - oxygenase
- (3) Carboxypeptidase
- (4) Hexokinase

**Ans. (2)**

**Sol.** The enzyme required for carboxylation in the Calvin cycle is RuBP carboxylase - oxygenase

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99. 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) A, D, C, B                      (2) D, A, C, B  
(3) B, D, C, A                      (4) B, D, A, C

**Ans. (4)**

**Sol.** Sporogenes tissue  $\rightarrow$  Pollen mother cell ( $2n$ )  $\xrightarrow{\text{Meiosis}}$  Microspore tetrads  $\rightarrow$  Pollen grain

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

**Ans. (1)**

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

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

**Ans. (4)**

**Sol.** In the *lac* operon, the *z* gene codes for beta-galactosidase

102. Match List I with List II :

**List-I**

**(Phase of cell cycle)**

A. G<sub>1</sub> phase

B. S phase

C. G<sub>2</sub> phase

D. M phase

**List-II**

**(Activity)**

I. Actual cell division occurs

II. Cell is metabolically active and continuously grows but does not replicate its DNA

III. Synthesis of DNA occurs and the amount of DNA per cell doubles

IV. Proteins are synthesized while cell growth continues

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

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

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

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

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

**Ans. (4)**

**Sol.** A-II, B-III, C-IV, D-I

103.  $2(C_{51}H_{98}O_6) + 145 O_2 \rightarrow CO_2 + 98 H_2O + \text{energy}$

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

(1) Less than 0.5

(2) Between 1.25 and 2

(3) 1.0

(4) Between 0.5 and 0.95

**Ans. (4)**

**Sol.** Between 0.5 and 0.95

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

(1) New cell wall deposition

(2) Cell enlargement

(3) Large conspicuous nuclei

(4) Increased vacuolation

**Ans. (3)**

**Sol.** Large conspicuous nuclei is a characteristic feature of plant cell in the meristematic phase whereas other three are characteristic of plant cell in the phase of elongation.

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

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

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

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

**Ans. (4)**

**Sol.** D, A, B, C, E

106. Match List-I with List-II :

**List-I**

- A. Conjunctive tissue
- B. Casparian strips
- C. Subsidiary cells
- D. Starch sheath

**List-II**

- I. Specialised cells in the vicinity of guard cells
- II. Endodermal cells rich in starch
- III. Tissue between xylem and phloem
- IV. Endodermal cells with suberin deposition

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

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

**Ans. (2)**

**Sol.** A-III, B-IV, C-I, D-II

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

- (1) The region of elongation      (2) The region of meristematic activity
- (3) The region of maturation      (4) The root cap zone

**Ans. (3)**

**Sol.** In angiosperms, root hairs arise from the region of maturation.

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

$$(1) \oplus \text{♀} \text{K}_{(5)} \text{C}_{(5)} \text{A}_5 \underline{\text{G}}_{(2)}$$

$$(2) \oplus \text{♀} \text{K}_5 \text{C}_5 \text{A}_5 \underline{\text{G}}_{(2)}$$

$$(3) \oplus \text{♀} \text{K}_{(5)} \text{C}_{(5)} \text{A}_5 \underline{\text{G}}_{(2)}$$

$$(4) \oplus \text{♀} \text{K}_5 \text{C}_{(5)} \text{A}_5 \underline{\text{G}}_{(2)}$$

**Ans. (3)**

**Sol.**  $\oplus \text{♀} \text{K}_{(5)} \text{C}_{(5)} \text{A}_5 \underline{\text{G}}_{(2)}$

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

(1) Synergid

(2) Primary endosperm cell

(3) Central cell

(4) Zygote

**Ans. (2)**

**Sol.** Synergid

→ n

Primary endosperm cell

→ 3n

Central cell

→ n + n

Zygote

→ 2n

110. 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-III, B-II, C-I, D-IV

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

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

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

**Ans. (4)**

**Sol.** A-III, B-IV, C-II, D-I

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

**Ans. (4)**

**Sol.** The main criteria used for Five Kingdom Classification proposed by R.H. Whittaker (1969) included : Cell structure, Body organization, Reproduction and Phylogenetic relationships

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

- (1) Over-exploitation; Alien species invasions; Soil pollution; Co-extinctions
- (2) Habitat loss and fragmentation; Air pollution; Water pollution; Co-extinctions
- (3) Habitats loss and fragmentation; over-exploitation; Alien species invasions; Co-extinctions
- (4) Over-exploitation; Alien species invasions; Air pollution; Co-extinctions

**Ans. (3)**

**Sol.** "The Evil Quartet" of biodiversity loss includes habitats loss and fragmentation; over-exploitation; Alien species invasions; Co-extinctions.

113. 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, B, C, D
- (2) A, D, B, E, C
- (3) A, B, D, C, E
- (4) A, E, C, B, D

**Ans. (4)**

**Sol.** A, E, C, B, D

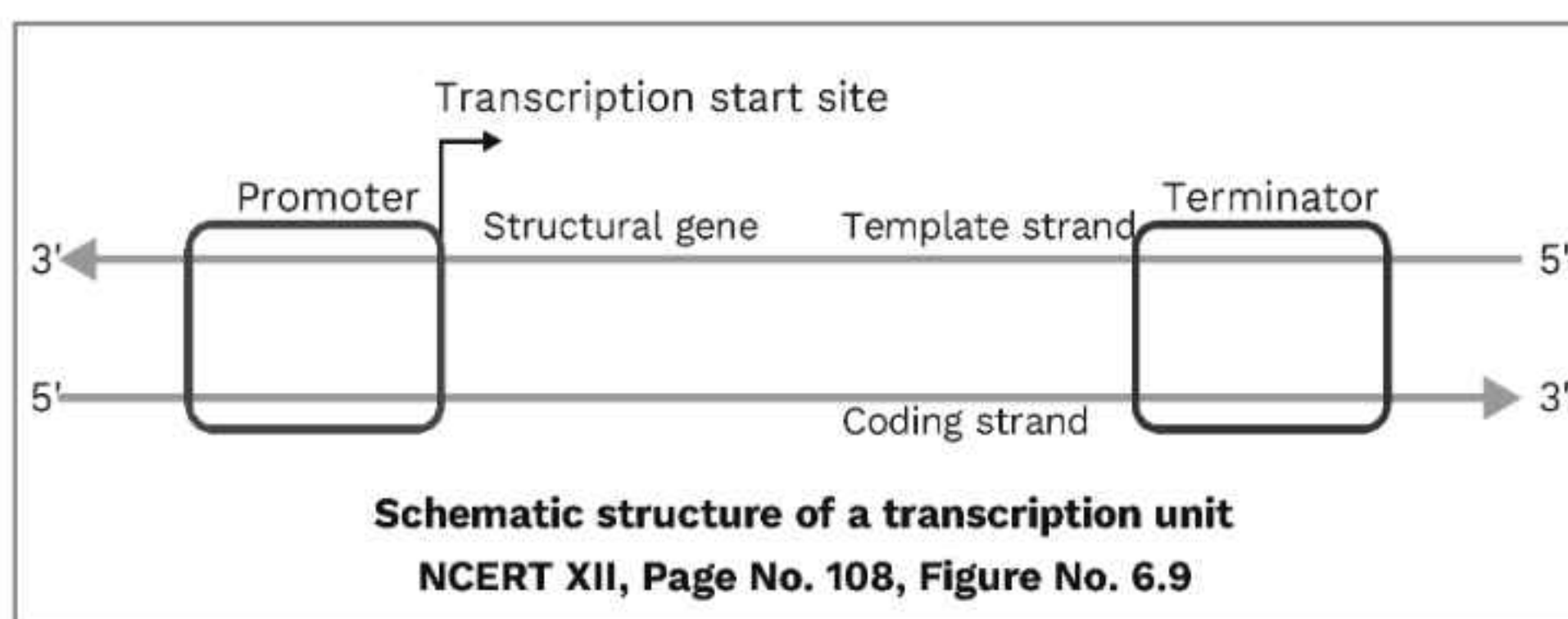
114. Which of the following statements are **correct** with reference to a transcription unit ?
- A. A transcription unit in DNA is defined primarily by three regions : promoter, structural gene and terminator.
  - B. The promoter is said to be located towards the 5'-end of the structural gene.
  - C. 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) B, C, D and E only | (2) A, B, C, D and E   |
| (3) A, B, C and D only | (4) A, C, D and E only |

**Ans. (2)**

**Sol.** A, B, C, D and E



115. Which one of the following types of pollination brings genetically different types of pollen grains to the stigma?
- |                 |              |
|-----------------|--------------|
| (1) Geitonogamy | (2) Xenogamy |
| (3) Cleistogamy | (4) Autogamy |

**Ans. (2)**

**Sol.** Xenogamy brings genetically different types of pollen grains to the stigma.

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

- |                       |                           |
|-----------------------|---------------------------|
| (1) Seed Banks        | (2) Sacred Groves         |
| (3) Botanical Gardens | (4) Wildlife Safari parks |

**Ans. (2)**

**Sol.** Sacred Groves

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

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

**Ans. (4)**

**Sol.** Plasticity

118. Match List-I with List-II :

**List-I**

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

**List-II**

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

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

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

**Ans. (3)**

**Sol.** A-III, B-I, C-IV, D-II

119. 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) A and B only      (2) C and D only      (3) B and C only      (4) A and C only

**Ans. (4)**

**Sol.** B. Serine is a non-aromatic alcoholic amino acid characterised by the presence of hydroxymethyl ( $-\text{CH}_2\text{OH}$ ) side chain.

D. Lysine is a basic amino acid.

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

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

**Ans. (1)**

**Sol.** Gymnosperms have ovules which are not enclosed by an ovary wall and remain exposed eg : *Pinus*

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

**Ans. (4)**

**Sol.** A, C and E only

122. Match List I with List II

**List-I**

**(Placentation)**

A. Marginal

B. Axile

C. Parietal

D. Basal

**List-II**

**(Example)**

I. Mustard

II. Pea

III. Marigold

IV. Lemon

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

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

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

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

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

**Ans. (1)**

**Sol.** A-II, B-IV, C-I, D-III

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

(1) Nucleolus

(2) Kinetochore

(3) Centrosome

(4) Chromatin

**Ans. (1)**

**Sol.** Site for active ribosomal RNA synthesis is Nucleolus.

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

(1) to perform photosynthesis.

(2) to minimize water loss during water stress.

(3) to make the leaf impermeable to fungal spores.

(4) to transport water.

**Ans. (2)**

**Sol.** The main function of bulliform cells in grasses is to minimize water loss during water stress

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

**Ans. (1)**

**Sol.** A, B and D only

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

- (1) The first word in the biological name represents the specific epithet, while the second component denotes the genus.
- (2) The specific epithet in the biological name starts with a small letter.
- (3) Both the words in a biological name, when handwritten, are separately underlined or printed in italics.
- (4) Biological names are generally in Latin.

**Ans. (1)**

**Sol.** The first word in the biological name represents the genus, while the second component denotes the specific epithet.

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

**Ans. (3)**

**Sol.** Sickle-cell anaemia

128. Find the statement(s) about **incorrect** 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 and C only (2) B and E only (3) B only (4) A and D only

**Ans. (4)**

**Sol.** A and D only

The correct version of A and D statement is as following :

- A. The water splitting complex is associated with PS-II.  
D.  $C_4$  plants exhibit 'Kranz' anatomy.

129. Match List I with List II :

**List I**

- A. Trypsin  
B. Morphine  
C. Concanavalin A  
D. Collagen

**List II**

- I. Intercellular ground substance  
II. Lectin  
III. Enzyme  
IV. Alkaloid

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

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

**Ans. (1)**

**Sol.** A-III, B-IV, C-II, D-I

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130. 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) A, B and C only | (2) B, D and E only |
| (3) B, C and E only | (4) C, D and E only |

**Ans. (3)**

**Sol.** A. Lipids are hydrophobic and generally insoluble in water.

D. Adenine and guanine are purine while cytosine, thymine and uracil are pyrimidines.

131. Match List I with List II:

**List I**

- A. Incomplete dominance
- B. Co-dominance
- C. Pleiotropy
- D. Polygenic inheritance

**List II**

- I. Human skin colour
- II. Inheritance of flower colour in *Antirrhinum* sp.
- III. Phenylketonuria disease in humans
- IV. ABO blood groups

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

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

**Ans. (3)**

**Sol.** A-II, B-IV, C-III, D-I

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

- (1) Denaturation → Extension → Annealing
- (2) Denaturation → Annealing → Extension
- (3) Annealing → Denaturation → Extension
- (4) Extension → Annealing → Denaturation

**Ans. (2)**

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

- (1) 12 ATP and 18 NADPH
- (2) 18 ATP and 12 NADPH
- (3) 6 ATP and 12 NADPH
- (4) 24 ATP and 18 NADPH

**Ans. (2)**

**Sol.** To make one molecule of glucose through the Calvin pathway 18 ATP and 12 NADPH are required.

134. Match List I with List II :

**List I**

**(Process)**

- A. Glycolysis
- B. ETS
- C. Accumulation of protons
- D. Krebs' cycle

**List II**

**(Location)**

- I. Inner membrane mitochondrial
- II. Mitochondrial matrix
- III. Cytoplasm
- IV. Intermembrane space

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

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

**Ans. (4)**

**Sol.** A-III, B-I, C-IV, D-II

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135. 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 B only
- (2) B and D only
- (3) A and D only
- (4) B and C only

**Ans. (1)**

**Sol.** C. DNA is not naturally visible under UV light, it requires a specific fluorescent stain (like Ethidium bromide) to be seen.

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

136. 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) 0%
- (2) 50%
- (3) 25%
- (4) 75%

**Ans. (3)**

**Sol.**

|       |              |          |         |  |
|-------|--------------|----------|---------|--|
|       | $I^A i$      | $\times$ | $I^B i$ |  |
|       | $\downarrow$ |          |         |  |
|       | $I^A$        |          | $i$     |  |
| $I^B$ | $I^A I^B$    |          | $I^B i$ |  |
| $i$   | $I^A i$      |          | $ii$    |  |

137. Match List I with List II :

**List I**

- A. Molluscs
- B. Reptiles
- C. Adult amphibians
- D. Amoeba

**List II**

- I. Pulmonary respiration only
- II. Branchial respiration
- III. Cellular respiration
- 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-III, D-IV
- (3) A-I, B-II, C-IV, D-III
- (4) A-II, B-I, C-IV, D-III

**Ans. (4)**

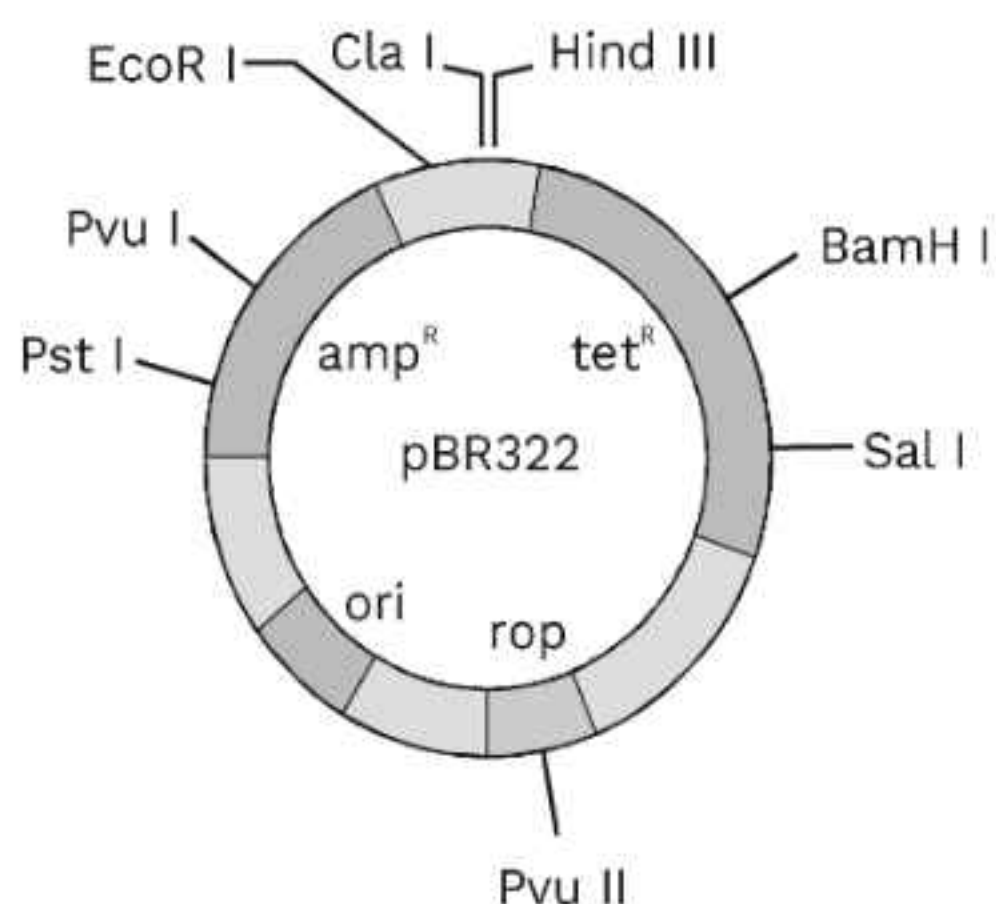
**Sol.** A-II, B-I, C-IV, D-III

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

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

**Ans. (3)**

**Sol.** BamH I recognition site is located within tetracyclin resistance gene.



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

- (1) The production of large amount of  $\text{CO}_2$  and  $\text{H}_2$  by *Trichoderma polysporum*
- (2) The production of large amount of  $\text{CO}_2$  and  $\text{H}_2$  by lactic acid bacteria called *Lactobacillus*
- (3) The production of large amount of  $\text{CO}_2$  by *Propionibacterium sharmanii*
- (4) The production of large amount of  $\text{CO}_2$  by *Clostridium butylicum*

**Ans. (3)**

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

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

**Ans. (1)**

**Sol.** Fore limbs of whales and bats are homologous organs representing divergent evolution.

141. Non-membrane bound cell organelles found in both prokaryotic and eukaryotic cells are \_\_\_\_\_.

- (1) Lysosomes
- (2) Centrosomes
- (3) Mitochondria
- (4) Ribosomes

**Ans. (4)**

**Sol.** Non-membrane bound cell organelles found in both prokaryotic and eukaryotic cells are Ribosomes.

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

- (1) Pyramid of number in grassland
- (2) Pyramid of energy in pond ecosystem
- (3) Pyramid of biomass in grassland
- (4) Pyramid of biomass in sea

**Ans. (4)**

**Sol.** Pyramid of biomass in sea is generally inverted.



143. Arrange the following events occurring in Renin-Angiotensin mechanism in the **correct** order :

- A. Increase in blood pressure and Glomerular filtration rate.
- B. Reabsorption of  $\text{Na}^+$  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) A, C, E, B, D      (2) C, A, B, D, E      (3) A, D, B, E, C      (4) C, E, D, B, A

**Ans. (4)**

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

**Ans. (3)**

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

- (1) Male honeybees      (2) Male grasshopper  
(3) Male earthworms      (4) Male frogs

**Ans. (1)**

**Sol.** Male honeybees are haploid and produced gametes through mitotic division.

146. In humans, respiration occurs in the following steps. Arrange these steps in the **correct** order :

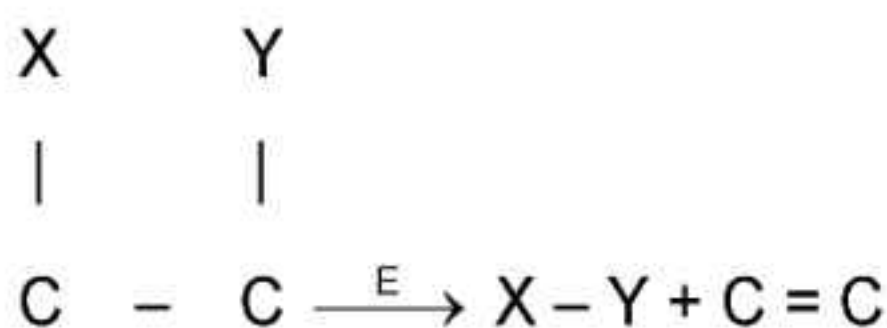
- A. Diffusion of  $O_2$  and  $CO_2$  between blood and tissues.
- B. Diffusion of  $O_2$  and  $CO_2$  across alveolar membrane.
- C. Pulmonary ventilation by which atmospheric air is drawn in and  $CO_2$  rich alveolar air is released out.
- D. Cellular respiration.
- E. Transport of gases by the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

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

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

**Ans. (3)**

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



(Substrate)   (Product)   (Product)

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

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

**Ans. (4)**

148. Match List I with List II :

**List I****(Bioactive molecules)**

A. Streptokinase

B. Statins

C. Lipases

D. Cyclosporin A

**List II****(Importance)**

I. Immunosuppressive agent

II. Removal of clots from the blood vessels

III. Blood cholesterol-lowering agent

IV. Detergent formulations

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

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

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

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

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

**Ans. (3)**

**Sol.** A-II, B-III, C-IV, D-I

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

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

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

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

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

**Ans. (1)**

**Sol.**  $\frac{dN}{dt} = rN \left( \frac{K-N}{K} \right)$



150. 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) D, B, A, C
- (2) A, C, B, D
- (3) C, A, D, B
- (4) C, A, B, D

**Ans. (4)**

- Sol.**
- 1. Corona radiata (C) - The outermost layer of follicular cells.
  - 2. Zona pellucida (A) - A thick, transparent glycoprotein membrane.
  - 3. Perivitelline space (B) - The fluid filled space between Zona pellucida and the plasma membrane of ovum
  - 4. Plasma membrane of ovum (D) - The innermost membrane of the egg cell.

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

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

**Ans. (2)**

**Sol.** Sexual deceit is present between *Ophrys* and bumblebee

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

**List I**

A. Tetany

B. Arthritis

C. Myasthenia gravis

D. Muscular dystrophy

**List II**

I. Inflammation of joints

II. Autoimmune disorder affecting neuromuscular junction

III. Wild contraction in muscle due to low  $\text{Ca}^{++}$  in body fluid

IV. Progressive degeneration of skeletal muscle

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

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

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

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

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

**Ans. (2)**

**Sol.** A-III, B-I, C-II, D-IV

153. 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) C, D and E only

(2) B, C and E only

(3) A, B and D only

(4) A, C and E only

**Ans. (3)**

**Sol.** A, B and D only

154. Choose the **correct** statements regarding cell organelles and their inclusions :

- A. The endomembrane system includes Golgi endoplasmic reticulum and complex, 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) A, B and C only | (2) C, D and E only |
| (3) A and B only    | (4) B, C and D only |

**Ans. (4)**

**Sol.** B, C and D only

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

- |                                      |                                       |
|--------------------------------------|---------------------------------------|
| (1) <i>cryIAc</i> and <i>cryIIAb</i> | (2) <i>cryIAc</i> and <i>cryIIIAb</i> |
| (3) <i>cryIAc</i> and <i>cryIAb</i>  | (4) <i>cryIIAb</i> and <i>cryIAc</i>  |

**Ans. (3)**

**Sol.** Cotton bollworms : Controlled by proteins encoded by the genes *cryIAc* and *cryIIAb*

Corn borer : Controlled by proteins encoded by the genes *cryIAb*

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

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

**Ans. (3)**

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157. 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, B and C only      (3) B and C only      (4) A, C and E only

**Ans. (4)**

**Sol.** B. There are ten pairs of cranial nerves arising from the brain.

D. Hind-brain consists of cerebellum, medulla oblongata while optic lobes are part of midbrain.

158. Match List I with List II :

List I

A. Cortisol

B. Aldosterone

C. Cholecystokinin

D. Progesterone

List II

I. Stimulates the formation of alveoli in mammary glands

II. Produces anti-inflammatory reactions

III. Stimulates reabsorption of  $\text{Na}^+$  and water from renal tubule

IV. Stimulates secretion of pancreatic enzymes and bile juice

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

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

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

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

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

**Ans. (1)**

**Sol.** A-II, B-III, C-IV, D-I

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159. The sixth mutant codon of beta globin gene causing polymerization of Haemoglobin and change in RBC shape is \_\_\_\_\_.

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

**Ans. (3)**

**Sol.** The sixth mutant codon of beta globin gene causing polymerization of Haemoglobin and change in RBC shape is GUG.

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

**Ans. (3)**

**Sol.** Vocal sacs and copulatory pad on first digit of fore limbs are unique to male frogs while bulging eyes, webbed digits in feet and olive green-coloured skin with dark irregular spots are found in both.

161. The human protein named  $\alpha$ -1 antitrypsin, obtained from transgenic animals, is used for the treatment of \_\_\_\_\_.

- (1) Alzheimer's disease  
(2) Rheumatoid arthritis  
(3) Emphysema  
(4) Cystic fibrosis

**Ans. (3)**

162. Match List I with List II :

**List I (Drug)**

A. Nicotine

B. Morphine

C. Heroin

D. Cocaine

**List-II (Effect)**

I. Causes sense of euphoria and increased energy

II. Stimulates adrenal gland to release catecholamines into blood circulation

III. Effective sedative and painkiller

IV. A depressant; slows down body function

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

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

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

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

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

**Ans. (4)**

**Sol.** A-II, B-III, C-IV, D-I

163. 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) 300– 500 / cu.mm and 500 – 700/cu.mm, respectively

(2) 300– 500 / cu.mm and 1200 – 1500/cu.mm, respectively

(3) 100– 120 / cu.mm and 160 – 200/cu.mm, respectively

(4) 160– 240 / cu.mm and 1600 – 2000/cu.mm, respectively

**Ans. (4)**

**Sol.** Eosinophils - 2-3% of total WBCs.

Lymphocytes - 20-25% of total WBCs.

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

**List I**

- A. About 65 mya
- B. About 500 mya
- C. About 350 mya
- D. About 320 mya

**List II**

- I. Jawless fish probably evolved
- II. The dinosaurs suddenly disappeared from the earth
- III. Seaweeds and few plants probably existed
- IV. Invertebrates were formed and became active

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

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

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

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

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

**Ans. (3)**

**Sol.** A-II, B-IV, C-I, D-III

165. Match List I with List II :

**List I**

- A. Progestasert
- B. Multiload 375
- C. Diaphragm
- D. Saheli

**List II**

- I. Barrier made of rubber used by females
- II. Oral contraceptive
- III. Hormone releasing IUD
- IV. Copper releasing IUD

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

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

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

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

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

**Ans. (4)**

**Sol.** A-III, B-IV, C-I, D-II

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

**Ans. (3)**

167. 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-II, B-IV, C-III, D-I | (2) A-II, B-III, C-IV, D-I |
| (3) A-IV, B-II, C-III, D-I | (4) A-III, B-II, C-IV, D-I |

**Ans. (2)**

**Sol.** A-II, B-III, C-IV, D-I

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

- (1) *Psittacula*                      (2) *Aptenodytes*                      (3) *Neophron*                      (4) *Struthio*

**Ans. (2)**

**Sol.** *Aptenodytes* (Penguins) are flightless bird which have wings that have evolved into stiff, flat flippers (paddles) used for swimming.

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

**Ans. (2)**

**Sol.** B. Adult Echinoderms are radially symmetrical while their larvae are bilaterally symmetrical .  
E. Members of class Reptilia are poikilothermic (cold-blooded) animals.

170. 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 7-15 pairs of gill slits were present.

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

- (1) *Scoliodon* sp.                                              (2) *Exocoetus* sp.  
(3) *Petromyzon* sp.                                              (4) *Branchiostoma* sp.

**Ans. (3)**

**Sol.** The diagnostic features of Class Cyclostomata include a sucking and circular mouth without jaws and the absence of scales and paired fins. *Petromyzon* (Lamprey) is the representative member that matches all criteria, including a cartilaginous endoskeleton and 7 pairs of gill slits.

171. 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  $\text{Ca}^{++}$  into sarcoplasm.
- C. Increase in  $\text{Ca}^{++}$  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 and B only
- (2) C and E only
- (3) C and D only
- (4) A, B, D and E only

**Ans. (4)**

**Sol.** C. Increase in  $\text{Ca}^{++}$  activates the actin for breaking cross bridges by binding to troponin.

172. 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) Early embryos with up to 8 blastomeres are transferred into the fallopian tube of an infertile female.
- (3) Early embryos with up to 8 blastomeres are transferred to the uterus of an infertile female.
- (4) 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 environment for fertilization and development.

**Ans. (4)**

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

**Ans. (2)**

**Sol.** A. Human skull is dicondylic i.e. it have two occipital condyles that articulates with first vertebra (Atlas).

D. In humans, all 12 pairs of ribs are bicephalic.

174. Spermatogonia undergo a series of cell divisions to produce sperms. Select the correct statements 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) A, C and E only   (2) C and E only   (3) A and E only   (4) B, C and D only

**Ans. (2)**

**Sol.** A. Spermatogonia primarily undergo mitotic cell division to increase their numbers.

B. Primary spermatocytes undergo meiosis-I to produce secondary spermatocytes.

D. Spermatids produce spermatozoa through spermiogenesis.

175. Select the **incorrect** statements 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<sup>-ve</sup> and the foetus is Rh<sup>+ve</sup>.
- 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 B only      (2) C and D only      (3) A and E only      (4) B and C only

**Ans. (3)**

**Sol.** A. Erythroblastosis foetalis is a condition observed when the mother is Rh-ve and foetus is Rh +ve.

B. Approximately 80% of humans are Rh +ve.

E. Anti-Rh antibodies must be administered to the mother immediately after the delivery of the first child to prevent Erythroblastosis foetalis.

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

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

**Ans. (4)**

177. 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) females and males, respectively      (2) males and females, respectively  
(3) all males      (4) all females

**Ans. (2)**

**Sol.** Grasshopper species shows XO type of sex determination where, the male grasshopper has only one X chromosome (e.g. XO) where as female grasshopper has two X chromosomes (e.g. XX).

178. 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) Ramapithecus → Homo habilis → Homo erectus → Neanderthal → Homo sapiens
- (2) Neanderthal → Ramapithecus → Homo habilis → Homo erectus → Homo sapiens
- (3) Homo habilis → Homo erectus → Ramapithecus → Neanderthal → Homo sapiens
- (4) Homo sapiens → Ramapithecus → Homo habilis → Neanderthal → Homo erectus

**Ans. (1)**

179. The specific receptors for neurotransmitters in a synapse are present on \_\_\_\_\_.

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

**Ans. (2)**

180. Match List I with List II :

**List I**

**(Respiratory Volume)**

- A. ERV (Expiratory Reserve Volume)
- B. RV (Residual Volume)
- C. IRV (Inspiratory Reserve Volume)
- D. TV (Tidal Volume)

**List II**

**(Capacity in mL)**

- I. 2500-3000 mL
- II. 500 mL
- III. 1000-1100 mL
- IV. 1100-1200 mL

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

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

**Ans. (1)**

**Sol.** A-III, B-IV, C-I, D-II