NEET 2021 Question paper & Solutions PDF by Embibe
BIOLOGY (Code -M5)

101. Mutations in plant cells can be induced by :

(1) Kinetin

(2) Infrared rays

(3) Gamma rays

(4) Zeatin

Correct Answer: (3)

Solution: (It is possible to induce mutations artificially through the use of chemicals or radiations (like gamma radiations), and selecting and using the plants that have the desired character as a source in breeding – this process is called mutation breeding.)

102. Match List - I with List.-II.

List-I		List-II	
(a)	Cells with active cell division capacity	(i)	Vascular tissues
(b)	Tissue having all cells similar in structure and function	(ii)	Meristematic tissue
(c)	Tissue having different types of cells	(iii)	Sclereids
(d)	Dead cells with highly thickened walls and narrow lumen	(iv)	Simple tissue

Select the correct answer from the options given below..

(1) $(a)\ (b)\ (c)\ (d)\ (ii)\ (iv)\ (i)\ (iii)$

(2) $(a)\ (b)\ (c)\ (d)\ (iv)\ (iii)\ (ii)\ (i)$

(3) $(a)\ (b)\ (c)\ (d)\ (i)\ (ii)\ (iii)\ (iv)$

(4) $(a)\ (b)\ (c)\ (d)\ (iii)\ (ii)\ (iv)\ (i)$

Correct Answer: (1)

Solution: (

a	Cells with active cell division capacity	(ii)	Meristematic tissue
b	Tissue having all cells similar in structure and function	(iv)	Simple tissue
c	Tissue having different types of cells	(i)	Vascular tissue
d	Dead cells with highly thickened walls and narrow lumen	(iii)	Sclereids

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103. Which of the following is a correct sequence of steps in a PCR (Polymerase Chain Reaction)?

(1) Denaturation, Annealing, Extension

(2) Denaturation, Extension, Annealing

(3) Extension, Denaturation, Annealing

(4) Annealing, Denaturation, Extension

Correct Answer: (1)

Solution: (PCR stands for Polymerase Chain Reaction. In this reaction, multiple copies of the gene (or DNA) of interest is synthesised in vitro using two sets of primers (small chemically synthesised oligonucleotides that are complementary to the regions of DNA) and the enzyme DNA polymerase.

Polymerase chain reaction (PCR): Each cycle has three steps: (i) Denaturation; (ii) Primer annealing; and (iii) Extension of primers)

104. Match List - I with List - II.

.List-I		List-II	
(a)	Lenticels	(i)	Phellogen
(b)	Cork cambium	(ii)	Suberin deposition
(c)	Secondary cortex	(iii)	Exchange of gases
(d)	Cork	(iv)	Phelloderm

Choose the correct answer from the options given below.

(1) $(a)\ (b)\ (c)\ (d)\ (iv)\ (i)\ (iii)\ (ii)$

(2) $(a)\ (b)\ (c)\ (d)\ (iii)\ (i)\ (iv)\ (ii)$

(3) $(a)\ (b)\ (c)\ (d)\ (ii)\ (iii)\ (iv)\ (i)$

(4) $(a)\ (b)\ (c)\ (d)\ (iv)\ (ii)\ (i)\ (iii)$

Correct Answer: (2)

Solution:

a	Lenticels	(iii)	Exchange of gases
b	Cork cambium	(i)	Phellogen
c	Secondary cortex	(iv)	Phelloderm
d	Cork	(ii)	Suberin deposition

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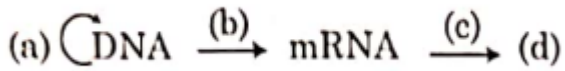
105. Complete the flow chart on central dogma.



(1) (a)-Replication; (b)-Transcription;

(c)-Transduction; (d)-Protein

(2) (a)-Translation; (b)-Replication;

(c)-Transcription; (d)-Transduction

(3) (a)-Replication; (b)-Transcription;

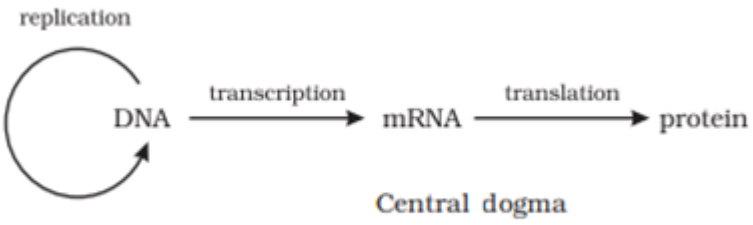
(c)-Translation; (d).Protein

(4) (a)-Transduction; (b)-Translation;

(c)-Replication; (d)-Protein

Correct Answer: (3)

Solution: Francis Crick proposed the Central dogma in molecular biology, which states that genetic information flows from DNA to RNA and to Protein.



106. The term used for transfer of pollen grains from anthers of one plant to stigma of a different plant which, during pollination, brings genetically different types of pollen grains to stigma, is :

(1) Xenogamy

(2) Geitonogamy

(3) Chasmogamy

(4) Cleistogamy

Correct Answer: (1)

Solution: The term used for transfer of pollen grain from the anther of the plant to the stigma of a different plant which during pollination brings genetically different types of pollen grains to stigma is xenogamy.)

107. DNA strands on a gel stained with ethidium bromide when viewed under UV radiation, appear as:

(1) Yellow bands

(2) Bright orange bands

(3) Dark red bands

(4) Bright blue bands

Correct Answer: 2

Solution: (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 (we cannot see pure DNA fragments in the visible light and without staining). We can see bright orange coloured bands of DNA in ethidium bromide-stained gel exposed to UV light.)

108. Which of the following is an incorrect statement?

(1) Mature sieve tube elements possess a conspicuous nucleus and usual cytoplasmic organelles.

(2) Microbodies are present both in plant and animal cells.

(3) The perinuclear space forms a barrier between the materials present inside the nucleus and that of the cytoplasm.

(4) Nuclear pores act as passages for proteins and RNA molecules in both directions between nucleus and cytoplasm.

Correct Answer: 1

Solution: (A mature sieve element possesses a peripheral cytoplasm and a large vacuole but lacks a nucleus)

109. Inspite of interspecific competition in nature, which mechanism the competing species might have evolved for their survival?

(1) Resource partitioning

(2) Competitive release

(3) Mutualism

(4) Predation

Correct Answer: 1

Solution (Resource partitioning- If two species compete for the same resource, they could avoid competition by choosing, for instance, different times for feeding or different foraging patterns.)

110. Gemmae are present in:

(1) Mosses

(2) Pteridophytes

(3) Some Gymnosperms

(4) Some Liverworts

Correct Answer: 4

Solution (Asexual reproduction in liverworts takes place by fragmentation of thalli, or by the formation of specialised structures called gemmae (sing. gemma). Gemmae are green, multicellular, asexual buds, which develop in small receptacles called gemma cups located on the thalli. The gemmae become detached from the parent body and germinate to form new individuals.)

111. Match List - I with List - II.

.List-I		List-II	
(a)	Protoplast fusion	(i)	Totipotency
(b)	Plant tissue culture	(ii)	Pomato
(c)	Meristem culture	(iii)	Somaclones
(d)	Micropropagation	(iv)	Virus free plants

Choose the correct answer from the options given below..

(1) (a) (b) (c) (d) (iii) (iv) (ii) (i)

(2) (a) (b) (c) (d) (ii) (i) (iv) (iii)

(3) (a) (b) (c) (d) (iii) (iv) (i) (ii)

(4) (a) (b) (c) (d) (iv) (iv) (ii) (i)

Correct Answer: 2

Solution: (

a	Protoplasm fusion	(ii)	Pomato
b	Plant tissue culture	(i)	Totipotency
c	Meristem culture	(iv)	Virus-free culture
d	Micropropagation	(ii)	Somaclones

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112. The production of gametes by the parents, formation of zygotes, the F_1 and F_2 plants, can be understood from a diagram called:

(1) Bullet square

(2) Punch square

(3) Punnett square

(4) Net square

Correct Answer: 3

Solution: (The production of gametes by the parents, the formation of the zygotes, the F1 and F2 plants can be understood from a diagram called Punnett Square).

113. Genera like Selaginella and Salvinia produce two kinds of spores. Such plants are known as:

(1) Homosorus

(2) Heterosorus

(3) Homosporous

(4) Heterosporous

Correct Answer: 4

Solution: (Genera like Selaginella and Salvinia which produce two kinds of spores, macro (large) and micro (small) spores, are known as heterosporous.)

114. The amount of nutrients, such as carbon, nitrogen, phosphorus and calcium present in the soil at any given time, is referred as:

(1) Climax

(2) Climax community

(3) Standing state

(4) Standing crop

Correct Answer: 3

Solution: (The amount of nutrients, such as carbon, nitrogen, phosphorus, calcium, etc., present in the soil at any given time, is referred to as the standing state. It varies in different kinds of ecosystems and also on a seasonal basis.)

115. Amensalism can be represented as :

(1) Species A $(-)$; Species B (0)

(2) Species A $(+)$; Species B $(+)$

(3) Species A $(-)$; Species B $(-)$

(4) Species $A(+)$; Species $B(0)$

Correct Answer: 1

Solution: (In amensalism, one species is harmed whereas the other is unaffected.

It is represented as species A (-); species B (0).)

116. Match List - I with List - II.

.List-I		List-II	
(a)	Cohesion	(i)	More attraction in liquid phase
(b)	Adhesion	(ii)	Mutual attraction among water molecules
(c)	Surface tension	(iii)	Water loss in liquid phase
(d)	Guttation	(iv)	Attraction towards polar surfaces

(1) (a) (b) (c) (d) (ii) (iv) (i) (iii)

(2) (a) (b) (c) (d) (iii) (iii) (ii) (i)

(3) (a) (b) (c) (d) (iii) (i) (iv) (ii)

(4) (a) (b) (c) (d) (ii) (i) (iv) (iii)

Correct Answer: 1

Solution: (

a	Cohesion	(ii)	The mutual attraction between water molecules.
b	Adhesion	(iv)	The attraction of water molecules to polar surfaces (such as the surface of tracheary elements).

c	Surface Tension	(i)	Water molecules are attracted to each other in the liquid phase more than to water in the gas phase.
d	Guttation	(iii)	Water loss in liquid phase

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117. Which of the following is not an application of PCR (Polymerase Chain Reaction)?

(1) Molecular diagnosis

(2) Gene amplification

(3) Purification of isolated protein

(4) Detection of gene mutation

Correct Answer: 3

Solution: (PCR stands for Polymerase Chain Reaction. In this reaction, multiple copies of the gene (or DNA) of interest is synthesised in vitro using two sets of primers (small chemically synthesised oligonucleotides that are complementary to the regions of DNA) and the enzyme DNA polymerase.

Application of PCR are molecular diagnosis, gene amplification, and detection of gene mutation.

PCR is now routinely used to detect HIV in suspected AIDS patients. It is being used to detect mutations in genes in suspected cancer patients too. It is a powerful technique to identify many other genetic disorders.)

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118. During the purification process for recombinant DNA technology, addition of chilled ethanol precipitates out :

(1) RNA

(2) DNA

(3) Histones

(4) Polysaccharides

Correct Answer: 2

Solution: (During the purification process for recombinant DNA technology, the RNA can be removed by treatment with ribonuclease whereas proteins can be removed by treatment with protease. Other molecules can be removed by appropriate treatments and purified DNA ultimately precipitates out after the addition of chilled ethanol.)

119. In the equation GPP $-R =$ NPP R represents:

(1) Radiant energy

(2) Retardation factor

(3) Environment factor

(4) Respiration losses

Correct Answer: 4

Solution: (Gross primary productivity minus respiration losses (R), is the net primary productivity (NPP). GPP – R = NPP.)

120. The first stable product of CO_2 fixation in sorghum is:

(1) Pyruvic acid

(2) Oxaloacetic acid

(3) Succinic acid

(4) Phosphoglyceric acid

Correct Answer: 4

Solution: (Sorghum is a C4 plant, thus the first stable product of CO2 fixation in this plant is Oxaloacetic acid (4-carbon compound).)

121. Which of the following algae produce Carrageen?

(1) Green algae

(2) Brown algae

(3) Red algae

(4) Blue-green algae

Correct Answer: 3

Solution: (Red algae or Rhodophyceae members are mainly marine forms. The marine brown and red algae produce large amounts of hydrocolloids (water-holding substances), e.g., algin (brown algae) and carrageen or carrageenan (red algae) which are used commercially.)

122. Which of the following statements is not correct?

(1) Pyramid of biomass in sea is generally inverted.

(2) Pyramid of biomass in sea is generally upright.

(3) Pyramid of energy is always upright.

(4) Pyramid of numbers in a grassland ecosystem is upright.

Correct Answer: 2

Solution: (The pyramid of biomass and number may be upright or inverted. However, the pyramid of energy can never be inverted. The energy pyramid is always upright. The pyramid of biomass in the sea is generally inverted. This Inverted pyramid of biomass is due to the presence of a small standing crop of phytoplankton supporting a large standing crop of zooplankton.)

123. Match List - I with List - II.

.List-I		List-II	
(a)	Cristae	(i)	Primary constriction in chromosome
(b)	Thylakoids	(ii)	Disc-shaped sacs in Golgi apparatus
(c)	Centromere	(iii)	Infoldings in mitochondria

(d)	Cisternae	(iv)	Flattened membranous sacs in stroma of plastids

Choose the correct answer from the options given below.

(1) (a) (b) (c) (d) (iv) (iii) (ii) (i)

(2) (a) (b) (c) (d) (iii) (iv) (iii) (ii)

(3) (a) (b) (c) (d) (iii) (iv) (i) (ii)

(4) (a) (b) (c) (d) (ii) (iii) (iv) (i)

Correct Answer: 3

Solution: ((a) - (iii). Cristae are the infoldings of the inner membrane of the mitochondria.

(b) - (iv). Thylakoids are the flattened sac-like structures present in the stroma or matrix in the chloroplasts. They are the primary site for light-dependent reactions of photosynthesis.

(c) - (i). The centromere is also called the primary constriction of the chromosomes. They are the sites where the spindle fibres bind during metaphase.

(d) - (ii). Cisternae are the sac-like structure of Golgi bodies. There are vesicles and tubules along with cisternae in Golgi bodies.)

124. Which of the following are not secondary metabolites in plants?

(1) Morphine, codeine

(2) Amino acids, glucose

(3) Vinblastin, curcumin

(4) Rubber, gums

Correct Answer: 3

Solution: (Amino acids and glucose are not considered secondary metabolites. They are primary metabolites. Morphine and codeine are alkaloids. Rubber and gums are polymeric substances and are secondary metabolites. On the other hand, vinblastin, curcumin etc. are drugs obtained from plants.)

125. Which of the following algae contains mannitol as reserve food material?

(1) *Ectocarpus*

(2) *Gracilaria*

(3) *Volvox*

(4) *Ulothrix*

Correct Answer: 1

Solution: (Laminarin and mannitol are the complex sugar alcohols found in the Phaeophyceae or brown algae members. *Laminaria*, *Sargassum*, *Ectocarpus*, *Fucus* are examples of marine brown algae which contain mannitol.)

126. A typical angiosperm embryo sac at maturity is:

(1) 8-nucleate and 7-celled

(2) 7-nucleate and 8-celled

(3) 7 -nucleate and 7-celled

(4) 8 -nucleate and 8-celled

Correct Answer: 2

Solution: (A typical monosporic embryo sac in angiosperms is 7-celled and 8-nucleated at maturity. There are three antipodal cells, two synergids, one egg cell and one polar nucleus. Except for polar nuclei, all other cells are haploid.)

127. Diadelphous stamens are found in:

(1) China rose

(2) Citrus

(3) Pea

(4) China rose and citrus

Correct Answer: 3

Solution: (The stamens may be united into one bunch or one bundle (monoadelphous) as in china rose, or two bundles (diadelphous) as in pea (*Pisum sativum*), or into more than two bundles (polyadelphous) as in citrus)

128. When gene targeting involving gene amplification is attempted in an individual's tissue to treat disease, it is known as:

(1) Biopiracy

(2) Gene therapy

(3) Molecular diagnosis

(4) Safety testing

Correct Answer: 2

Solution: (Recombinant DNA technology, Polymerase Chain Reaction (PCR) or gene amplification and Enzyme-Linked Immuno-sorbent Assay (ELISA) are some of the techniques that serve the purpose of early diagnosis. This is the use of recombinant DNA technology in gene therapy.)

129. Which of the following stages of meiosis involves division of centromere?

(1) Metaphase I

(2) Metaphase II

(3) Anaphase II

(4) Telophase II

Correct Answer: 3

Solution: (Anaphase II of meiosis II begins with the simultaneous splitting of the centromere of each chromosome (which was holding the sister chromatids together). This causes them to move toward opposite poles of the cell. During anaphase I of meiosis, there is no splitting of centromere.)

130. Plants follow different pathways in response to environment or phases of life to form different kinds of structures. This ability is called:

(1) Elasticity

(2) Flexibility

(3) Plasticity.

(4) Maturity

Correct Answer: 3

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

131. Which of the following plants is monoecious?

(1) *Carica papaya*

(2) *Chara*

(3) *Marchantia polymorpha*

(4) *Cycas circinalis*

Correct Answer: 3

Solution: (Plants may have both male and female reproductive structures in the same plant (bisexual) or on different plants (unisexual). Unisexual plants may be either monoecious where both male and female flowers may be present on the same individual or on separate individuals (dioecious). Some examples of monoecious plants are cucurbits and coconuts, *Chara* and dioecious plants are papayas and date palm.)

132. When the centromere is situated in the middle of two equal arms of chromosomes, the chromosome is referred as:

(1) Metacentric

(2) Telocentric

(3) Sub-metacentric

(4) Acrocentric

Correct Answer: 1

Solution: (The position of a centromere can be metacentric (centromere at the centre), sub-metacentric (centromere near at the centre), acrocentric (centromere near the end) or telocentric (centromere at the end). The metacentric chromosomes take the “V” shape during cell division.)

133. The site of perception of light in plants during photoperiodism is:

(1) Shoot apex

(2) Stem

(3) Axillary bud

(4) Leaf

Correct Answer: 4

Solution: (The site of perception of light/dark duration is the leaves. It has been hypothesised that there is a hypothetical hormonal substance(s) that is responsible for the flowering. This hormonal substance migrates from leaves to shoot apices for inducing flowering only when the plants are exposed to the necessary inductive photoperiod.)

134. The factor that leads to Founder effect in population is:

(1) Natural selection

(2) Genetic recombination

(3) Mutation

(4) Genetic drift

Correct Answer: 4

Solution: (Genetic drift is one of the strong driving forces for the formation of species. If the same change occurs by chance, it is called genetic drift. Sometimes the change in allele frequency is so different in the new sample of the population that they become a different species. The original drifted population becomes founders and the effect is called the founder effect.)

135. The plant hormone used to destroy weeds in a field is:

(1) IAA

(2) NAA

(3) $2,4-D$

(4) IBA

Correct Answer: 3

Solution: (2,4-D or 2,4-Dichlorophenoxyacetic acid is one of the synthetic auxins. This chemical is used to eliminate the monocotyledonous plants and as weedicides.)

136. Match Column - I with Column - II.

.List-I		List-II	
(a)	*Nitrococcus*	(i)	Denitrification
(b)	*Rhizobium*	(ii)	Conversion of ammonia to nitrite
(c)	*Thiobacillus*	(iii)	Conversion of nitrite to nitrate
(d)	*Nitrobacter*	(iv)	Conversion of atmospheric nitrogen to ammonia

Choose the correct answer from options given below.,

(1) $(a)-(ii);\ (b)-(iv);\ (c)-(i);\ (d)-(iii)$

(2) $(a)-(i);\ (b)-(ii);\ (c)-(iii);\ (d)-(iv)$

(3) $(a)-(iii);\ (b)-(i);\ (c)-(iv);\ (d)-(ii)$

(4) $(a)-(iv);\ (b)-(iii);\ (c)-(ii);\ (d)-(i)$

Correct option: (1)

Solution:

(a) – (ii). In the process of nitrogen fixation, first ammonia is converted into nitrite. This is accomplished by the bacteria *Nitrosomonas* and *Nitrococcus*.

(b) – (iv). One of the most important symbiotic bacterium, *Rhizobium*, remains associated with the roots of leguminous plants. They help in the conversion of atmospheric nitrogen into ammonia.

(c) – (i). Denitrification is carried out by the genera *Pseudomonas* and *Thiobacillus*. Nitrate present in the soil is also reduced to nitrogen by the process of denitrification.

(d) – (iii). The nitrification process also involves the conversion of nitrite to nitrate. The nitrite is further oxidised to nitrate with the help of the bacterium *Nitrobacter*.

137. Select the correct pair.

(1) Large colorless empty - Subsidiary cells cells in the epidermis of grass leaves

(2) In dicot leaves, vascular - Conjunctive bundles are surrounded $\quad$ tissue by large thick-walled cells

(3) Cells of medullary rays - Interfascicular that form part of cambium cambial ring

(4) Loose parenchyma cells - Spongy rupturing the epidermis parenchyma and forming a lensshaped opening in bark

Correct option: (3)

Solution:

The Fascicular vascular cambium, interfascicular cambium and cork-cambium are examples of lateral meristems and are responsible for the secondary growth in dicotyledonous plants.

In dicot stems, the cells of the cambium present between the primary xylem and primary phloem are the intrafascicular cambium. Additionally, the cells of medullary rays, adjoining this intrafascicular cambium become meristematic and form the interfascicular cambium. Thus, a continuous ring of cambium is formed.

138. Which of the following statements is correct?

(1) Fusion of two cells is called Karyogamy.

(2) Fusion of protoplasms between two motile on non-motile gametes is called plasmogamy.

(3) Organisms that depend on living plants are called saprophytes.

(4) Some of the organisms can fix atmospheric nitrogen in specialized cells called sheath cells.

Correct option: (2)

Solution: (The sexual cycle in fungi involves the three steps:

(i) The fusion of protoplasms between two motile or non-motile gametes is called plasmogamy.

(ii) Fusion of two nuclei called karyogamy.

(iii) Meiosis in zygote resulting in haploid spores.)

139. Identify the correct statement.

(1) In capping, methyl guanosine triphosphate is added to the 3’ end of hnRNA.

(2) RNA polymerase binds with Rho factor to terminate the process of transcription in bacteria.

(3) The coding strand in a transcription unit is copied to an mRNA.

(4) Split gene arrangement is characteristic of prokaryotes.

Correct option: (2)

Solution: (The termination of transcription is either (a) Rho-dependent or (b) Rho-independent. The rho-protein binds to a specific sequence of DNA and terminates the RNA transcription.

The capping is the addition of 7-methyl guanosine (an unusual base) to the 5’ end of hnRNA.

Split genes are characteristic features of eukaryotes and not prokaryotes.

The coding strand is also called the antisense strand and this is not transcribed during the transcription process.)

140. In the exponential growth equation $N_t = N_0 e^{rt}$, e represents:

(1) The base of number logarithms

(2) The base of exponential logarithms

(3) The base of natural logarithms

(4) The base of geometric logarithms

Correct option: (3)

Solution: (The equation describes the exponential or geometric growth pattern of a population. This results in the typical J-shaped curve with the equation: $N_t = N_0 e^{rt}$. In this equation, e is the base of natural logarithms (2.71828).)

141. Which of the following statements is incorrect?

(1) During aerobic respiration, the role of oxygen is limited to the terminal stage.

(2) In ETC (Electron Transport Chain), one molecule of $NADH + H^+$ gives rise to 2 ATP molecules, and one $FADH_2$ gives rise to 3 ATP molecules.

(3) ATP is synthesized through complex V.

(4) Oxidation-reduction reactions produce proton gradients in respiration.

Correct option: (2)

Solution: (Aerobic respiration is the process that leads to the complete oxidation of organic substances in the presence of oxygen and releases CO_2, water, and a large amount of energy present in the substrate. The crucial events in aerobic respiration are:

• The complete oxidation of pyruvate by the stepwise removal of all the hydrogen atoms, leaving three molecules of CO_2.

• The passing on of the electrons removed as part of the hydrogen atoms to molecular O_2 with the simultaneous synthesis of ATP.

When the electrons pass from one carrier to another via complex I to IV in the electron transport chain, they are coupled to ATP synthase (complex V) to produce ATP from ADP and inorganic phosphate. The number of ATP molecules synthesised depends on the nature of the electron donor. Oxidation of one molecule of NADH gives rise to 3 molecules of ATP, while that of one molecule of $FADH_2$ produces 2 molecules of ATP. Although the aerobic

process of respiration takes place only in the presence of oxygen, the role of oxygen is limited to the terminal stage of the process.)

142. What is the role of RNA polymerase III in the process of transcription in eukaryotes?

(1) Transcribes $rRNAs(28\,S, 18\,S$ and $5.8\,S)$

(2) Transcribes tRNA, $5srRNA$ and snRNA

(3) Transcribes precursor of mRNA

(4) Transcribes only snRNAs

Correct option: (2)

Solution: (The RNA polymerase I transcribe rRNAs (28S, 18S, and 5.8S), whereas the RNA polymerase III is responsible for transcription of tRNA, 5srRNA, and snRNAs (small nuclear RNAs). The RNA polymerase II transcribes a precursor of mRNA, the heterogeneous nuclear RNA (hnRNA).)

143. In some members of which of the following pairs of families, pollen grains retain their viability for months after release?

(1) Poaceae; Rosaceae

(2) Poaceae; Leguminosae

(3) Poaceae; Solanaceae

(4) Rosaceae; Leguminosae

Correct option: (4)

Solution: (The period for which pollen grains remain viable is highly variable and to some extent depends on the prevailing temperature and humidity. In some cereals such as rice and wheat, pollen grains lose viability within 30 minutes of their release, and in some members of Rosaceae, Leguminosae and Solanaceae, they maintain viability for months.)

144. Match List - I with List - II.

.List-I		List-II	
(a)	S phase	(i)	Proteins are synthesized
(b)	G_2 phase	(ii)	Inactive phase
(c)	Quiescent stage	(iii)	Interval between mitosis and initiation of DNA replication
(d)	G_1 phase	(iv)	DNA replication

Choose the correct answer from the options given below.

(1) $(a)-(iii);\ (b)-(ii);\ (c)-(i);\ (d)-(iv)$

(2) $(a)-(iv);\ (b)-(ii);\ (c)-(iii);\ (d)-(i)$

(3) $(a)-(iv);\ (b)-(i);\ (c)-(ii);\ (d)-(iii)$

(4) $(a)-(ii);\ (b)-(iv);\ (c)-(iii);\ (d)-(i)$

Correct option: (3)

Solution: (S-phase is related to DNA replication.

G_2 phase is related to the synthesis of proteins.

The quiescent phase is the inactive phase.

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

145. Now a days it is possible to detect the mutated gene causing cancer by allowing radioactive probe to hybridise its complimentary DNA in a clone of cells, followed by its detection using autoradiography because:

(1) mutated gene partially appears on a photographic film.

(2) mutated gene completely and clearly appears on a photographic film.

(3) mutated gene does not appear on a photographic film as the probe has no complementarity with it.

(4) mutated gene does not appear on photographic film as the probe has complementarity with it.

Correct option: (3)

Solution: (During cancer detection, for the presence of the mutated gene by using the autoradiographic technique, the complementary gene does not bind to the mutated gene and hence in the photographic film, the gene is not observed, because the probe will not have the complementarity with the mutated gene.)

146. Plasmid $pBR322$ has PstI restriction enzyme site within gene amp^R that confers ampicillin resistance. If this enzyme is used for inserting a gene for β-galactoside production and the recombinant plasmid is inserted in an $E.$ coli strain

(1) it will not be able to confer ampicillin resistance to the host cell.

(2) the transformed cells will have the ability to resist ampicillin as well as produce β-galactoside.

(3) it will lead to lysis of host cell.

(4) it will be able to produce a novel protein with dual ability.

Correct option: (1)

Solution: (pBR322 has two antibiotic-resistant genes for ampicillin (ampR) and tetracycline (tetR). Due to the insertion of the gene in the ampR region, insertional inactivation results in the inactivation of the ampicillin gene and hence the organisms become sensitive to this antibiotic and do not grow in the media containing this antibiotic.)

147. Match Column - I with Column - II.

Column-I		Column-II	
(a)	$\%\,\mathrm{K}_{(5)}\mathrm{C}_{1+2+(2)}\mathrm{A}_{(9)+1}\underline{\mathrm{G}}_1$	(i)	Brassicaceae
(b)	$\oplus\,\mathrm{K}_{(5)}\overset{\frown}{\mathrm{C}_{(5)}\mathrm{A}_5}\underline{\mathrm{G}}_2$	(ii)	Liliaceae
(c)	$\oplus\,\overset{\frown}{\mathrm{P}_{(3+3)}\mathrm{A}_{3+3}}\underline{\mathrm{G}}_{(3)}$	(iii)	Fabaceae
(d)	$\oplus\,\mathrm{K}_{2+2}\mathrm{C}_4\mathrm{A}_{2-4}\underline{\mathrm{G}}_{(2)}$	(iv)	Solanaceae

Select 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) $(a)-(ii);\ (b)-(iii);\ (c)-(iv);\ (d)-(i)$

(4) $(a)-(iv);\ (b)-(ii);\ (c)-(i);\ (d)-(iii)$

Correct option: (1)

Solution: (Floral Formula of Fabaceae: $\% \male\female K_{(5)}\ C_{1+2+(2)}\ A_{(9)+1}\ \underline{G}_1$

Floral Formula of Solanaceae: $\oplus \male\female K_{(5)}\ \overbrace{C_{(5)}\ A_5}\ \underline{G}_{(2)}$

Floral Formula of Liliaceae: $Br\ \oplus \male\female \overbrace{P_{(3+3)}\ A_{3+3}}\ G_{(3)}$

Floral Formula of Brassicaceae: $\oplus \male\female K_{2+2}\ C_4\ A_{2+4}\ \underline{G}_{(2)}$

)

148. Which of the following statements is incorrect?

(1) Both ATP and NADPH+H+ are synthesized during non-cyclic photophosphorylation.

(2) Stroma lamellae have PS I only and lack NADP reductase.

(3) Grana lamellae have both PS I and PS II.

(4) Cyclic photophosphorylation involves both PS I and PS II.

Correct option: (4)

Solution: (Cyclic photophosphorylation also occurs when only light of wavelengths beyond 680 nm are available for excitation. When only PS I is functional, the electron is circulated within the photosystem I and the phosphorylation occur due to the cyclic flow of electrons. A possible location where this could be happening is in the stroma lamellae. While the membrane or lamellae of the grana have both PS I and PS II the stroma lamellae membranes lack PS II as well as NADP reductase enzyme. The excited electron does not pass on to NADP+ but is cycled back to the PS I complex through the electron transport chain. The cyclic flow, hence, results only in the synthesis of ATP, but not of NADPH + H+.)

149. Match List - I with List - II.

Column-I		Column-II	
(a)	Protein	(i)	$C=C$ double bonds
(b)	Unsaturated fatty acid	(ii)	Phosphodiester bonds
(c)	Nucleic acid	(iii)	Glycosidic bonds
(d)	Polysaccharide	(iv)	Peptide bonds

Choose the correct answer from the options given below.

(1) $(a)-(iv);\ (b)-(i);\ (c)-(ii);\ (d)-(iii)$

(2) $(a)-(i);\ (b)-(iv);\ (c)-(iii);\ (d)-(ii)$

(3) $(a)-(ii);\ (b)-(i);\ (c)-(iv);\ (d)-(iii)$

(4) $(a)-(iv);\ (b)-(iii);\ (c)-(i);\ (d)-(ii)$

Correct option: (1)

Solution: (Proteins are made up of polypeptides and the polypeptides are made up of amino acids linked by the peptide bonds. The glycosidic linkages are seen in the carbohydrates, the glucose units are linked by these linkages to form dipeptides and polypeptides. The nucleotides are linked by the phosphodiester linkages and the unsaturated fatty acids are characterised by the C=C double bonds.)

150. DNA fingerprinting involves identifying differences in some specific regions in DNA sequence, called as:

(1) Satellite DNA

(2) Repetitive DNA

(3) Single nucleotides

(4) Polymorphic DNA

Correct option: (2)

Solution: (DNA fingerprinting is a very quick way to compare the DNA sequences of any two individuals. DNA fingerprinting involves identifying differences in some specific regions in a DNA sequence called repetitive DNA because, in these sequences, a small stretch of DNA is repeated many times.)

Q151. Which of the following statements wrongly represents the nature of smooth muscle?

(1) These muscle have no striations

(2) They are involuntary muscles

(3) Communication among the cells is performed by intercalated discs

(4) These muscles are present in the wall of blood vessels

Correct option: (3)

Solution:

The smooth muscles are involuntary muscles with a single and centrally located nucleus. The shape of these cells is spindle-shaped and lacks striations. Cardiac muscle cells have intercalated discs that are connected to each other for communications.

Q152. The organelles that are included in the endomembrane system are:

(1) Endoplasmic reticulum, Mitochondria, Ribosomes and Lysosomes

(2) Endoplasmic reticulum, Golgi complex, Lysosomes and Vacuoles

(3) Golgi complex, Mitochondria, Ribosomes and Lysosomes

(4) Golgi complex, Endoplasmic reticulum, Mitochondria and Lysosomes

Correct option: (2)

Solution:

The endomembrane system includes the nuclear envelope, endoplasmic reticulum, Golgi apparatus, lysosomes, vacuoles, and the plasma membrane. Mitochondria and ribosomes are not a part of this system.

Q153. With regard to insulin choose correct options.

(a) C-peptide is not present in mature insulin.

(b) The insulin produced by rDNA technology has C-peptide.

(c) The pro-insulin has C-peptide.

(d) A-peptide and B-peptide of insulin are interconnected by disulphide bridges.

Choose the correct answer from the options given below.

(1) (b) and (d) only

(2) (b) and (c) only

(3) (a), (c) and (d) only

(4) (a) and (d) only

Correct option: (3)

Solution:

Insulin is a protein hormone that is composed of two chains, an A-chain having 21 amino acids and a B-chain having 30 amino acids, linked together by disulphide bonds (S-S). Insulin is derived from a 74-amino-acid prohormone molecule called proinsulin having C-peptide and this is removed before the processing of mature insulin and during the production of recombinant insulin, the two chains were separately produced and then linked with each other. C-peptide is absent in mature insulin.

Q154. Veneral diseases can spread through:

(a) Using sterile needles

(b) Transfusion of blood from infected person

(c) Infected mother to foetus

(d) Kissing

(e) Inheritance

Choose the correct answer from the options given below.

(1) (a), (b) and (c) only

(2) (b), (c) and (d) only

(3) (b) and (c) only

(4) (a) and (c) only

Correct option: (3)

Solution:

Venereal diseases are known as sexually transmitted diseases (STDs) or sexually transmitted infections (STIs) are generally acquired by sexual contact. The causative organisms like bacteria, viruses or protozoans pass from one person to another person through blood, semen, vaginal route or from mother to child. Using sterile needles and normally kissing does not aid in transferring these causative organisms.

Q155. Select the favourable conditions required for the formation of oxyhaemoglobin at the alveoli.

(1) High pO_2, low pCO_2, less H^+, lower temperature

(2) Low pO_2, high pCO_2, more H^+, higher temperature

(3) High pO_2, high pCO_2, less H^+, higher temperature

(4) Low pO_2, low pCO_2, more H^+, higher temperature

Correct option: (1)

Solution:

In the alveoli, where there is high pO_2, low pCO_2, lesser H^+ concentration and lower temperature, the factors are all favourable for the formation of oxyhaemoglobin, whereas, in the tissues, where low pO_2, high pCO_2, high H^+ concentration and higher temperature exist, the conditions are favourable for dissociation of oxygen from the oxyhaemoglobin.

Q156. Match List-I with List-II.

List - I		List - II	
(a)	*Physalia*	(i)	Pearl oyster
(b)	*Limulus*	(ii)	Portuguese Man of War
(c)	*Ancylostoma*	(iii)	Living fossil
(d)	*Pinctada*	(iv)	Hookworm

Choose the correct answer from the options given below.

(1) $(a)-(ii);\ (b)-(iii);\ (c)-(i);\ (d)-(iv)$

(2) $(a)-(iv);\ (b)-(i);\ (c)-(iii);\ (d)-(ii)$

(3) $(a)-(ii);\ (b)-(iii);\ (c)-(iv);\ (d)-(i)$

(4) $(a)-(i);\ (b)-(iv);\ (c)-(iii);\ (d)-(ii)$

Correct option: (3)

Solution:

Physalia (Portuguese man-of-war)

Living fossil – *Limulus* (King crab)

Ancylostoma (Hookworm)

Pinctada (Pearl oyster)

Q157. In a cross between a male and female, both heterozygous for sickle cell anaemia gene, what percentage of the progeny will be diseased?

(1) 50 %

(2) 75 %

(3) 25 %

(4) 100 %

Correct option: (3)

Solution:

Since both the parents are heterozygous for sickle-cell anaemia, i.e. shows sickle-cell trait, they are represented by the symbol $\mathbf{Hb^AHb^S}$**.** Each parent thus will produce two types of gametes; one having a composition $\mathbf{Hb^A}$ and the other having a composition for sickle cell anaemia as $\mathbf{Hb^S}$. The progeny cross will be as follows:

Progeny:

	$\mathbf{Hb^A}$	$\mathbf{Hb^S}$
$\mathbf{Hb^A}$	$\mathbf{Hb^AHb^A}$ **(Normal)**	$\mathbf{Hb^AHb^S}$ **(Sickle-cell trait)**
$\mathbf{Hb^S}$	$\mathbf{Hb^AHb^S}$ **(Sickle-cell trait)**	$\mathbf{Hb^SHb^S}$ **(Diseased)**

Phenotypic ratio: Normal: Sickle-cell trait: Diseased :: 1:2:1

Thus 25% progeny will be affected.

Q158.

. Match List-I with List-II.

	List - I		List - II
(a)	Aspergillus niger	(i)	Acetic Acid
(b)	Acetobacter aceti	(ii)	Lactic Acid
(c)	Clostridium butylicum	(iii)	Citric Acid
(d)	Lactobacillus	(iv)	Butyric Acid

Choose the correct answer from the options given below.

(1) $(a)-(iii);\ (b)-(i);\ (c)-(iv);\ (d)-(ii)$

(2) $(a)-(i);\ (b)-(ii);\ (c)-(iii);\ (d)-(iv)$

(3) $(a)-(ii);\ (b)-(iii);\ (c)-(i);\ (d)-(iv)$

(4) $(a)-(iv);\ (b)-(ii);\ (c)-(i);\ (d)-(iii)$

Correct option: (1)

Solution:

Aspergillus niger - Citric acid

Acetobacter aceti – Acetic acid

Clostridium butylicum – Butyric acid

Lactobacillus – Lactic acid

Q159. Sphincter of oddi is present at:

(1) Ileo-caecal junction

(2) Junction of hepato-pancreatic duct and duodenum

(3) Gastro-oesophageal junction

(4) Junction of jejunum and duodenum

Correct option: (2)

Solution:

The bile duct and the pancreatic duct open together into the duodenum as the common hepato-pancreatic duct which is guarded by a sphincter called the sphincter of Oddi.

Q160. Which of the following is not an objective of Biofortification in crops?

(1) Improve protein content

(2) Improve resistance to diseases

(3) Improve vitamin content

(4) Improve micronutrient and mineral content

Correct option: (2)

Solution:

Biofortification is the method of breeding crops with higher levels of vitamins and minerals, or higher protein and healthier fats and hence is the most practical means to improve public health. Breeding for improved nutritional quality is undertaken with the objectives of improving – (i) Protein content and quality; (ii) Oil content and quality; (iii) Vitamin content; and (iv) Micronutrient and mineral content.

Q161. Erythropoietin hormone which stimulates R.B.C. formation is produced by:

(1) Alpha cells of pancreas

(2) The cells of rostral adenohypophysis

(3) The cells of bone marrow

(4) Juxtaglomerular cells of the kidney

Correct option: (4)

Solution:

Erythropoietin (Epo) is a glycoprotein that promotes the proliferation and differentiation of erythrocyte precursors. The kidney cells that make EPO are specialized and are sensitive to low oxygen levels in the blood coming into the kidney. After being released into the bloodstream it binds with receptors in the bone marrow, where it stimulates the production of red blood cells (erythrocytes). Medically, EPO is used to treat certain forms of anaemia.

Q162. Which one of the following organisms bears hollow and pneumatic long bones?

(1) Neophron

(2) Hemidactylus

(3) Macropus

(4) Ornithorhynchus

Correct option: (1)

Solution:

Birds have remarkably specialized bones that are pneumatic because they are full of air sacs that provide a continuous flow of breath throughout their bodies. Also, it is one of the flight adaptations of the birds besides, lack of urinary bladder and boat-shaped body etc. E.g. Neophron (Vulture)

Q163. The centriole undergoes duplication during:

(1) S-phase

(2) Prophase

(3) Metaphase

(4) G_2 phase

Correct option: (1)

Solution:

Centrioles undergo duplication during the S phase of the interphase and begin to move towards the opposite pole of the cell during the prophase stage of mitosis.

Q164. Dobson units are used to measure thickness of :

(1) CFCs

(2) Stratosphere

(3) Ozone

(4) Troposphere

Correct option: (3)

Solution:

The Dobson Unit is a way to describe how much ozone there would be in the column if it were all squeezed into a single layer. The average amount of ozone in the atmosphere is roughly 300 Dobson Units, equivalent to a layer 3 millimetres.

Q165. Which one of the following belongs to the family Muscidae?

(1) Fire fly

(2) Grasshopper

(3) Cockroach

(4) House fly

Correct option: (4)

Solution:

Muscidae constitutes a family of flies found in the superfamily Muscoidea. Muscidae, some of which are commonly known as house flies or stable flies.

Q166. Read the following statements.

(a) Metagenesis is observed in Helminths.

(b) Echinoderms are triploblastic and coelomate animals.

(c) Round worms have organ-system level of body organization.

(d) Comb plates present in ctenophores help in digestion.

(e) Water vascular system is characteristic of Echinoderms.

Choose the correct answer from the options given below.

(1) (c), (d) and (e) are correct

(2) (a), (b) and (c) are correct

(3) (a), (d) and (e) are correct

(4) (b), (c) and (e) are correct

Correct option: (4)

Solution:

Metagenesis is another term for alternation of generation which is a popular feature of Coelenterata. Also comb plates which are a feature of the ctenophores, help in locomotion but not digestion.

Q167. For effective treatment of the disease, early diagnosis and understanding its pathophysiology is very important. Which of the following molecular diagnostic techniques is very useful for early detection?

(1) Western Blotting Technique

(2) Southern Blotting Technique

(3) ELISA Technique

(4) Hybridization Technique

Correct option: (3)

Solution:

For effective treatment of a disease, early diagnosis and understanding its pathophysiology is very important. Using conventional methods of diagnosis (serum and urine analysis, etc.) early detection is not possible. Recombinant DNA technology, Polymerase Chain Reaction (PCR) and Enzyme-Linked Immuno-sorbent Assay (ELISA) are some of the techniques that serve the purpose of early diagnosis.

Q168. Receptors for sperm binding in mammals are present on:

(1) Corona radiata

(2) Vitelline membrane

(3) Perivitelline space

(4) Zona pellucida

Correct option: (4)

Solution: **ZP3**, one of three zona pellucida glycoproteins, serves as a structural glycoprotein, a sperm receptor, and an acrosome reaction-inducer.

Q169. Chronic autoimmune disorder affecting neuromuscular junction leading to fatigue, weakening and paralysis of skeletal muscle is called as:

(1) Arthritis

(2) Muscular dystrophy

(3) Myasthenia gravis

(4) Gout

Correct option: (3)

Solution: This auto-immune disorder is triggered when the acetylcholine receptors on the postsynaptic membrane are destroyed by the immune cells, as a result, the impulse conduction faces difficulty in further carrying out, leading to weakness and paralysis.

Q170. Which one of the following is an example of Hormone releasing IUD?

(1) CuT

(2) LNG 20

(3) Cu7

(4) Multiload 375

Correct option: (2)

Solution: LNG-20 is IUD that releases levonorgestrel (LNG), causes endometrial atrophy and alters the stroma to inhibit implantation. It also increases sperm phagocytosis in the uterus.

Q171. Match List-I with List-II.

List - I		List - II	
(a)	Vaults	(i)	Entry of sperm through Cervix is blocked
(b)	IUDs	(ii)	Removal of Vas deferens
(c)	Vasectomy	(iii)	Phagocytosis of sperms within the Uterus
(d)	Tubectomy	(iv)	Removal of fallopian tube

Choose the correct answer from the options given below.

(1) $(a)-(iv);\ (b)-(ii);\ (c)-(i);\ (d)-(iii)$

(2) $(a)-(i);\ (b)-(iii);\ (c)-(ii);\ (d)-(iv)$

(3) $(a)-(ii);\ (b)-(iv);\ (c)-(iii);\ (d)-(i)$

(4) $(a)-(iii);\ (b)-(i);\ (c)-(iv);\ (d)-(ii)$

Correct option: (2)

Solution: Vaults are an example of barrier methods of contraception which is made up of rubber latex and is cup-shaped, fitted in the cervix to block the entry of sperms. IUDs are used to kill sperm in the uterine region. Tubectomy and vasectomy are the terminal methods of contraception.

Q172. Match List-I with List-II.

List - I		List - II	
(a)	Metamerism	(i)	Coelenterata
(b)	Canal system	(ii)	Ctenophora
(c)	Comb plates	(iii)	Annelida
(d)	Cnidoblasts	(iv)	Porifera

Choose the correct answer from the options given below.

(1) $(a)-(iv);\ (b)-(iii);\ (c)-(i);\ (d)-(ii)$

(2) $(a)-(iii);\ (b)-(iv);\ (c)-(i);\ (d)-(ii)$

(3) $(a)-(iii);\ (b)-(iv);\ (c)-(ii);\ (d)-(i)$

(4) $(a)-(iv);\ (b)-(i);\ (c)-(ii);\ (d)-(iii)$

Correct option: (3)

Solution: Metamerism is a characteristic feature of the annelids which signifies the presence of body segments. A water canal system is present in poriferans to aid digestion, excretion and respiration. Comb plates allow the ctenophores to locomote and the cnidoblasts are the structure of offence and defence in Coelenterata.

Q173. The fruit fly has 8 chromosomes $(2n)$ in each cell. During interphase of Mitosis if the number of chromosomes at G_1 phase is 8. What would be the number of chromosomes after the S phase?

(1) 8

(2) 16

(3) 4

(4) 32

Correct option: (1)

Solution: The number of chromosomes remains same after S-phase, but the amount of DNA becomes double.

Q174. During the process of gene amplification using PCR, if a very high temperature is not maintained in the beginning, then which of the following steps of PCR will be affected first?

(1) Annealing

(2) Extension

(3) Denaturation

(4) Ligation

Correct option: (3)

Solution: Denaturation -94-95^{o}C, annealing- 50-60^{o}C, extension- 72^{o}C. Since maximum temperature is required during denaturation, it will be affected the most.

Q175. If Adenine makes 30% of the DNA molecule, what will be the percentage of Thymine, Guanine and Cytosine in it?

(1) $T: 20; G: 30; C: 20$

(2) $T: 20; G: 20; C: 30$

(3) $T: 30; G: 20; C: 20$

(4) $T: 20; G: 25; C: 25$

Correct option: (3)

Solution: According to Chargaff's principle, A is equal to T and G is equal to C. Hence, if the total is 100, and A is 30 then T will also be 30. Likewise , G+C will be 40, so, G = 20, C = 20.

Q176. Which enzyme is responsible for the conversion of inactive fibrinogens to fibrins?

(1) Thrombin

(2) Renin

(3) Epinephrine

(4) Thrombokinase

Correct option: (1)

Solution: Thrombin is a naturally occurring enzyme that converts fibrinogen into fibrin, which is an integral step in clot formation. In vivo thrombin is formed from prothrombin as a result of activation of both the intrinsic and extrinsic pathways of the coagulation cascade.

Q177. Succus entericus is referred to as:

(1) Pancreatic juice

(2) Intestinal juice

(3) Gastric juice

(4) Chyme

Correct option: (2)

Solution: The word “entero” is related to the intestine. Succus entericus also called intestinal juice is a fluid secreted in the small intestine in small quantities. Succus entericus is the alkaline secretion produced by glands in the duodenum wall, which consists of water, mucoproteins, and carbonate hydrogen ions.

Q178. Identify the incorrect pair.

(1) Alkaloids - Codeine

(2) Toxin - Abrin

(3) Lectins - Concanavalin A

(4) Drugs - Ricin

Correct option: (4)

Solution: Abrin and ricin are toxins. The drugs include vinblastine, curcumin etc.

Q179. Which stage of meiotic prophase shows terminalisation of chiasmata as its distinctive feature?

(1) Leptotene

(2) Zygotene

(3) Diakinesis

(4) Pachytene

Correct option: (3)

Solution: The final stage of meiotic prophase I is **diakinesis**. This is marked by terminalisation of chiasmata. During this phase, the chromosomes are fully condensed and the meiotic spindle is assembled to prepare the homologous chromosomes for separation.

Q180. Persons with 'AB' blood group are called as "Universal recipients". This is due to:

(1) Absence of antigens A and B on the surface of RBCs

(2) Absence of antigens A and B in plasma

(3) Presence of antibodies, anti-A and anti-B, on RBCs

(4) Absence of antibodies, anti-A and anti-B, in plasma

Correct option: (4)

Solution: AB blood groups lack antibodies against antigen A & B, i.e. anti-A and anti-B, in plasma. Hence, they cannot target any particular blood group and have no chances of incompatibility reaction. Thus, called universal recipients.

Q181. A specific recognition sequence identified by endonucleases to make cuts at specific positions within the DNA is:

(1) Degenerate primer sequence

(2) Okazaki sequences

(3) Palindromic Nucleotide sequences

(4) Poly (A) tail sequences

Correct option: (3)

Solution: Each restriction enzyme recognizes a specific palindromic nucleotide sequence in DNA. Palindrome in DNA is a sequence of base pairs that reads the same on the two strands when the orientation of reading is kept the same. These sequences may range from 4-8 nucleotides in length.

Q182. Which of the following characteristics is incorrect with respect to cockroaches?

(1) A ring of gastric caeca is present at the junction of midgut and hindgut.

(2) Hypopharynx lies within the cavity enclosed by the mouth parts.

(3) In females, $7^{th} - 9^{th}$ sterna together form a genital pouch.

(4) 10^{th} abdominal segment in both sexes, bears a pair of anal cerci.

Correct option: (1)

Solution: At the junction between foregut and midgut, 6-8 finger-like tubular structures are present called hepatic caeca or gastric caeca. These hepatic caeca help in the secretion of digestive enzymes and absorption.

Q183. Which of the following RNAs is not required for the synthesis of protein?

(1) mRNA

(2) tRNA

(3) rRNA

(4) siRNA

Correct option: (4)

Solution: The process of synthesis of protein is called translation. It utilizes three types of RNA for the process:

(1) **mRNA:** It carries the message for a sequence of amino acids in the form of genetic codons.
(2) tRNA: It carries amino acids at its 3’ end. Also, it has an anticodon loop to identify codons of mRNA.
(3) rRNA: It forms the ribosomal subunits and hence is called ribosomal RNA. Ribosomes are called protein factories of the cell.

siRNA or small interfering RNA is not used in protein synthesis mechanism, it interferes with the synthesis of proteins.

Q184. Which is the "Only enzyme" that has "Capability" to catalyse Initiation, Elongation and Termination in the process of transcription in prokaryotes?

(1) DNA dependent DNA polymerase

(2) DNA dependent RNA polymerase

(3) DNA Ligase

(4) DNase

Correct option: (2)

Solution: Transcription is the process of the formation of RNA from a template strand of DNA. In prokaryotes, a single RNA polymerase or DNA dependent RNA polymerase carries out the formation of all types of RNAs of the cell.

Q185. The partial pressures $(in\ mmHg)$ of oxygen (O_2) and carbon dioxide (CO_2) at alveoli (the site of diffusion) are:

(1) $pO_2 = 104\ and\ pCO_2 = 40$

(2) $pO_2 = 40\ and\ pCO_2 = 45$

(3) $pO_2 = 95\ and\ pCO_2 = 40$

(4) $pO_2 = 159\ and\ pCO_2 = 0.3$

Correct option: (1)

Solution: Partial Pressures (in mmHg) of O_2 and CO_2 at different sites of the body and in the atmosphere:

Respiratory Gases	Atmospheric	Alveoli	Oxygenated Blood	Deoxygenated Blood	Tissues
O_2	159	104	95	40	40
CO_2	0.3	40	40	45	45

Q186. Which of the following is not a step in Multiple Ovulation Embryo Transfer Technology (MOET)?

(1) Cow is administered hormone having LH like activity for superovulation

(2) Cow yields about $6 - 8$ eggs at a time

(3) Cow is fertilized by artificial insemination

(4) Fertilized eggs are transferred to surrogate mothers at $8 - 32$ cell stage

Correct option: (1)

Solution: In MOET, a cow is administered with hormones having FSH-like activity, to induce maturation of follicles and superovulation, i.e. release of multiple eggs instead of a single egg in a normal oestrous cycle.

Q187. Which of the following secretes the hormone, relaxin, during the later phase of pregnancy?

(1) Graafian follicle

(2) Corpus luteum

(3) Foetus

(4) Uterus

Correct option: (2)

Solution: In the later phase of pregnancy, relaxin is secreted by the corpus luteum of the ovary and by the placenta.

Q188. During muscular contraction which of the following events occur?

(a) 'H' zone disappears

(b) 'A' band widens

(c) 'I' band reduces in width

(d) Myosin hydrolyzes ATP, releasing the ADP and Pi

(e) Z-lines attached to actins are pulled inwards Choose the correct answer from the options given below.

(1) (a), (c), (d), (e) only

(2) (a), (b), (c), (d) only

(3) (b), (c), (d), (e) only

(4) (b), (d), (e), (a) only

Correct option: (1)

Solution: The following events take place during muscular contraction.

(1) Myosin hydrolysis ATP into ADP and Pi. The energy released is used to make a cross-bridge with actin filaments.
(2) This pulls the actin filaments towards A-band.
(3) 'Z' line attached to these actins are also pulled inwards thereby causing the shortening of the I-band and thus the sarcomere.
(4) The size of the A-band remains constant.
(5) The movement of actins towards the A-band, causes H-zone to disappear.

Q189. Following are the statements with reference to 'lipids'.

(a) Lipids having only single bonds are called unsaturated fatty acids.

(b) Lecithin is a phospholipid.

(c) Trihydroxy propane is glycerol.

(d) Palmitic acid has 20 carbon atoms including carboxyl carbon.

(e) Arachidonic acid has 16 carbon atoms. 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) (b) and (e) only

Correct option: (3)

Solution: The correct statement about lipids are:

(1) Lipids having only single bonds are called saturated fatty acids, while those having single, double and triple bonds are called unsaturated fatty acids.
(2) Lecithin is a phospholipid.

(3) Trihydroxy propane or Propane-1,2,3 triol is glycerol.
(4) Palmitic acid has 16 carbon atoms including carboxyl carbon.
(5) Palmitic acid has 20 carbon atoms including carboxyl carbon.

Q190. Which one of the following statements about Histones is wrong?

(1) Histones are organized to form a unit of 8 molecules.

(2) The pH of histones is slightly acidic.

(3) Histones are rich in amino acids - Lysine and Arginine.

(4) Histones carry positive charge in the side chain.

Correct option: (2)

Solution: Histones are rich in the basic amino acids residues like lysines and arginines having positively charged side chains. Four of them occur in pairs to produce histone octamer or nu-body (two copies of each).

Q191. Match List - I with List - II.

	List - I		List - II
(a)	Adaptive radiation	(i)	Selection of resistant varieties due to excessive use of herbicides and pesticides
(b)	Convergent evolution	(ii)	Bones of forelimbs in Man and Whale
(c)	Divergent evolution	(iii)	Wings of Butterfly and Bird
(d)	Evolution by anthropogenic action	(iv)	Darwin Finches

Choose the correct answer from the options given below.

(1) $(a)-(iv);\ (b)-(iii);\ (c)-(ii);\ (d)-(i)$

(2) $(a)-(iii);\ (b)-(ii);\ (c)-(i);\ (d)-(iv)$

(3) $(a)-(ii);\ (b)-(i);\ (c)-(iv);\ (d)-(iii)$

(4) $(a)-(i);\ (b)-(iv);\ (c)-(iii);\ (d)-(ii)$

Correct option: (1)

Solution:

Mechanism	**Definition and Examples**
Adaptive radiation	The process of evolution of different species in a given geographical area starting from a point and literally radiating to other areas of geography (habitats) is called adaptive radiation. **Example: Darwin finches**
Divergent evolution	The structures in different organisms which have similarities in their anatomy or basic plan but serve

	different functions are known as homologous structures. This is an example of divergent evolution. **Example: Bones of forelimbs in man and whale**
Convergent evolution	The structures in different organisms which are not similar anatomically though they perform similar functions are called analogous organs. This is an example of convergent evolution. **Example: Wings of butterfly and bird**
Evolution by anthropogenic action	Herbicide and pesticide resistance developed in the weeds and pests respectively after prolonged use of herbicides and pesticides. This is also an example of natural selection which supports the process of evolution due to anthropogenic action or due to actions of man.

Q192. Identify the types of cell junctions that help to stop the leakage of the substances across a tissue and facilitate communication with neighbouring cells via rapid transfer of ions and molecules.

(1) Gap junctions and Adhering junctions, respectively.

(2) Tight junctions and Gap junctions, respectively.

(3) Adhering junctions and Tight junctions, respectively.

(4) Adhering junctions and Gap junctions, respectively.

Correct option: (2)

Solution: The neighbouring cells in tissues are held together by three types of intercellular junctions such as tight junction, adhering junction and gap junction.

The tight junction prevents the leakage of substances.

The adhering junction cement and adjoining cells with desmosomes, interdigitation, etc.

The gap junction allows the movement of ions, signals and biomolecules between adjoining cells.

Q193. Following are the statements about prostomium of earthworm.

(a) It serves as a covering for the mouth.

(b) It helps to open cracks in the soil into which it can crawl.

(c) It is one of the sensory structures.

(d) It is the first body segment.

Choose the correct answer from the options given below.

(1) (a), (b) and (c) are correct

(2) (a), (b) and (d) are correct

(3) (a), (b), (c) and (d) are correct

(4) (b) and (c) are correct

Correct option: (1)

Solution: In an earthworm, the anterior end of the body consists of the mouth and the prostomium. The prostomium is a lobe that acts as a covering for the mouth and serves as a wedge to force open cracks in the soil into which the earthworm may crawl. The prostomium is sensory in function. The first segment of the body is called the peristomium.

Q194. The Adenosine deaminase deficiency results into:

(1) Dysfunction of Immune system

(2) Parkinson's disease

(3) Digestive disorder

(4) Addison's disease

Correct option: (1)

Solution: Adenosine deaminase enzyme deficiency causes SCID (Severe Combined Immunodeficiency). ADA enzyme is required for the survival of T-lymphocytes.

Q195. Statement I: The codon 'AUG' codes for methionine and phenylalanine.

Statement II: 'AAA' and 'AAG' both codons code for the amino acid lysine.

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

(1) Both Statement I and Statement II are true

(2) Both Statement I and Statement II are false

(3) Statement I is correct but Statement II is false

(4) Statement I is incorrect but Statement II is true

Correct option: (4)

Solution: AUG is the start codon that codes for amino acid methionine. Phenylalanine is coded by codons UUU and UUC. Lysine is coded by codons AAA and AAG.

Q196. Assertion (A): A person goes to high altitude and experiences 'altitude sickness' with symptoms like breathing difficulty and heart palpitations.

Reason (R): Due to low atmospheric pressure at high altitude, the body does not get sufficient oxygen.

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

(1) Both (A) and (R) are true and (R) is the correct explanation of (A)

(2) Both (A) and (R) are true but (R) is not the correct explanation of (A)

(3) (A) is true but (R) is false

(4) (A) is false but (R) is true

Correct option: (1)

Solution: Altitude sickness (AMS) is experienced by a person at a high altitude where the body does not get enough oxygen due to low atmospheric pressure and causes nausea, fatigue and heart palpitations. Under these conditions, the body increases RBC production, decreases the binding capacity of haemoglobin and increases breathing rate. These physiological adaptations allow organisms to respond quickly to stressful conditions. **Hence the correct option is option (1).**

Q197. Match List - I with List - II.

List - I		List - II	
(a)	Allen's Rule	(i)	Kangaroo rat
(b)	Physiological adaptation	(ii)	Desert lizard
(c)	Behavioural adaptation	(iii)	Marine fish at depth
(d)	Biochemical adaptation	(iv)	Polar seal

Choose the correct answer from the options given below.

(1) $(a)-(iv);\ (b)-(ii);\ (c)-(iii);\ (d)-(i)$

(2) $(a)-(iv);\ (b)-(i);\ (c)-(iii);\ (d)-(ii)$

(3) $(a)-(iv);\ (b)-(i);\ (c)-(ii);\ (d)-(iii)$

(4) $(a)-(iv);\ (b)-(iii);\ (c)-(ii);\ (d)-(i)$

Correct option: (2)

Solution:

Adaptation	**Example**
Allen's rule	Mammals from colder climates generally have shorter ears and limbs (extremities) to minimize heat loss. Example: Polar seal
Physiological adaptation	Kangaroo rat is capable of meeting all of its water requirements through its internal fat oxidation where water is released as a by-product. It can also concentrate its urine so that a minimal volume of water is used to remove excretory products. Thus it is an example of physiological adaptation.
Behavioural adaptation	Desert lizards lack the physiological ability to cope with extreme temperatures but manage the body temperature by behavioural means.
Biochemical adaptation	A large variety of marine invertebrates and fishes are adapted biochemically to survive great depths in the ocean where the pressure (called crushing pressure) could be >100 times the normal atmospheric pressure.

Q198. Match List - I with List - II.

List - I	List - II

(a)	Filariasis	(i)	*Haemophilus influenzae*
(b)	Amoebiasis	(ii)	*Trichophyton*
(c)	Pneumonia	(iii)	*Wuchereria bancrofti*
(d)	Ringworm	(iv)	*Entamoeba histolytica*

Choose the correct answer from the options given below.

(1) $(a)-(iv);\ (b)-(i);\ (c)-(iii);\ (d)-(ii)$

(2) $(a)-(iii);\ (b)-(iv);\ (c)-(i);\ (d)-(ii)$

(3) $(a)-(i);\ (b)-(ii);\ (c)-(iv);\ (d)-(iii)$

(4) $(a)-(ii);\ (b)-(iii);\ (c)-(i);\ (d)-(iv)$

Correct option: (2)

Solution:

Disease	**Causative organism**
Filariasis	*Wuchereria bancrofti*
Pneumonia	*Haemophilus influenzae*
Ringworm	*Trichophyton*
Amoebiasis	*Entamoeba histolytica*

Q199. Which of these is not an important component of initiation of parturition in humans?

(1) Increase in estrogen and progesterone ratio

(2) Synthesis of prostaglandins

(3) Release of Oxytocin

(4) Release of Prolactin

Correct option: (4)

Solution: During parturition, secretion of progesterone decreases, thus estrogen and progesterone ratio increases. Prostaglandins facilitate dilation of the cervix, and oxytocin causes contraction of the myometrium. Prolactin helps in the process of lactation.

Q200. Match List - I with List - II.

List - I		List - II	
(a)	Scapula	(i)	Cartilaginous joints

(b)	Cranium	(ii)	Flat bone
(c)	Sternum	(iii)	Fibrous joints
(d)	Vertebral column	(iv)	Triangular flat bone

Choose the correct answer from the options given below.

(1) $(a)-(i);\ (b)-(iii);\ (c)-(ii);\ (d)-(iv)$

(2) $(a)-(ii);\ (b)-(iii)\ (c)-(i);\ (d)-(iv)$

(3) $(a)-(iii);(b)-(iv);\ (c)-(i);\ (d)-(ii)$

(4) $(a)-(iv);(b)-(iii);\ (c)-(ii);(d)-(i)$

Correct option: (4)

Solution:

Bones	**Joints/ Characteristics**
Scapula	Is a triangular flat bone that forms the part of the pectoral girdle along with the clavicle. It is located in the dorsal part of the thorax between the second and the seventh ribs.
Cranium	The bones of the cranium are joined by dense fibrous connective tissue in the form of fibrous joints or sutures that do not allow any movements.
Sternum	Sternum or breastbone is the central flat bone to which true ribs are directly attached on the ventral side of the body.
Vertebral column	The joint between the adjacent vertebrae in the vertebral column is made up of cartilaginous joints and allows limited movements.