

SECTION - A

101. Amensalism can be represented as:

- (1) Species A (+); Species B (+)
- (2) Species A (-); Species B (-)
- (3) Species A (+); Species B (0)
- (4) Species A (-); Species B (0)

Answer (4)

Sol. • Amensalism is an interaction between two organisms of different species in which one species inhibits the growth of other species by secreting certain chemicals. The first species is neither get benefited nor harmed.

- (+) : (0) interaction is observed in commensalism
- (+) : (+) interaction is observed in mutualism.
- (-) : (-) interaction is seen in competition

102. In the equation $GPP - R = NPP$

R represents :

- (1) Retardation factor
- (2) Environmental factor
- (3) Respiration losses
- (4) Radiant energy

Answer (3)

Sol. In the equation,

$$GPP - R = NPP$$

R refers to respiratory loss

GPP is gross primary productivity

NPP is net primary productivity

103. The plant hormone used to destroy weeds in a field

- (1) NAA
- (2) 2, 4-D
- (3) IBA
- (4) IAA

Answer (2)

Sol. Some synthetic auxins are used as weedicides. 2,4-D is widely used to remove broad leaved weeds or dicotyledonous weeds in cereal crops or monocotyledonous plants.

IAA and IBA are natural auxins.

NAA is a synthetic auxin.

104. Which of the following is an **incorrect** statement?

- (1) Microbodies are present both in plant and animal cells
- (2) The perinuclear space forms a barrier between the materials present inside the nucleus and that of the cytoplasm
- (3) Nuclear pores act as passages for proteins and RNA molecules in both directions between nucleus and cytoplasm
- (4) Mature sieve tube elements possess a conspicuous nucleus and usual cytoplasmic organelles

Answer (4)

Sol. A mature sieve tube elements possess a peripheral cytoplasm and a large central vacuole but lacks a nucleus.

Rest of other statements are correct.

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

- (1) Gene amplification
- (2) Purification of isolated protein
- (3) Detection of gene mutation
- (4) Molecular diagnosis

Answer (2)

Sol. PCR is Polymerase Chain Reaction.

It is used for making multiple copies of the gene.

Hence PCR is used for

- Gene amplification.
- PCR-based assays have been developed that detect the presence of gene sequences of the infectious agents.
- It is also used in detecting mutations.
- Protein is not the target of PCR. Hence, plays no role in its purification.

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

- (1) Amino acids, glucose
- (2) Vinblastin, curcumin
- (3) Rubber, gums
- (4) Morphine, codeine

Answer (1)

Sol. The correct option is (1)

- Amino acids and glucose are included under the category of primary metabolites as they have identifiable functions and play known roles in normal physiological processes.
- Rubber, gums, morphine, codeine, vinblastin and curcumin are included under the category of secondary metabolites as their role or functions in host organisms is not known yet. However, many of them are useful to human welfare.

107. 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.

- | | (a) | (b) | (c) | (d) |
|-----|-------|-------|-------|------|
| (1) | (i) | (iv) | (iii) | (ii) |
| (2) | (iii) | (iv) | (i) | (ii) |
| (3) | (ii) | (iii) | (iv) | (i) |
| (4) | (iv) | (iii) | (ii) | (i) |

Answer (2)

- Sol.**
- The inner membrane of mitochondria forms infoldings called cristae.
 - Thylakoids are flattened membranous sacs in stroma of plastids.

- Cisternae are disc shaped sacs in Golgi apparatus.
- Primary constriction in chromosome that holds two chromatids together is called centromere.

Hence correct option is (2)- a(iii), b(iv), c(i), d(ii)

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

- (1) Bright orange bands
- (2) Dark red bands
- (3) Bright blue bands
- (4) Yellow bands

Answer (1)

Sol. After the bands are stained, they are viewed in UV light. The bands appear bright orange in colour. Ethidium bromide is the intercalating agent that stacks in between the nitrogenous bases.

109. 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) Punch square
- (2) Punnett square
- (3) Net square
- (4) Bullet square

Answer (2)

Sol. The production of gametes (n) by the parents ($2n$), the formation of the zygote ($2n$), the F_1 and F_2 plants can be understood from a diagram called Punnett square.

110. The first stable product of CO_2 fixation in Sorghum is

- (1) Oxaloacetic acid
- (2) Succinic acid
- (3) Phosphoglyceric acid
- (4) Pyruvic acid

Answer (1)

- Sol.**
- *Sorghum* is a C_4 plant. The first stable product of CO_2 fixation in *Sorghum* is oxaloacetic acid.
 - The first stable product in C_3 cycle is 3-phosphoglyceric acid.
 - Pyruvic acid is the end product of glycolysis.
 - Succinic acid is an intermediate product in krebs cycle.

111. In spite of interspecific competition in nature, which mechanism the competing species might have evolved for their survival?

- (1) Competitive release
- (2) Mutualism
- (3) Predation
- (4) Resource partitioning

Answer (4)

Sol. • In spite of interspecific competition the competing species may co-exist by doing resource partitioning.

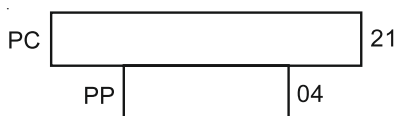
- In mutualism two organisms are equally benefitted.
- In predation one organism (Predator) eats the another one (Prey).
- In competition release there occurs dramatical increase in population of a less distributed species when its superior competitor is removed.

112. Which of the following statements is **not** correct?

- (1) Pyramid of biomass in sea is generally upright.
- (2) Pyramid of energy is always upright.
- (3) Pyramid of numbers in a grassland ecosystem is upright.
- (4) Pyramid of biomass in sea is generally inverted.

Answer (1)

Sol. Pyramid of biomass in sea is inverted. For example, biomass of zooplanktons is higher than that of phytoplanktons as life span of former is longer and the latter multiply much faster though having shorter life span.



Small standing crop of phytoplanktons supports large standing crop of zooplankton

113. The site of perception of light in plants during photoperiodism is

- (1) Stem
- (2) Axillary bud
- (3) Leaf
- (4) Shoot apex

Answer (3)

Sol. • The site of perception of light in plants during photoperiodism is leaf.

- The site of perception of low temperature stimulus during vernalisation is shoot apex and embryo.
- Axillary bud are not sites of perception of photoperiod.

114. 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.

- (a) (b) (c) (d)
- (1) (iii) (i) (iv) (ii)
- (2) (ii) (iii) (iv) (i)
- (3) (iv) (ii) (i) (iii)
- (4) (iv) (i) (iii) (ii)

Answer (1)

Sol. • Lenticels are meant for exchange of gases.

- Phellogen is also known as cork cambium.
- Phelloderm is also called secondary cortex because it is the cortex that develops during secondary growth.
- Cork has deposition of suberin in their cell walls when they get mature.

115. 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.

- (a) (b) (c) (d)
- (1) (ii) (i) (iv) (iii)
- (2) (iii) (iv) (i) (ii)
- (3) (iv) (iii) (ii) (i)
- (4) (iii) (iv) (ii) (i)

Answer (1)

Sol. • Pomato is obtained as a result of protoplast fusion.

- Totipotency is a property of explant to develop into whole plant body during plant tissue culture.
- Virus free plants can be obtained through meristem culture.
- Somaclones are obtained by the process of micropropagation.

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

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

- (a) (b) (c) (d)
- (1) (iv) (iii) (ii) (i)
- (2) (iii) (i) (iv) (ii)
- (3) (ii) (i) (iv) (iii)
- (4) (ii) (iv) (i) (iii)

Answer (4)

- Sol.** (a) Cohesion is mutual attraction among water molecules.
- (b) Adhesion is attraction towards polar surfaces.
- (c) Surface tension explains water molecules are more attracted in liquid phase than gaseous phase.
- (d) Guttation is loss of water in liquid form from the leaf margins.

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

- (1) Gene therapy
- (2) Molecular diagnosis
- (3) Safety testing
- (4) Biopiracy

Answer (1)

Sol. The correct option is (1)

- Gene therapy is a collection of methods that allows correction of a gene defect that has been diagnosed in a child/embryo.
- Biopiracy is the term used to refer to the use of bio-resources by multinational companies and other organisations without proper authorisation from the countries and people concerned without compensatory payment.
- Molecular diagnosis refers to the act or process of determining the nature and cause of a disease.

118. Diadelphous stamens are found in

- (1) Citrus
- (2) Pea
- (3) China rose and citrus
- (4) China rose

Answer (2)

- Sol.** • Stamens are said to be diadelphous when these are united in two bundles e.g. Pea.
- China rose has monadelphous stamens while, *Citrus* has polyadelphous stamens. Monoadelphous stamens are grouped in single bundle whereas polyadelphous stamens occur in more than two bundles.

119. A typical angiosperm embryo sac at maturity is:

- (1) 7-nucleate and 8-celled
- (2) 7-nucleate and 7-celled
- (3) 8-nucleate and 8-celled
- (4) 8-nucleate and 7-celled

Answer (4)

Sol. A typical angiospermic embryo sac has seven cells that are three antipodals, one central cell, one egg cell and two synergids.

The central cell has two polar nuclei, hence the embryo sac is eight nucleated.

120. 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.

- | | (a) | (b) | (c) | (d) |
|-----|-------|-------|-------|-------|
| (1) | (iv) | (iii) | (ii) | (i) |
| (2) | (i) | (ii) | (iii) | (iv) |
| (3) | (iii) | (ii) | (iv) | (i) |
| (4) | (ii) | (iv) | (i) | (iii) |

Answer (4)

Sol. (a) Meristematic tissues are those tissues which have cells with active cell division capacity.
 (b) Simple tissues are those tissues which have all the cells similar in structure and function.
 (c) Vascular tissues are complex permanent tissues hence they have different types of cells.
 (d) Sclereids are sclerenchymatous cells which are dead with highly thickened walls and narrow lumen.

121. 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) Geitonogamy
- (2) Chasmogamy
- (3) Cleistogamy
- (4) Xenogamy

Answer (4)

Sol. • Xenogamy refers to the transfer to 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.

- Cleistogamy is a condition in which flower does not open.
- Geitonogamy refers to the transfer of pollen grain from anther to stigma of another flower of the same plant.
- Chasmogamy is a condition in which flowers remain open.

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

- (1) Flexibility
- (2) Plasticity
- (3) Maturity
- (4) Elasticity

Answer (2)

Sol. Plants show plasticity which means the ability of plant to follow different pathways and produce different structures in response to environment.

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

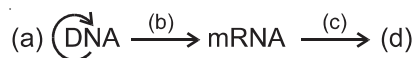
- (1) *Gracilaria*
- (2) *Volvox*
- (3) *Ulothrix*
- (4) *Ectocarpus*

Answer (4)

Sol. *Ectocarpus* is a brown alga belongs to the class Phaeophyceae. Members of this class have mannitol and laminarin as stored food material.

Ulothrix and *Volvox* belong to Chlorophyceae (green algae). Members of this class have starch as reserve food material. *Gracilaria* is a member of red algae (Rhodophyceae). This class is characterised by having floridean starch as stored food material.

124. Complete the flow chart on central dogma.



- (1) (a)-Translation; (b)-Replication;
(c)-Transcription;(d)-Transduction
- (2) (a)-Replication; (b)-Transcription; (c)-Translation;
(d)-Protein
- (3) (a)-Transduction; (b)-Translation; (c)-Replication;
(d)-Protein
- (4) (a)-Replication; (b)-Transcription;
(c)-Transduction; (d)-Protein

Answer (2)

- Sol.** • Formation of DNA from DNA is replication.
- Formation of mRNA from DNA is called Transcription.
 - Formation of protein from mRNA is called Translation.
 - So, (a) is Replication
(b) is Transcription
(c) is Translation
(d) is Protein
 - Transduction is transfer of genetic material from one bacterium to another with the help of virus or a bacteriophage.

125. Which of the following plants is monoecious?

- (1) *Chara*
- (2) *Marchantia polymorpha*
- (3) *Cycas circinalis*
- (4) *Carica papaya*

Answer (1)

- Sol.** • When male and female sex organs are present on same plant body, such plants are said to be monoecious.
- Most of the species of *Chara* are monoecious.
 - *Cycas circinalis*, *Carica papaya* and *Marchantia polymorpha* are dioecious.

126. Mutations in plant cells can be induced by:

- (1) Infrared rays
- (2) Gamma rays
- (3) Zeatin
- (4) Kinetin

Answer (2)

- Sol.** • Several kinds of radiation like gamma rays, X-rays, UV-rays cause mutation.
- These are physical mutagens.
 - Such induced mutation in plants is done to develop improved varieties. The first natural cytokinin was isolated from unripe maize grain known as zeatin. The cytokinin that was obtained from degraded product of autoclaved herring sperm DNA was kinetin (N⁶-furfuryl aminopurine). Infrared rays cause heating effect.

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

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

Answer (4)

- Sol.** The first step in the polymerase chain reaction is denaturation during which strands of dsDNA separate. This requires temperature around 94°C.

This is followed by annealing in which primers anneal to 3' end of template DNA strand.

Annealing is followed by extension in which *Taq* polymerase adds nucleotides to 3'OH end of primers.

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

- (1) Heterosorus
- (2) Homosporous
- (3) Heterosporous
- (4) Homosorus

Answer (3)

Sol. Plants like *Selaginella* and *Salvinia* produce two kinds of spore *i.e.*, microspores and macrospores. They are known as heterosporous.

Most of the pteridophytes produce single type of spores and are called homosporous

Sorus are brownish or yellowish cluster of spore-producing structures located on the lower surface of fern leaves.

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

- (1) Metaphase II (2) Anaphase II
(3) Telophase II (4) Metaphase I

Answer (2)

Sol. • Division of centromere occurs in anaphase II.

- Telophase II is the last stage of meiosis II. During this phase, the chromatids reach the poles and start uncoiling.
- Chromosomes form two parallel plates in metaphase I and one plate in metaphase II.

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

- (1) DNA (2) Histones
(3) Polysaccharides (4) RNA

Answer (1)

Sol. Various enzymes like protease, RNase, etc. are added to break down substances like proteins, RNA, etc. Once all these substances are broken down, DNA is left which is precipitated out by adding chilled ethanol.

Histones are basic proteins that help condense DNA in a cell.

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

- (1) Genetic recombination
(2) Mutation
(3) Genetic drift
(4) Natural selection

Answer (3)

Sol. • Change in gene frequency in a small population by chance is known as genetic drift. Genetic drift has two ramifications, one is bottle neck effect and another is founder's effect.

- When accidentally a few individuals are dispersed and act as founders of a new isolated population, founder's effect is said to be observed.

- Crossing over which occurs during gamete formation results in genetic recombination.
- Mutations are random and directionless.

132. Which of the following algae produce Carrageen?

- (1) Brown algae
(2) Red algae
(3) Blue-green algae
(4) Green algae

Answer (2)

Sol. • The cell wall of red algae is composed of agar, carrageen and funori along with cellulose.

- In brown algae cell wall contains algin while in green algae it is composed of cellulose and pectin.
- In blue green algae cell wall is composed of mucopeptides.

133. Gemmae are present in

- (1) Pteridophytes (2) Some Gymnosperms
(3) Some Liverworts (4) Mosses

Answer (3)

Sol. • Gemmae are green, multicellular asexual buds that are produced by some liverworts like *Marchantia*.

- Mosses reproduce vegetatively by fragmentation and budding of protonema.
- Pteridophytes and Gymnosperms normally do not reproduce asexually

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

- (1) Climax community (2) Standing state
(3) Standing crop (4) Climax

Answer (2)

Sol. • Amount of all the inorganic substances or nutrients, such as carbon, nitrogen, phosphorus and calcium present in soil at any given time, is referred as standing state.

- Amount of living material present in different trophic levels at a given time, is referred as standing crop.
- Climax community is the last community in biotic succession which is relatively stable and is in near equilibrium with the environment of that area.

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

- (1) Telocentric (2) Sub-metacentric
(3) Acrocentric (4) Metacentric

Answer (4)

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

When the centromere is present slightly away from the middle, it is called sub-metacentric chromosome.

When the centromere is present very close to one end of the chromosome, it is called acrocentric chromosome.

When the centromere is present at terminal position, the chromosome is called telocentric.

SECTION - B

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

- (1) Repetitive DNA (2) Single nucleotides
(3) Polymorphic DNA (4) Satellite DNA

Answer (1)

Sol. • DNA fingerprinting involves identifying differences in some specific regions in DNA sequence called as repetitive DNA.

- The basis of DNA fingerprinting is VNTR (a satellite DNA as probe that show very high degree of polymorphism)
- Polymorphism is the variation at genetic level. Allelic sequence variation has traditionally been described as a DNA polymorphism.

137. 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) The transformed cells will have the ability to resist ampicillin as well as produce β -galactoside
(2) It will lead to lysis of host cell
(3) It will be able to produce a novel protein with dual ability
(4) It will not be able to confer ampicillin resistance to the host cell

Answer (4)

Sol. pBR322 is a commonly used cloning vector. When the gene for β -galactoside is inserted in the ampicillin resistance gene by using *Pst* I, the recombinant *E.coli* will lose ampicillin resistance due to insertional inactivation of the antibiotic resistance gene.

The host (recombinant) cell will produce β -galactoside which is not a novel protein **nor** does it have dual ability.

The transformed cells cannot resist ampicillin as they have lost ampicillin resistance.

A recombinant *E. coli* is produced and the host cell will not undergo lysis due to insertion of β -galactoside gene.

138. Match **Column-I** with **Column-II**.

	Column-I		Column-II
(a)	<i>Nitrococcus</i>	(i)	Denitrification
(b)	<i>Rhizobium</i>	(ii)	Conversion of ammonia to nitrite
(c)	<i>Thiobacillus</i>	(iii)	Conversion of nitrite to nitrate
(d)	<i>Nitrobacter</i>	(iv)	Conversion of atmospheric nitrogen to ammonia

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

- (a) (b) (c) (d)
(1) (i) (ii) (iii) (iv)
(2) (iii) (i) (iv) (ii)
(3) (iv) (iii) (ii) (i)
(4) (ii) (iv) (i) (iii)

Answer (4)

Sol. • Nitrogen fixation is conversion of atmospheric N_2 to NH_3 (ammonia). It is carried out by N_2 fixers such as *Rhizobium*.

- NH_3 is converted to NO_2^- (nitrite) by nitrifying bacteria such as *Nitrococcus*.
- Then NO_2^- is converted to NO_3^- (nitrate) by nitrifying bacteria called *Nitrobacter*.
- *Thiobacillus* carries out denitrification, a process where NO_2^- / NO_3^- is converted to N_2 .

139. Match **List-I** with **List-II**.

List-I	List-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.

- (a) (b) (c) (d)
- (1) (i) (iv) (iii) (ii)
- (2) (ii) (i) (iv) (iii)
- (3) (iv) (iii) (i) (ii)
- (4) (iv) (i) (ii) (iii)

Answer (4)

- Sol.** • In a polypeptide or a protein, amino acids are linked by a peptide bond which is formed when the carboxyl (–COOH) group of one amino acid reacts with amino (–NH₂) group of the next amino acid with the elimination of a water moiety.
- Unsaturated fatty acids are with one or more C = C double bonds.
 - In nucleic acids, a phosphate moiety links the 3'-carbon of one sugar of one nucleotide to the 5'-carbon of the sugar of the succeeding nucleotide. The bond between the phosphate and hydroxyl group is an ester bond. As there is one such ester bond on either side, it is called phosphodiester bond.
 - In a polysaccharide, the individual monosaccharides are linked by a glycosidic bond.

140. 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.

- (a) (b) (c) (d)
- (1) (iv) (ii) (iii) (i)
- (2) (iv) (i) (ii) (iii)
- (3) (ii) (iv) (iii) (i)
- (4) (iii) (ii) (i) (iv)

Answer (2)

- Sol.** • In S phase DNA replication takes place.
- In G₂ phase there is synthesis of proteins, RNA etc.
 - Quiescent stage is inactive stage of cell cycle but cells remain metabolically active in this stage.
 - G₁ phase is the interval between mitosis and initiation of DNA replication.

141. Which of the following statements is **correct** ?

- (1) Fusion of protoplasts between two motile on non-motile gametes is called plasmogamy
- (2) Organisms that depend on living plants are called saprophytes
- (3) Some of the organisms can fix atmospheric nitrogen in specialized cells called sheath cells
- (4) Fusion of two cells is called Karyogamy

Answer (1)

- Sol.** • In some blue-green algae specialised cells called heterocyst fixes atmospheric nitrogen into ammonia.
- Fusion of two nuclei is called Karyogamy.
 - Organisms that depend on living plants are parasites, saprophytes grow on dead material.
 - Fusion of protoplasts of two cells is called plasmogamy.

142. Which of the following statements is **incorrect**?

- (1) Stroma lamellae have PS I only and lack NADP reductase
- (2) Grana lamellae have both PS I and PS II
- (3) Cyclic photophosphorylation involves both PS I and PS II
- (4) Both ATP and NADPH + H⁺ are synthesized during non-cyclic photophosphorylation

Answer (3)

- Sol.** • Cyclic photophosphorylation involves only PS I. Both PS I and PS II are involved in non-cyclic photophosphorylation where both ATP and NADPH + H⁺ are synthesized.
- Both PS I and PS II are found on grana lamellae whereas stroma lamellae have PS I only and lack NADP reductase.

143. Identify the **correct** statement.

- (1) RNA polymerase binds with Rho factor to terminate the process of transcription in bacteria
- (2) The coding strand in a transcription unit is copied to an mRNA
- (3) Split gene arrangement is characteristic of prokaryotes
- (4) In capping, methyl guanosine triphosphate is added to the 3' end of hnRNA

Answer (1)

Sol. • Split gene arrangement is characteristic of eukaryotes.

- In capping 5-methyl guanosine triphosphate is added at 5' end of hnRNA.
- At 3' end poly-A tail is added.
- The non coding or template strand is copied to an mRNA. RNA polymerase associate with ρ factor (Rho factor) and it alters the specificity of the RNA polymerase to terminate the processes.

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

- (1) The base of exponential logarithms
- (2) The base of natural logarithms
- (3) The base of geometric logarithms
- (4) The base of number logarithms

Answer (2)

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

e represents the base of natural logarithms

N_t = Population density after time t

N_0 = Population density at time zero

r = Intrinsic rate of natural increase called biotic potential.

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 completely and clearly appears on a photographic film
- (2) mutated gene does not appear on a photographic film as the probe has no complementarity with it

- (3) mutated gene does not appear on photographic film as the probe has complementarity with it
- (4) mutated gene partially appears on a photographic film

Answer (2)

Sol. Autoradiography allows the detection/localisation of radioactive isotope within a biological sample.

Probe is a radiolabelled ss DNA or ss RNA depending on the technique. To identify the mutated gene probe is allowed to hybridise to its complementary DNA in a clone of cells followed by detection using autoradiography. The mutated gene will not appear on the photographic film, because the probe does not have complementarity with the mutated gene.

146. Match Column-I with Column-II

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

Select the **correct** answer from the options given below.

	(a)	(b)	(c)	(d)
(1)	(i)	(ii)	(iii)	(iv)
(2)	(ii)	(iii)	(iv)	(i)
(3)	(iv)	(ii)	(i)	(iii)
(4)	(iii)	(iv)	(ii)	(i)

Answer (4)

Sol. The floral formula of

Brassicaceae family – $\oplus \overline{\text{K}}_{2+2} \text{C}_4 \text{A}_{2+4} \underline{\text{G}}_{(2)}$

Solanaceae family – $\oplus \overline{\text{K}}_{(5)} \overline{\text{C}}_{(5)} \text{A}_5 \underline{\text{G}}_{(2)}$

Fabaceae family – $\% \overline{\text{K}}_{(5)} \text{C}_{1+2+(2)} \text{A}_{(9)+1} \underline{\text{G}}_1$

Liliaceae family – $\oplus \overline{\text{P}}_{(3+3)} \text{A}_{3+3} \underline{\text{G}}_{(3)}$

So a(iii), b(iv), c(ii), d(i) is correct matching.

147. Which of the following statements is **incorrect**?

- (1) In ETC (Electron Transport Chain), one molecule of $\text{NADH} + \text{H}^+$ gives rise to 2 ATP molecules, and one FADH_2 gives rise to 3 ATP molecules
- (2) ATP is synthesized through complex V
- (3) Oxidation-reduction reactions produce proton gradient in respiration
- (4) During aerobic respiration, role of oxygen is limited to the terminal stage

Answer (1)

Sol. • During respiration, process of ATP synthesis is explained by chemiosmotic model. It says that a proton gradient is required for ATP synthesis that is established by oxidation-reduction reactions.

- In ETC, one $\text{NADH} + \text{H}^+$ produces 3 ATP while one FADH_2 produces 2 ATP molecules.
- ATP is synthesised via complex V.
- In ETS, oxygen acts as terminal electron acceptor.

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

- (1) Transcribes tRNA, 5s rRNA and snRNA
- (2) Transcribes precursor of mRNA
- (3) Transcribes only snRNAs
- (4) Transcribes rRNAs (28S, 18S and 5.8S)

Answer (1)

Sol. • RNA polymerase III transcribes tRNA, ScRNA, 5S rRNA and SnRNA.

- RNA polymerase I transcribes 5.8S, 18S and 28S rRNA.
- RNA polymerase II transcribes hnRNA which is precursor of mRNA

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

- (1) Poaceae ; Leguminosae
- (2) Poaceae ; Solanaceae
- (3) Rosaceae ; Leguminosae
- (4) Poaceae ; Rosaceae

Answer (3)

Sol. • In members of some plant families like Solanaceae, Rosaceae and Leguminosae the pollen grains retain their viability for several months.

- In cereals (Poaceae) pollen grains retain viability for around 30 minutes.

150. Select the **correct** pair.

- (1) In dicot leaves, vascular bundles are surrounded by large thick-walled cells - Conjunctive tissue
- (2) Cells of medullary rays that form part of cambial ring - Interfascicular cambium
- (3) Loose parenchyma cells rupturing the epidermis and forming a lens shaped opening in bark - Spongy parenchyma
- (4) Large colorless empty cells in the epidermis of grass leaves - Subsidiary cells

Answer (2)

Sol. • When the cells of medullary rays differentiated, they give rise to the new cambium called interfascicular cambium.

- Loose parenchyma cells rupturing the epidermis and forming a lens-shaped opening in bark are called complementary cells.
- Large colourless empty cells in the epidermis of grass leaves are called bulliform cells.
- In dicot leave, vascular bundles are surrounded by large thick walled cells called bundle sheath cells.