

AIPMT 2014

Biology

1. Which one of the following shows isogamy with non-flagellated gametes?

- (1) *Sargassum* (2) *Ectocarpus*
(3) *Ulothrix* (4) *Spirogyra*

Solution:

Syngamy is isogamy when gametes are similar. Out of the given options, only *Spirogyra* shows isogamy with the non-flagellated gametes.

Hence, the correct option is (4).

2. Five kingdom system of classification suggested by R.H. Whittaker is not based on:

- (1) Presence or absence of a well-defined nucleus (2) Mode of reproduction
(3) Mode of nutrition. (4) Complexity of body organization

Solution:

Five kingdom classification was given by R.H. Whittaker. He used taxonomic features such as cell type, biochemical profile of cell wall, presence or absence of nuclear membrane, level of structural organization, for example, cell-tissue-organ-organ system grade and mechanism of obtaining food to classify organisms.

Hence, the correct option is (1).

3. Which one of the following fungi contains hallucinogens?

- (1) *Morchella esculenta* (2) *Amanita muscaria*
(3) *Neurospora sp.* (4) *Ustilago sp.*

Solution:

Amanita muscaria is a mushroom. It is commonly known as the fly agaric or fly amanita. It is poisonous. It is noted for its hallucinogenic properties. Its main psychoactive constituent is the compound muscimol. It is a depressant that cause dissociative changes in perception.

Hence, the correct option is (2).

4. Archaeobacteria differs from eubacteria in:

- (1) Cell membrane structure (2) Mode of nutrition
(3) Cell shape (4) Mode of reproduction

Solution:

Archaeobacteria have several features that differentiate these bacteria from other bacteria:

- Archaeans do not cause common diseases like bacteria do.
- They differ chemically from bacteria in their cell walls, cell membranes and ribosomal RNA and RNA polymerase. Their cell wall is made up of proteins and polysaccharides. Peptidoglycan is absent. This is the reason why they are able to survive in harsh environments where bacteria cannot.
- They are different in their physiological processes.

Hence, the correct option is (1).

5. Which one of the following is wrong about *Chara*?

- (1) Upper oogonium and lower round antheridium
(2) Globule and nucule present on the same plant
(3) Upper antheridium and lower oogonium
(4) Globule is male reproductive structure

Solution:

Chara reproduces both vegetatively and sexually. Vegetative reproduction takes place by tubers and secondary protonema. The fructifications for sexual reproduction are male globule or antheridium and female nucule or archegonium. Oogonium is the upper part and antheridium is the lower part.

Hence, the correct option is (3).

6. Which of the following is responsible for peat formation?

- | | |
|-----------------------|---------------------|
| (1) <i>Marchantia</i> | (2) <i>Riccia</i> |
| (3) <i>Funaria</i> | (4) <i>Sphagnum</i> |

Solution:

Sphagnum is commonly known as peat moss. *Sphagnum* amass to store water. It is because both living and dead plants present in it has large water holding capacities in their cells. The vacant cells can hold water under drier conditions. Therefore, as sphagnum moss grows, it slowly extents into drier conditions, thus forming bigger peatlands. These peat buildups provide habitat for a wide array of peatland plants.

Hence, the correct option is (4).

7. Placenta and pericarp are both edible portions in:

- | | |
|------------|------------|
| (1) Apple | (2) Banana |
| (3) Tomato | (4) Potato |

Solution:

The fruit of tomato is smooth or grooved, like a true berry. It is formed from a bicarpellary, syncarpous, bilocular or tetralocular ovary with swollen placenta. All parts of the fruit except the small seeds are edible. The membranous skin is represented by epicarp, while mesocarp is the middle fleshy part. The endocarp, septa and placentae are all pulpy.

Hence, the correct option is (3).

8. When the margins of sepals or petals overlap one another without any particular direction, the condition is termed as:

- | | |
|---------------|---------------|
| (1) Vexillary | (2) Imbricate |
| (3) Twisted | (4) Valvate |

Solution:

Aestivation is said to be imbricate when irregular overlapping of appendages by one another occurs. Some of the five sepals are external, while some are internal. It is seen in *Cassia*, gulmohar, etc.

In vexillary, out of five petals, the largest posterior or standard petal is the outermost with both margins outside and overlapping two lateral petals (wings or alae) and in the two smallest anterior petals (keel), both margins are inside. In twisted, one margin of a sepal or petal overlaps the margin of the next one while the other margin is overlapped by the preceding one, thereby giving a twisted appearance. In valvate, Margins of adjacent petals or sepals touch each other without overlapping.

Hence, the correct option is (2).

9. You are given a fairly old piece of dicot stem and a dicot root. Which of the following anatomical structures will your use to distinguish between the two?

- | | |
|---------------------|----------------------|
| (1) Secondary xylem | (2) Secondary phloem |
| (3) Protoxylem | (4) Cortical cells |

Solution:

Developmentally, the earlier formed part of the primary xylem is protoxylem. On the basis of the position of Protoxylem, roots can be differentiated from shoots. In roots, xylem is exarch i.e. protoxylem is towards periphery and metaxylem lies towards the centre, while in shoots xylem is endarch i.e. protoxylem is towards centre and the metaxylem lies towards the periphery.

Hence, the correct option is (3).

10. Which one of the following statements is correct?

- (1) The seed in grasses is not endospermic.

- (2) Mango is a parthenocarpic fruit
- (3) A proteinaceous aleurone layer is present in maize grain.
- (4) A sterile pistil is called a staminode

Solution:

In the seed of maize grain, the endosperm is surrounded by a layer of cells called aleurone which separates the embryo from the endosperm. The cells of aleurone layer consist of numerous protein bodies that are sources of enzymes required for mobilizing food reserves during germination

The seed in grasses is endospermic.

Mango is a true fruit, it is one-seeded fruit formed from monocarpellary superior ovaries.

A stamen which is sterile is called a staminode.

Hence, the correct option is (3).

11. Tracheids differ from the tracheary elements in:

- (1) Having casparian strips
- (2) Being imperforate
- (3) Lacking nucleus
- (4) Being lignified

Solution:

The difference between tracheids and vessels lies in the fact that tracheids are imperforate cells and have pits on the common walls. In vessels, perforations are present in areas which lack both primary and secondary walls through which vessel elements are interconnected.

Hence, the correct option is (2).

12. An example of edible underground stem is:

- (1) Carrot
- (2) Groundnut
- (3) Sweet potato
- (4) Potato

Solution:

Potatoes are stem tubers that are underground swollen tips of the underground branches. Since the branch growth is retarded so food accumulates and the tips become swollen. They help in food storage.

Carrot, groundnut and sweet potato are root modifications. They are roots which have been modified for storing food materials.

Hence, the correct option is (4).

13. Which structures perform the function of mitochondria in bacteria?

- (1) Nucleoid
- (2) Ribosomes
- (3) Cell wall
- (4) Mesosomes

Solution:

Electron micrographs of bacterial cells often show large infoldings of the cell membrane called mesosomes which are structurally similar to the mitochondria. These are formed by the invaginations of the cell membrane. They help in the synthesis of the cell wall, replication of DNA, equal distribution of chromosomes in the daughter cells, increase the surface area of plasma membrane for effective absorption and also increase the enzyme content.

Hence, the correct option is (4).

14. The solid linear cytoskeletal elements having a diameter of 6 nm and made up of a single type of monomer are known as:

- (1) Microtubules
- (2) Microfilaments
- (3) Intermediate filaments
- (4) Lamins

Solution:

Microfilaments are approximately 6-8 nm in diameter. The actin monomers that form microfilaments, polymerize in the presence of ATP and form a flexible, helical filament. The subunit organization in microfilaments is two-stranded structure with two helical grooves running along its length.

Hence, the correct option is (2).

15. The osmotic expansion of a cell kept in water is chiefly regulated by:

- | | |
|------------------|---------------|
| (1) Mitochondria | (2) Vacuoles |
| (3) Plastids | (4) Ribosomes |

Solution:

The vacuolar membrane, called the tonoplast, like the lysosomal membrane, also contains many protein pumps which lead to active transport of ions into the vacuolar compartment. This results in a much higher concentration of these ions in the vacuole as compared to the cytoplasm or the extracellular fluid. This in turn helps in osmotic entry of water into the vacuole and forms the basis of mechanical support for the soft tissues of a plant and also helps stretch the cell wall during cell growth.

Hence, the correct option is (2).

16. During which phase(s) of cell cycle, amount of DNA in a cell remains at 4C level if the initial amount is denoted as 2C ?

- | | |
|---------------------------------------|--------------------------|
| (1) G ₀ and G ₁ | (2) G ₁ and S |
| (3) Only G ₂ | (4) G ₂ and M |

Solution:

During the G₂ stage of interphase, the time gap between the end of DNA replication and the beginning of cell division, the supercoils of DNA condense into tightly compacted bodies that become visible as chromosomes during mitosis. Each chromosome contains two copies of hereditary information (the original and its replica synthesized during the S phase), which can be seen as two strands of chromosomal material held together at a single point. The strands are called sister chromatids.

Hence, the correct option is (3).

17. Match the following and select the correct answer:

- | | |
|-----------------|-----------------------------------|
| (a) Centriole | (i) Infoldings in mitochondria |
| (b) Chlorophyll | (ii) Thylakoids |
| (c) Cristae | (iii) Nucleic acids |
| (d) Ribozymes | (iv) Basal body cilia or flagella |

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

Solution:

- | | |
|-----------------|-----------------------------------|
| (a) Centriole | (iv) Basal body cilia or flagella |
| (b) Chlorophyll | (iii) Nucleic acid |
| (c) Cristae | (i) Infoldings in mitochondria |
| (d) Ribozyme | (ii) Thylakoids |

Hence, the correct option is (4).

18. Dr F. Went noted that if coleoptile tips were removed and placed on agar for one hour, the agar would produce a bending when placed on one side of freshly-cut coleoptile stumps. Of what significance is this experiment?

- (1) It made possible the isolation and exact identification of auxin.
- (2) It is the basis for quantitative determination of small amounts of growth-promoting substances.
- (3) It supports the hypothesis that IAA is auxin.

(4) It demonstrated polar movements of auxins

Solution:

This curvature was due to differential cell elongation and was proportional to the amount of substance present in the agar. The significant conclusions from Went's experiments were:

- (a) Presence of regulatory substance, auxin in the apex of the coleoptile was confirmed.
- (b) A method for isolation and quantitative analysis of auxin was devised

Hence, the correct option is (1).

19. Deficiency symptoms of nitrogen and potassium are visible first in:

- (1) Senescent leaves
- (2) Young leaves
- (3) Roots
- (4) Buds

Solution:

As nitrogen travels in the form of soluble amines and amides from the older to the younger leaves, the symptoms of nitrogen deficiency generally appear first in the older leaves and occur in the younger leaves only when the deficiency becomes severe.

The deficiency symptoms of potassium first appear in older leaves, which characteristically develop mottling or chlorosis, followed by necrotic lesions.

Hence, the correct option is (1).

20. In which one of the following processes CO₂ is not released?

- (1) Aerobic respiration in plants
- (2) Aerobic respiration in animals
- (3) Alcoholic fermentation
- (4) Lactate fermentation

Solution:

Under anaerobic conditions in some bacteria or in muscles of animals, pyruvate is reduced to lactate to regenerate NAD⁺. It is also known as homolactic fermentation.

In all other processes, CO₂ is the end product.

Hence, the correct option is (4).

21. Anoxygenic photosynthesis is characteristic of:

- (1) *Rhodospirillum*
- (2) *Spirogyra*
- (3) *Chlamydomonas*
- (4) *Ulva*

Solution:

Chromatium and *Rhodospirillum* are anoxygenic nitrogen fixing photosynthetic bacteria. Photosynthetic *Rhodospirillaceae* are obligate anaerobes that is, they die in the presence of oxygen.

Hence, the correct option is (1).

22. A few normal seedling of tomato were kept in a dark room. After few days they were found to have become white- coloured like albino, Which of the following terms will you use to describe them?

- (1) Mutated
- (2) Embolised
- (3) Etiolated
- (4) Defoliated

Solution:

Etiolation is characterized by increased stem elongation, reduced leaf development, and lack of chlorophyll in seedlings grown in darkness or low light conditions.

Hence, the correct option is (3).

23. Which one of the following growth regulators is known as stress hormone?

- (1) Abscissic acid
- (2) Ethylene
- (3) GA₃
- (4) Indole acetic acid

Solution:

Abscisic acid is synthesized in mesophyll cells, guard cells and vascular tissue mainly from mevalonic acid or xanthophyll. It is highly mobile and rapidly moves out of the leaves to other parts of the plant body, specially sink tissues through diffusion, as well as through xylem and phloem transport. It serves to increase plant tolerance to several stresses, such as drought, waterlogging, etc., hence, it is also known as stress hormone.

Hence, the correct option is (1).

24. Geitonogamy involves

- (1) Fertilization of a flower by the pollen from another flower of the same plant
- (2) Fertilization of a flower by the pollen from another same flower.
- (3) Fertilization of a flower by the pollen from a flower of another plant in the same population
- (4) Fertilization of a flower by the pollen from a flower of another plant belonging to a distant population

Solution:

Transfer of pollen grains from the anther of the flower of one plant to the stigma of another flower of the same plant is known as geitonogamy. It involves two flowers and requires a pollinating agent. Hence, functionally, it is cross-pollination. However, genetically, it is self-pollination because both the flowers belong to the same plant.

Hence, the correct option is (1).

25. Male gametophyte with least number of cells is present in:

- (1) *Pteris*
- (2) *Funaria*
- (3) *Lilium*
- (4) *Pinus*

Solution:

Most reduced male gametophyte or minimum number of cells in the male gametophyte is present in angiosperms. They have three celled male gametophyte. *Lilium* is an angiosperm, while *Funaria* is a bryophyte, *Pinus* is a gymnosperm and *Pteris* is a Pteridophyte.

Hence, the correct option is (3).

26. An aggregate fruit is one which developed from

- (1) Multicarpellary syncarpous gynoecium
- (2) Multicarpellary apocarups gynoecium
- (3) Complete inflorescence
- (4) Multicarpellary superior ovary

Solution:

If the number of carpels of gynoecium is more than one then the fruit formed is aggregate. In apocarpous condition, the carpels of the gynoecium must be free, while the carpels of styles and stigma may be fused. Thus, fruit formed is aggregate. For example, rose, lotus, Ranunculus, etc.

Hence, the correct option is (2).

27. Pollen tablets are available in the market for:

- (1) *In vitro* fertilization
- (2) Breeding programmes
- (3) Supplementing food
- (4) *Ex situ* conservation

Solution:

Since pollen grains are rich in nutrients (proteins, carbohydrates and fats), they are taken as food supplements to increase stamina in athletes and race horses. They are used as pollen tablets or syrups. Pollen grains are also used to produce variety of products such as cosmetics, syrups, energy drinks, etc.

Hence, the correct option is (3).

28. Function of filiform apparatus is to:

- (1) Recognize the suitable pollen at stigma
- (2) Stimulate division of generative cell
- (3) Producer nectar
- (4) Guide the entry of pollen tube

Solution:

The three cells at the micropylar end form the egg apparatus. They consist of two synergids (or help cells) and one egg cell (ovum). The synergids have a filiform apparatus (finger-like cellular thickenings at the micropylar tip) attached to their upper wall that functions to attract and guide the pollen tube into the synergid. The egg cell has a large vacuole at its upper end and a nucleus at its lower end.

Hence, the correct option is (4).

29. Non-albuminous seed is produced in:

- (1) Maize (2) Castor
(3) Wheat (4) Pea

Solution:

Endosperm is a nutritive tissue and plays an important role in development and germination of seed. The developing embryo can consume it or it may remain persistent in the mature seed. In the former case, the seed is called albuminous, while in the latter case, the seed is called ex-albuminous. Ex-albuminous seeds do not contain endosperm. Their cotyledons carry food and are thick and fleshy. For example, peas, beans, groundnut, gram, etc.

Hence, the correct option is (4).

30. Which of the following shows coiled RNA strand and capsomeres?

- (1) Polio virus (2) Tobacco mosaic virus
(3) Measles virus (4) Retrovirus

Solution:

Tobacco mosaic virus has a single stranded coiled RNA and a protein capsid coat known as capsomere. Its infection causes mosaic-like mottling and discoloration of the leaves of tobacco plant.

Hence, the correct option is (2).

31. Which one of the following is wrongly matched?

- (1) Transcription- Writing information from DNA to- RNA
(2) Transcription- Using information in m- RNA to make protein
(3) Repressor protein - Binds to a operator to stop enzyme synthesis
(4) Operon- Structural genes, operator and promoter

Solution:

- (i) Transcription is the transfer of the genetic information from DNA to RNA (mRNA)
(ii) Translation: It is the transfer of information from RNA (mRNA) to protein.
(iii) Repressor protein is encoded by regulator gene. It binds to operator to stop the synthesis of enzyme.
(iv) A typical operon consists of structural genes, a promoter region (binding site of RNA polymerase) and an operator region (binding site of the repressor, a regulatory protein).

Hence, the correct option is (2).

32. Transformation was discovered by:

- (1) Meselson and Stahl (2) Hershey and Chase
(3) Griffith (4) Watson and Crick

Solution:

Transformation is the change in an organism's characteristics because of the transfer of genetic information. Frederick Griffith, an English military physician, while studying pneumococcal infections in mice discovered bacterial transformation in 1928. Hence, it is also called Griffith effect.

Hence, the correct option is (3).

33. Fruit colour in squash is an example of:

- (1) Recessive epistasis (2) Dominant epistasis
(3) Complementary genes (4) Inhibitory genes

Solution:

There are three fruit colors observed in *Curcubita pepo*—yellow, green and white. There are two genes involved to produce the color, one gene has alleles Y and y, while the other has alleles W and w. The genotypes W—produces white color; wwY— produces yellow color; wwyy gives green color. The outcome of a cross between plants heterozygous for both of the fruit-color determining genes results in phenotype ratio 12 (white): 3 (yellow): 1 (green). Therefore, we can see that allele W in one gene is dominant over all the alleles (Y and y) of the other gene, and thus epistatic over the other gene. This is a case of dominant epistasis.

Hence, the correct option is (2).

34. Viruses have:

- | | |
|------------------------------------|-------------------------|
| (1) DNA enclosed in a protein coat | (2) Prokaryotic nucleus |
| (3) Single Chromosome | (4) Both DNA and RNA |

Solution:

A virus is a small infectious agent that replicates only inside the living cells of other organisms. Virus particles contain three parts: i) the genetic material made from either DNA or RNA, long molecules that carry genetic information; ii) a protein coat that protects these genes; and in some cases iii) an envelope of lipids that surrounds the protein coat.

35. The first human hormone produced by recombinant DNA technology is:

- | | |
|--------------|------------------|
| (1) Insulin | (2) Estrogen |
| (3) Thyroxin | (4) Progesterone |

Solution:

Insulin is synthesized by the beta cells of the islets of Langerhans in the pancreas and controls blood sugar (glucose) levels. Its deficiency results in diabetes mellitus. In 1983, Eli Lilly, an American company, prepared two DNA sequences corresponding to A and B chains of human insulin. Thus, it was the first hormone to be produced using recombinant DNA technology.

Hence, the correct option is (1).

36. An analysis of chromosomal DNA using the Southern hybridization technique does not use:

- | | |
|---------------------|--------------|
| (1) Electrophoresis | (2) Blotting |
| (3) Autoradiography | (4) PCR |

Solution:

Southern blot hybridization was developed by M. Southern in 1975 in which the locations of genes and other DNA sequences can be identified on restriction fragments separated by gel electrophoresis. The DNA molecules that have been separated by gel electrophoresis are transferred onto nitrocellulose or nylon membranes. A radioactively labeled VNTR DNA probe containing the sequence of interest is then hybridized with the immobilized DNA on the membrane and detected by autoradiography.

Hence, the correct option is (4).

37. In vitro clonal propagation in plants is characterized by:

- | | |
|------------------------------|-----------------------|
| (1) PCR and RAPD | (2) Northern blotting |
| (3) Electrophoresis and HPLC | (4) Microscopy |

Solution:

Clonal propagation or Somaclonal propagation refers to the multiplication of genetically identical copies of a plant by micropropagation. They are often used to develop new plant varieties. Meristems are regions of active cell division in plants. The meristems found at the shoot and root tips are called apical meristems while those that form in the axils of leaf primordia, giving rise to branches and flowers are called axillary meristems. They are selected by using microscopy and cultured on a suitable medium where multiplication takes place.

Hence, the correct option is (4).

38. An alga which can be employed as food for human beings:

- (1) *Ulothrix* (2) *Chlorella*
(3) *Spirogyra* (4) *Polysiphonia*

Solution:

Some algae such as *Scenedesmus* and *Chlorella* are used as food. The cyanobacterium *Spirulina* is consumed as food. They are rich source of protein.

Hence, the correct option is (2).

39. Which vector can clone only a small fragment of DNA?

- (1) Bacterial artificial chromosome (2) Yeast artificial chromosome
(3) Plasmid (4) Cosmid

Solution:

(i) Bacterial Artificial Chromosomes (BAC) vectors are vectors which are based on fertility plasmid of bacteria. These are used for mapping of large eukaryotic genome. They can accommodate large DNA fragments of size 300–350 kb.

(ii) Yeast Artificial Chromosomes (YAC) vectors resembles a natural chromosome. They have telomere at each end, autonomously replicating sequence (origin of replication) and a centromere. These are used for the cloning of DNA fragments of size more than 10⁶ bp in size.

(iii) Plasmids are circular molecules of DNA that lead an independent existence in a bacterial cell. The size of the plasmid should be relatively small since large molecules tend to break down during purification and are also difficult to manipulate.

(iv) Cosmid vectors are hybrid vectors constructed by inserting “cos” site of phage Lambda into plasmid DNA. Cosmid is inserted into lambda protein heads. They infect bacteria and replicate like plasmids. They can clone DNA fragments up to 45 kb of length.

Hence, the correct option is (3).

40. An example of ex situ conservation is:

- (1) National Park (2) Seed Bank
(3) Wildlife sanctuary (4) Sacred Grove

Solution:

Ex situ conservation involves the conservation of genetic resources of species away from their area of origin or development. This includes off site collection and gene banks. This strategy is aimed to conserve more genetic material in less area.

Hence, the correct option is (2).

41. A location with luxuriant growth of lichens on the trees indicates that the :

- (1) Trees are very healthy (2) Trees are heavily infested
(3) Location is highly polluted (4) Location is not polluted

Solution:

Lichens are bio-monitors. They are indicators of air pollution or in other words are very sensitive to changes in the environment. Lichens not grow in polluted habitat. They are sensitive to oxides of Sulphur. The absence of lichens means air pollution in the area and hence luxuriant growth of lichens indicates that the location is not polluted.

Hence, the correct option is (4).

42. Match the following and select the correct option:

- (a) Earthworm (i) Pioneer species
(b) Succession (ii) Detritivore
(c) Ecosystem service (iii) Nataliy
(d) Population growth (iv) Pollination

- (a) (b) (c) (d)

- | | | | | |
|-----|-------|------|-------|-------|
| (1) | (i) | (ii) | (iii) | (iv) |
| (2) | (iv) | (i) | (iii) | (ii) |
| (3) | (iii) | (ii) | (iv) | (i) |
| (4) | (ii) | (i) | (iv) | (iii) |

Solution:

(i) The pioneer species are generally small hardy species that spread into un-colonized areas generally algae and lichens. They are perennial species that spread quickly and produce large amount of seeds for the next season. The appearance of these species modifies the microenvironment of the ecosystem and generates changes in its abiotic and biotic factors. Therefore, they open the way to other species to establish in the place by the creation of new potential ecological niches.

(ii) Detritivore, also known as detritus feeders, or saprophages, are heterotrophs. They obtain their nutrients by consuming decomposing plant and animal parts as well as feces. Earthworm is a detritivore.

(iii) Natality is the number of young individuals produced in a unit time in a population in the given area and is added to the density.

(iv) The process of the transfer of pollen grains from the anthers of a flower to the stigma of the same flower or of another flower is known as pollination.

Hence, the correct option is (4).

43. A species facing extremely high risk of extinction in the immediate future is called:

- | | |
|---------------------------|-------------|
| (1) Vulnerable | (2) Endemic |
| (3) Critically Endangered | (4) Extinct |

Solution:

Species are classified into nine groups on the criteria such as population size, rate of decline, area of geographic distribution, etc. According to IUCN, a taxon is considered critically endangered when it is facing an extremely high risk of extinction in the wild in the immediate future. For example, pygmy hog (*Sus salvanius*).

Hence, the correct option is (3).

44. The zone of atmosphere in which the ozone layer is:

- | | |
|------------------|-----------------|
| (1) Ionosphere | (2) Mesosphere |
| (3) Stratosphere | (4) Troposphere |

Solution:

Ozone is formed as a natural layer high in the atmosphere (stratosphere) by the effect of sunlight on normal oxygen. It is an allotropic form of oxygen in which three atoms of oxygen occur together rather than the normal two. It is relatively unstable and releases its third oxygen atom readily, so it oxidizes or burns things more readily and at much lower concentrations than normal oxygen. It is very active chemically, and has a short average lifetime in the air.

Hence, the correct option is (3).

45. The organization which published the Red List of species is :

- | | |
|-----------|----------|
| (1) ICFRE | (2) IUCN |
| (3) UNEP | (4) WWF |

Solution:

Founded in 1948, IUCN or World Conservation Union encourages the preservation of natural environment and wildlife. The IUCN Red List or Red Data List, was created in 1963. It is the world's most comprehensive inventory of global conservation status of biological species and has many uses in conservation including

Hence, the correct option is (2).

46. Select the Taxon mentioned that represents both marine and fresh water species:

- | | |
|---------------------|----------------|
| (1) Echinoderms | (2) Ctenophroa |
| (3) Cephalocoradata | (4) Cnidaria |

Solution:

The phylum Coelenterata, sometimes called Cnidaria, includes about 9000 species of jellyfish, hydras, sea anemones, sea fans and corals. There are thousands of cnidarian species, and most are marine except a few, example, *Hydra* are fresh water cnidarian.

All species belonging to Echinodermata are marine animals that live on the sea floor. Ctenophores commonly known as sea walnuts or comb jellies are gelatinous marine animals. Cephalochordata are exclusively marine and are considered to be primitive and are also known as protochordates.

Hence, the correct option is (4).

47. Which one of the following living organisms completely lacks a cell wall?

- (1) *Cyanobacteria* (2) Sea- fan (*Gorgonia*)
(3) *Saccharomyces* (4) Blue- green algae

Solution:

Sea fan (*Gorgonia*) is an animal belonging to the phylum Coelenterata. The cells of this animal lack cellulosic cell wall unlike other animal of this phylum.

Cyanobacteria, *Saccharomyces* (fungus) and blue-green algae have cell wall.

Hence, the correct option is (2).

48. *Planaria* possesses high capacity of:

- (1) metamorphosis (2) regeneration
(3) alternation of generation (4) bioluminescence

Solution:

If an individual is divided into two or more parts, each part can regenerate into a new individual. This type of asexual reproduction is called regeneration. It is commonly observed in some flatworms like *Planaria*, sponges and in Cnidarians.

Hence, the correct option is (2).

49. A marine cartilaginous fish that can produce electric current is:

- (1) *Pristis* (2) *Torpedo*
(3) *Trygon* (4) *Scoliodon*

Solution:

Torpedo is a marine, cartilaginous fish. It has an electric organ between the eyes and pectoral fins. This electric organ can give electric shocks. Hence, this fish is called an electric ray.

Hence, the correct option is (2).

50. Choose the correctly matched pair:

- (1) Tendon-Specialized connective tissue
(2) Adipose tissue-Dense connective tissue
(3) Areolar tissue- Loose connective tissue
(4) Cartilage-Loose connective tissue

Solution:

The cells and fibers of loose connective tissues are loosely arranged in a ground substance which is semi-fluid. The types of loose connective tissues are areolar connective tissue, adipose tissue and reticular connective tissue.

Dense connective tissues contain more fibres and fibroblasts, which are thicker and more densely packed. There are two types: dense regular connective tissue (white fibrous and yellow elastic connective tissues) and dense irregular connective tissue. The three specialized connective tissues are cartilage, bone and blood.

Hence, the correct option is (3).

51. Choose the correctly matched pair:

- (1) Inner lining of salivary ducts- Ciliated epithelium

- (2) Moist surface of buccal cavity- Glandular epithelium
- (3) Tubular parts of nephrons- Cuboidal epithelium
- (4) Inner surface of bronchioles- Squamous epithelium

Solution:

Tubular parts of nephrons in kidneys and inner lining of smaller ducts of many glands like salivary are lined by simple cuboidal epithelium. Buccal cavity is lined by stratified squamous epithelium. Bronchioles (small tubes) of respiratory tract are lined by simple ciliated epithelium.

Hence, the correct option is (3).

52. In 'S' phase of the cell cycle:

- (1) amount of DNA doubles in each cell.
- (2) amount of DNA remains same in each cell.
- (3) chromosome number is increased
- (4) amount of DNA is reduced to half in each cell

Solution:

During the S stage of interphase, the DNA of the cell is replicated in the nucleus in preparation for cell division and its amount doubles. The chromosome number, however, remains the same. The cell synthesizes the additional histones that will be needed as the cell doubles the number of nucleosomes (repeating subunits of DNA and histones) in its chromosomes. The centriole present in the cytoplasm also duplicates.

Hence, the correct option is (1).

53. The motile bacteria are able to move by:

- (1) fimbriae
- (2) flagella
- (3) cilia
- (4) pili

Solution:

One of the appendages used by bacteria for movement is the flagella (singular: flagellum, means whip in Latin). These are long, thin, helical appendages, which could be single or multiple in number. Hence, bacteria are motile or non-motile depending upon the presence or absence of flagella.

Hence, the correct option is (2).

54. Select the option which is not correct with respect to enzyme action:

- (1) Substrate binds with enzyme at its active site.
- (2) Addition of lot of succinate does not reverse the inhibition of succinic dehydrogenase by malonate
- (3) A non- competitive inhibitor binds the enzyme at a site distinct from that which binds the substrate
- (4) Malonate is a competitive inhibitor of succinic dehydrogenase

Solution:

Enzymes are highly specific. Each particular enzyme binds only to specific substrates at its active site.

Non-competitive inhibitors do not compete with the substrate for the same binding site of the enzyme; rather, the inhibitor binds to a site other than the enzyme's active site.

Malonate is a competitive inhibitor of succinate dehydrogenase, an enzyme that converts succinate to fumarate. Malonate structurally resembles succinate but cannot be dehydrogenated. Such inhibition is overcome by addition of lot of succinate.

Hence, the correct option is (2).

55. Which one of the following is a non-reducing carbohydrate?

- (1) Maltose
- (2) Sucrose
- (3) Lactose
- (4) Ribose 5-phosphate

Solution:

Sucrose is commonly known as table sugar. It is a non-reducing sugar made up of glucose and fructose. The formula for sucrose is $C_{12}H_{22}O_{11}$, not $C_{12}H_{24}O_{12}$, because a molecule of water is removed as the two monosaccharides are joined. It is found in free-state in many fruits.

Hence, the correct option is (2).

56. The enzyme recombinase is required at which stage of meiosis:

- (1) Pachytene
- (2) Zygotene
- (3) Diplotene
- (4) Diakinesis

Solution:

With the end of synapsis, the zygotene phase ends and the next stage of prophase I, called pachytene begins. This stage is characterized by a fully formed synaptonemal complex. During pachytene, the homologues are held closely together along their length by the SC. The DNA of sister chromatids is extended into parallel loops. Under the electron microscope, within the center of the SC, a number of electron-dense bodies about 100 nm in diameter are seen. These structures are called recombination nodules because they correspond to the sites where crossing over is taking place between non-sister chromatids of the homologous chromosomes. Recombination nodules contain the enzyme recombinase that facilitates genetic recombination.

Hence, the correct option is (1).

57. The initial step in the digestion of milk in human is carried out by?

- (1) Lipase
- (2) Trypsin
- (3) Rennin
- (4) Pepsin

Solution:

In stomach, prorennin gets activated to rennin in the presence of HCl and hydrolyses the soluble milk protein calcium casein as insoluble milk protein calcium paracaseinate, forming soluble curd or coagulated milk. This is the first step in the digestion of milk.

Hence, the correct option is (3).

58. Fructose is absorbed into the blood through mucosa cells of intestine by the process called:

- (1) active transport
- (2) facilitated transport
- (3) simple diffusion
- (4) co-transport mechanism

Solution:

Monosaccharides pass from the lumen through the apical membrane via facilitated transport which occurs against the concentration gradient. Fructose, a monosaccharide found in fruits, is transported via facilitated transport. Its transport involves a carrier protein and carries fructose without utilization of ATP.

Hence, the correct option is (2).

59. Approximately seventy percent of carbon-dioxide absorbed by the blood will be transported to the lungs:

- (1) as bicarbonate ions
- (2) in the form of dissolved gas molecules
- (3) by binding to R.B.C.
- (4) as carbamino-haemoglobin

Solution:

The greatest percentage of CO₂—about 70 per cent—is transported in blood plasma as bicarbonate ions (HCO₃⁻). As CO₂ diffuses into systemic capillaries and enters red blood cells, it reacts with water in the presence of the enzyme carbonic anhydrase (CA) to form carbonic acid, which dissociates into H⁺ and HCO₃⁻.

Hence, the correct option is (1).

60. Person with blood group AB is considered as universal recipient because he has:

- (1) both A and B antigens on RBC but no antibodies in the plasma.
- (2) both A and B antibodies in the plasma.
- (3) no antigen on RBC and no antibody in the plasma
- (4) both A and B antigens in the plasma but no antibodies

Solution:

People with type AB blood do not have anti-A or anti-B antibodies in their blood plasma and have no antigen on the red blood cells. Thus, they are sometimes called as universal recipients because theoretically they can receive blood from donors of all four blood types A, B, O or AB. People with blood group O are considered universal donors.

Hence, the correct option is (3).

61. How do parasympathetic neural signals affect the working of the heart?

- (1) Reduce both heart rate and cardiac output
- (2) Heart rate is increased without affecting the cardiac output.
- (3) Both heart rate and cardiac output increase
- (4) Heart rate decreases but cardiac output increases.

Solution:

Neural system regulation of the heart rate originates in the cardiovascular center in the medulla oblongata. This region of the brain stem receives input from a variety of sensory receptors and from higher brain centers, such as the limbic system and cerebral cortex. The cardiovascular center then directs appropriate output by increasing or decreasing the frequency of nerve impulses in both the sympathetic and parasympathetic branches of the autonomic neural system. Parasympathetic nerve impulses reach the heart via the right and left vagus nerves. They release acetylcholine, which decreases heart rate by slowing the rate of spontaneous depolarization in autorhythmic fibers.

Hence, the correct option is (1).

62. Which of the following causes an increase in sodium reabsorption in distal convoluted tubule?

- (1) Increase in aldosterone levels
- (2) Decrease in antidiuretic hormone levels
- (3) Decrease in aldosterone levels
- (4) Decrease in antidiuretic hormone levels

Solution:

When glomerular blood flow, glomerular blood pressure or GFR decrease, the walls of the afferent arterioles are stretched less and the juxta glomerular (JG) cells secrete the enzyme renin. Renin converts angiotensinogen to angiotensin I; angiotensin-converting enzyme (ACE) further converts angiotensin I to angiotensin II. It stimulates the adrenal cortex to release aldosterone. It in turn stimulates the principal cells in the collecting ducts to reabsorb more Na^+ and Cl^- and secrete more K^+ . The osmotic consequence of reabsorbing more Na^+ and Cl^- is that more water is reabsorbed, which causes an increase in blood volume, blood pressure and GFR. This mechanism is called renin-angiotensin mechanism.

Hence, the correct option is (1).

63. Select the correct matching of the types of the joint with the example in human skeletal system:

	Types of joints	Examples
(1)	Cartilaginous joint	between frontal and parietal
(2)	Pivot joint	between third and fourth cervical vertebrae
(3)	Hinge joint	between humerus and pectoral girdle
(4)	Gliding joint	between carpals

Solution:

The articulating surfaces of bones in a gliding joint are flat or slightly curved. They primarily permit back-and-forth and side-to-side movements between the flat surfaces of bones, but they may also rotate against one another. For example, the inter-carpal joints, inter-tarsal joints, sterno-clavicular joints and acromio-clavicular joints.

A cartilaginous joint lacks a synovial cavity and allows little or no movement, for example, the epiphyseal plate and the pubic symphysis.

In a pivot joint, the rounded or pointed surface of one bone articulates with a ring formed partly by another bone and partly by a ligament, for example, the atlanto-axial joint and the radio-ulnar joint.

In a hinge joint, the convex surface of one bone fits into the concave surface of another bone, for example, knee, elbow, ankle and interphalangeal joints.

Hence, the correct option is (4).

64. Stimulation of a muscle fiber by a motor neuron occurs at:

- (1) the neuromuscular junction
- (2) the transverse tubules
- (3) the myofibril
- (4) the sarcoplasmic reticulum

Solution:

The site of communication between two neurons or between a neuron and an effector cell is called a synapse. The tips of some axon terminals swell into bulb-shaped structures called synaptic end bulbs or synaptic knobs. The synaptic end bulbs contain many tiny membrane-enclosed sacs called synaptic vesicles that store a chemical called a neurotransmitter. The nerve impulses are transmitted away from the cell body to a synapse or a neuromuscular junction by the axon. The region of the sarcolemma opposite the synaptic end bulbs, called the motor end plate containing millions of acetylcholine (a neurotransmitter) receptors.

Hence, the correct option is (1).

65. Injury localized to the hypothalamus would most likely disrupt:

- (1) short- term memory
- (2) coordination during locomotion
- (3) executive functions, such as decision making.
- (4) regulation of body temperature

Solution:

Hypothalamus regulates autonomic nervous system, production of hormones, emotional and behavioral patterns, drinking and eating of food, body temperature and circadian rhythms and states of consciousness. Short term memory and decision making is regulated by cerebrum. Cerebellum regulates posture and balances the body during locomotion.

Hence, the correct option is (4).

66. Which one of the following statements is not correct?

- (1) Retinal is the light absorbing portion of visual photo pigments.
- (2) In retina the rods have the photopigments rhodopsin while cones have three different photopigments.
- (3) Retinal is a derivative of Vitamin C.
- (4) Rhodopsin is the purplish red protein present in rods only.

Solution:

Retinal is a derivative of vitamin A called retinal. Vitamin A derivatives are formed from carotene, the plant pigment that gives carrots their orange color. Good vision depends on adequate dietary intake of carotene-rich vegetables such as carrots, spinach, broccoli or foods that contain vitamin A, such as liver.

Hence, the correct option is (3).

67. Identify the hormone with its correct matching of source and function:

- (1) Oxytocin- posterior pituitary, growth and maintenance of mammary glands.
- (2) Melatonin- pineal gland, regulates the normal rhythm of sleepwake cycle.
- (3) Progesterone- corpus-luteum, stimulation of growth and activities of female secondary sex organs.
- (4) atrial natriuretic factor- ventricular wall increases the blood pressure

Solution:

The pineal gland secretes melatonin, an amine hormone derived from tryptophan. Melatonin appears to contribute to the setting of the body's biological clock, which is controlled by the suprachiasmatic nucleus of the hypothalamus. It also helps maintain body temperature and sleep-wake cycle.

Oxytocin is released by posterior pituitary gland. After delivery, it stimulates milk ejection from the mammary glands in response to the mechanical stimulus.

Progesterone, secreted mainly by cells of the corpus luteum, cooperates with estrogens to prepare and maintain the endometrium for implantation of a fertilized ovum and to prepare the mammary glands for milk secretion by stimulating the formation of alveoli.

Atrial natriuretic factor (ANF) is a peptide hormone released by cells of the atria and heart on receiving signals as a result of high blood pressure.

Hence, the correct option is (2).

68. Fight- or- flight reaction cause activation of:

- (1) the parathyroid glands, leading to increased metabolic rate.
- (2) the kidney, leading to suppression of renin-angiotensin-aldosterone pathway.
- (3) the adrenal medulla, leading to increased secretion of epinephrine and norepinephrine
- (4) the pancreas leading to a reduction in the blood sugar levels.

Solution:

Sympatheticoadrenal system is formed by the sympathetic neural system and adrenal medulla which work together as an integrated system, in close association with each other to provide more energy for the body during times of stress. The sympathetic nerves stimulate the adrenal medulla to secrete hormones. Adrenal medulla releases emergency hormones or “Flight or Fight hormones” (catecholamines) in response to stress. Catecholamines [e.g. epinephrine (adrenalin) and norepinephrine (noradrenalin)] so released, function to enhance heart beat and rate of respiration rate, glycogen breakdown to release more glucose and thus, energy.

Hence, the correct option is (3).

69. The shared terminal duct of the reproductive and urinary system in the human male is:

- (1) Urethra
- (2) Ureter
- (3) Vas deferens
- (4) Vasa efferentia

Solution:

In males, the urethra is the shared terminal duct of the reproductive and excretory systems. The ejaculatory duct opens into the urethra, it serves as a passageway for both semen and urine.

Hence, the correct option is (1).

70. The main function of mammalian corpus luteum is to produce:

- (1) estrogen only
- (2) progesterone
- (3) human chorionic gonadotropin
- (4) relaxin only

Solution:

A corpus luteum (yellow body) contains the remnants of a mature follicle after ovulation (i.e., luteum cells, fibrin and blood clot). The corpus luteum produces progesterone, estrogens, relaxin and inhibin until it degenerates into fibrous scar tissue called the corpus albicans (white body).

Hence, the correct option is (2).

71. Select the correct option describing gonadotropin activity in a normal pregnant female:

- (1) High level of FSH and LH stimulates the thickening of endometrium
- (2) High level of FSH and LH facilitate implantation of the embryo.
- (3) high level of hCG stimulates the synthesise of estrogen and progesterone
- (4) High level of hCG stimulates the thickening of endometrium

Solution:

The chorion secretes human chorionic gonadotropin (hCG) into the blood. In turn, hCG stimulates the corpus luteum to continue production of progesterone and estrogens—an activity required to prevent menstruation and for the continued attachment of the embryo and foetus to the lining of the uterus. By the eighth day after fertilization, hCG can be detected in the blood and urine of a pregnant woman. Peak secretion of hCG occurs at about the ninth week of pregnancy.

Hence, the correct option is (3).

72. Tubectomy is method of sterilization in which:

- (1) small part of the fallopian tube is removed or tied up.
- (2) ovaries are removed surgically
- (3) small part of vas deferens is removed or tied up.
- (4) uterus is removed surgically

Solution:

Sterilization in females most often is achieved by performing a tubal ligation, in which both fallopian tubes are tied closed and then cut. This process is called tubectomy. This can be achieved in a few different ways. “Clips” or “clamps” can be placed on the fallopian tubes, the tubes can be tied and/or cut, and sometimes they are cauterized (sealed by burning or freezing).

Hence, the correct option is (1).

73. Which of the following is a hormone releasing intra Uterine Device (IUD)?

- (1) Multiload 375 (2) LNG- 20
 (3) Cervical cap (4) Vault

Solution:

Intra uterine device (IUD) are small objects made of plastic, copper, or stainless steel inserted into the cavity of the uterus through vagina to prevent sperm from entering the fallopian tubes and enhance phagocytosis of the sperms. The IUDs can be non-medicated such as Lippes loop, copper-releasing such as CuT, Cu7, Multiload 375 and hormone releasing such as Progestasert, LNG-20, etc.

Hence, the correct option is (2).

74. Assisted reproductive technology, IVF involves transfer of:

- (1) Ovum into the fallopian tube.
 (2) Zygote into the fallopian tube.
 (3) Zygote into the uterus
 (4) Embryo with 16 blastomeres into the fallopian tube

Solution:

In vitro fertilization (IVF) means fertilization outside of the body of woman in which similar conditions as that of the body are provided. This technique is also known as test tube baby programme. It is followed by embryo transfer (ET) in the fallopian tube. It is the most common form of assisted reproductive technology.

Hence, the correct option is (2).

75. A man whose father was colour blind marries a woman who had a colour blind mother and normal father.

What percentage of male children of this couple will be colour blind?

- (1) 25% (2) 0%
 (3) 50% (4) 75%

Solution:

The man's father was colourblind, and he has got normal vision as he has got y chromosome from his father and X from his mother. His wife's mother was colourblind and father was normal. She must be carrier of the trait. Their cross will produce:

X^cX Female (Normal & Carrier) XY Male (Normal eyed)

♀	♂	X	Y
X^c		X^cX	X^cY
X		X^cX	XY

Thus, 50% of their male children will be colorblind of this couple.

Hence, the correct option is (3).

76. In a population of 1000 individuals 360 belong to genotype AA, 480 to Aa and the remaining 160 to aa, Based on this data, the frequency of allele A in the population is:

- (1) 0.4 (2) 0.5
 (3) 0.6 (4) 0.7

Solution:

In a population of 1000:

AA: 260

Aa: 480

Aa: 160

$$\text{Frequency of allele } a = \frac{480 + 160}{1000} = \frac{640}{1000} \\ = 0.64$$

Hence, the correct option is (3).

77. A human female with Turner's syndrome:

- (1) has 45 chromosomes with XO
- (2) has one additional X chromosome.
- (3) exhibits male characters
- (4) is able to produce children with normal husband

Solution:

Monosomy occurs when one chromosome is missing in an otherwise diploid individual. In human beings, there is only one viable monosomic, the 45, X karyotype. If an O gamete (no X) from the mother fuses with a Y gamete, the resulting OY zygote is nonviable and fails to develop further. If, on the other hand, an O gamete from either the mother or the father fuses with an X gamete to form an XO zygote, the resulting zygote has only one X chromosome and no second sex chromosome (denoted as XO) develops into a female with Turner syndrome.

Hence, the correct option is (1).

78. Select the correct option:

	Direction of RNA synthesis	Direction of reading of the template DNA strand
(1)	5'-3'	3'-5'
(2)	3'-5'	5'-3'
(3)	5'-3'	5'-3'
(4)	3'-5'	3'-5'

Solution:

The process by which RNA is synthesized from its DNA template is known as transcription. The template DNA strand has polarity 3' → 5'. It serves as a template for the synthesis of RNA. RNA polymerase synthesizes RNA only in 5' → 3' direction.

Hence, the correct option is (1).

79. Commonly used vectors for human genome sequencing are:

- (1) T- DNA
- (2) BAC and YAC
- (3) Expression Vectors
- (4) T/A Cloning Vectors

Solution:

Bacterial Artificial Chromosomes (BAC) vectors are vectors which are based on fertility plasmid of bacteria. These are used for mapping of large eukaryotic genome. They can accommodate large DNA fragments of size 300–350 kb.

Yeast Artificial Chromosomes (YAC) vectors resembles a natural chromosome. They have telomere at each end, autonomously replicating sequence (origin of replication) and a centromere. These are used for the cloning of DNA fragments of size more than 106 bp in size.

Hence, the correct option is (2).

80. Forelimbs of cat, lizard used in walking; forelimbs of whale used in swimming and forelimbs of bats used in flying are an example of:

- (1) Analogous organs
- (2) Adaptive radiation
- (3) Homologous organs
- (4) Convergent evolution

Solution:

Homologous structures are those which have the same basic structure and developmental origin, but different functions and appearance. The various classes of organisms, such as birds, mammals and amphibians, exhibit similar basic anatomical plan of bones (and also brain, heart, nerves, etc.) although these bones function differently among the classes. For example, the forelimbs of cat, lizard used in walking, forelimbs of whale used in swimming and forelimb of bats used in flying are made up of similar bones.

Hence, the correct option is (3).

81. Which one of the following are analogous structures?

- (1) Wings of Bat and Wings of Pigeon
- (2) Gills of Prawn and Lungs of Man
- (3) Thorns of Bougainvillea and Tendrils of Cucurbita
- (4) Flippers of Dolphin and legs of Horse

Solution:

If the structures in organisms are similar and carry out similar functions but do not have same embryological origin or similar anatomy, they are known as analogous structures. For example, the wings of bats and pigeon are analogous structures. Though they perform similar function, they have different structures.

Hence, the correct option is (1).

82. Which is the particular type of drug that is obtained from the plants whose one flowering branch is shown below?



- (1) Hallucinogen
- (2) Depressant
- (3) Stimulant
- (4) Pain- Killer

Solution:

The branch of the plant given above is of Datura. It is a source of psychoactive compound which causes hallucinations. It acts by altering the way users perceive time, movement, colors and sound. It also disrupts the thinking ability, leading to abnormal behavior.

Hence, the correct option is (1).

83. At which stage of HIV infection does one usually show symptoms of AIDS?

- (1) Within 15 days of sexual contact with an infected person.
- (2) When the infected retrovirus enters host cells.
- (3) When HIV damages large number of helper T- Lymphocytes.
- (4) When the viral DNA is produced by reverse transcriptase

Solution:

After a period of 2 to 10 years, HIV destroys enough helper T cells that most infected people begin to experience symptoms of immunodeficiency. AIDS related complex (ARC) refers to the initial form of AIDS. The infected people commonly have enlarged lymph nodes and experience persistent fatigue, involuntary weight loss, night sweats, skin rashes, diarrhoea and various lesions of the mouth and gums. Besides, the virus can also infect neurons in the brain, affecting the person's memory and vision.

Hence, the correct option is (3).

84. To obtain virus- free healthy plants from a diseased one by tissue culture technique, which part/parts of the diseased plant will be taken?

- (1) Apical meristem only
- (2) Palisade parenchyma

(3) Both apical and axillary meristems

(4) Epidermis only

Solution:

Meristems are regions of active cell division in plants. The meristems found at the shoot and root tips are called apical meristems while those that form in the axils of leaf primordia, giving rise to branches and flowers are called axillary meristems. They are selected by using microscopy and cultured on a suitable medium to obtain disease free plant.

Hence, the correct option is (3).

85. What gases are produced in anaerobic sludge digesters?

(1) Methane and CO₂

(2) Methane, Hydrogen Sulphide and CO₂

(3) Methane, Hydrogen Sulphide and CO₂

(4) Hydrogen Sulphide and CO

Solution:

The effluent from primary treatment is constantly agitated, aerated and added to solid material remaining from earlier water treatment. This is known as sludge. The sludge so formed is then pumped into sludge digesters where anaerobic bacteria partially digest the sludge to simple organic molecules and the gases carbon dioxide, hydrogen sulphide and methane. These gases produce biogas which can be used as a source of energy to run the sludge digester.

Hence, the correct option is (2).

86. Just as a person moving from Delhi to Shimla to escape the heat for the duration of hot summer, thousands of migratory birds from Siberia and other extremely cold northern regions move to:

(1) Western Ghat

(2) Meghalaya

(3) Corbett National Park

(4) Keoladeo National Park

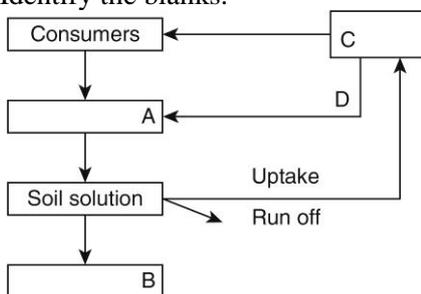
Solution:

Organisms can move away temporarily from the stressful habitat to a favorable habitat and return with the onset of favorable conditions in their original habitat. The migration of animals to places of optimum temperature range to escape from the extremes of temperature is called thermal migration. Siberian birds migrate from Siberia during winter to Keoladeo National Park located in Bharatpur, Rajasthan, India. This is a mechanism of escape in space.

Hence, the correct option is (4).

87. Given below is a simplified model of phosphorus cycling in a terrestrial ecosystem with four blanks (A-D).

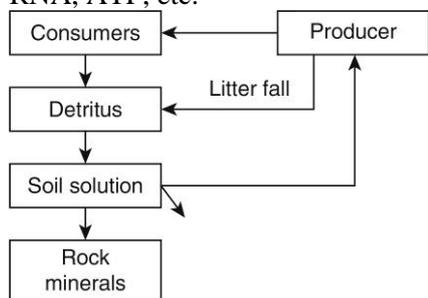
Identify the blanks.



- | | A | B | C | D |
|-----|---------------|---------------|---------------|-------------|
| (1) | Rock minerals | Detritus | Litter fall | Producers |
| (2) | Litter fall | Producers | Rock minerals | Detritus |
| (3) | Detritus | Rock minerals | Producers | Litter fall |
| (4) | Producers | Litter fall | Rock minerals | Detritus |

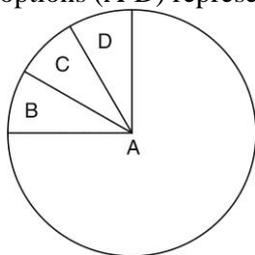
Solution:

Phosphorus cycle is also called imperfect cycle because phosphorus remains in the relatively inactive and immobile state in the Earth's crust and any disturbance can disturb it. Phosphorus that enters the nutrient cycles in ecosystems has to come from rocks. Plants absorb phosphorus from the soil in the form of hydrogenated phosphates. Herbivorous animals derive phosphorus from plants. Carnivores, however, obtain phosphorus from the animals that they feed on. Decomposers such as phosphate solubilizing bacteria return phosphorus to the soil in the form of phosphates. This phosphate is released from molecules such as DNA, RNA, ATP, etc.



Hence, the correct option is (3).

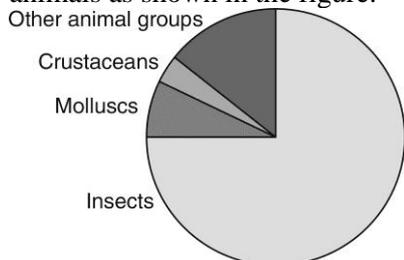
88. Given below is the representation of the extent of global diversity of invertebrates. What groups the four options (A-D) represent respectively?



- | | | | | |
|-----|-------------|---------------------|---------------------|---------------------|
| | A | B | C | D |
| (1) | Insects | Crustaceans | Other animals group | Molluscs |
| (2) | Crustaceans | Insects | Molluscs | Other animals group |
| (3) | Molluscs | Other animals group | Crustaceans | Litter fall |
| (4) | Insects | Molluscs | Crustaceans | Other animals group |

Solution:

In invertebrates, 70% of the population is of insects, and the rest contains molluscs, crustaceans and other animals as shown in the figure.



Hence, the correct option is (4).

89. A scrubber in the exhaust of a chemical industrial plant removes:

- (1) Gases like sulphur dioxide
- (2) Particulate matter of the size 5 micrometer or above
- (3) Gases like ozone and methane
- (4) Particulate matter of the size 2.5 micrometer or less

