

**Solution**  
**BIOLOGY**  
**Class 12 - Biology**  
**Section A**

1. Select and write the correct answer:

- (i) (c) mechanical  
**Explanation:** {  
mechanical
- (ii) (c) Abscisic acid  
**Explanation:** {  
Abscisic acid
- (iii) (b) 4 to 8  
**Explanation:** {  
4 to 8
- (iv) (b) Thromboplastin → Prothrombinase → Prothrombin → Thrombin  
**Explanation:** {  
Thromboplastin → Prothrombinase → Prothrombin → Thrombin
- (v) (c) Corpus callosum  
**Explanation:** {  
Corpus callosum
- (vi) (d) zonation  
**Explanation:** {  
zonation
- (vii) (d) velamen  
**Explanation:** {  
velamen
- (viii) (c) mutualism  
**Explanation:** {  
mutualism
- (ix) (c) Azotobacter  
**Explanation:** {  
Azotobacter
- (x) (c) AIDS  
**Explanation:** {  
AIDS

2. Answer the following:

- (i) In a dissimilar pair of factors, one member of the pair dominates (i.e. dominant) over the other (i.e. recessive).  
The law of dominance is used to explain the expression of only one of the parental characters of a monohybrid cross in  $F_1$  generation.
- (ii) Calcitriol is produced by the kidneys.
- (iii) Protandry is a type of dichogamy in which anthers mature first, but the stigma of the same flower is not receptive at that time. e.g. in the disc florets of sunflower.
- (iv) The passive absorption of solutes when mediated by a carrier it is called as facilitated diffusion.
- (v) Leaching is a step in the process of decomposition in which water soluble inorganic nutrients percolate into the soil horizon and get precipitated as unavailable salts.
- (vi) IAA: Indole-3-acetic acid
- (vii) Amphimixis or sexual reproduction is the process which involves the production of offspring by the formation and fusion of gametes.
- (viii) Splicing is the process that removes introns from RNA.

## Section B

3. Answer the following:

- (i) The cross between  $F_1$  hybrid and its homozygous recessive parent is called as test cross.
- (ii) i. Autosomal dominant traits: Widow's peak and Huntington's disease  
ii. Autosomal recessive traits: Phenylketonuria (PKU), Cystic fibrosis and Sickle cell anaemia.

4. The importance of palaeontology (study of fossils) is as follows:

- i. It is useful in reconstruction of phylogeny.
  - ii. It helps in studying various forms and structures of extinct animals.
  - iii. It provides record of missing link between two groups of organisms.
  - iv. It helps in the study of habits of extinct organisms.
  - v. Connecting links can be identified by palaeontology which can provide evidence for organic evolution.
5. i. Segments labelled as *A* and *B* in the given diagram are as follows:

**A:** P wave.

**B:** RR interval

- ii. **T-wave:** T-wave is a small, wide and upwardly elevated wave. It is dome shaped. It represents the ventricular repolarization.

6. Lac is a complex substance having large amount of resin together with sugar, water, minerals and alkaline substances.

**Economic importance:**

- i. Products of lac play a vital role in the economy of the farmers.
  - ii. Lac is used in bangles, toys, woodwork, inks, mirrors, etc.
  - iii. Production of lac requires an artificial inoculation of plants which give better and regular supply of good quality and quantity of lac.
7. i. Connecting links are fossil forms, transitional or intermediate between two groups of organisms. They show some characters akin to both the groups.
- ii. Archaeopteryx lithographica is fossilized crow size, toothed bird found from Jurassic rocks in Germany. It is known as missing link between reptiles and birds because it shows characters of both.

8. Answer the following:

- (i) **Endangered (EN):** A designation applied to species that possess a very high risk of extinction as a result of rapid population decline of 50 to more than 70 percent over the previous 10 years (or three generations).
- (ii) The trapping of the reflected heat radiations of the sun, by the atmospheric gases is called the greenhouse effect.

9. i. 'Melt in the mouth' vaccines come under the category of edible vaccines.
- ii. 'Melt in the mouth' vaccines can be administered by placing them under tongue that delivers it into the blood stream.
  - iii. The benefit of such vaccines is the comfort of administration, low cost and ease of storage.
10. i. Cytokinins promote cell division. It also promotes cell enlargement.
- ii. Cytokinin and auxin ratio and their interactions control morphogenic differentiation.
  - iii. A low ratio of cytokinin to auxin induces root development, but a high ratio causes buds and shoot development.
  - iv. Cytokinin reverses apical dominance effect. It promotes the growth of lateral buds and controls apical dominance by cell division.
  - v. It delays the senescence or; ageing and abscission processes in plant organs. This was reported by Richmond and Lang (1957).
  - vi. Cytokinins induce formation of interfascicular cambium and expansion of cells.
  - vii. It also breaks dormancy and promotes the germination of seeds.
  - viii. It induces RNA synthesis.

[Note: Cytokinins induces rRNA transcription.]

11. Increase in atmospheric concentration of greenhouse gases, has resulted in the heating of Earth or rise in the temperature. During past century, the temperature of the Earth has increased by  $0.6^{\circ}\text{C}$ , most of it during last three decades. Hence, global warming is caused by greenhouse effect.

12. The hormones released by the neurohypophysis are vasopressin and oxytocin.

i. **ADH: Anti Diuretic Hormone (ADH) or Vasopressin.**

**Functions:** It increases reabsorption of water in distal convoluted tubules and collecting ducts of kidney tubules.

It regulates the balance of body fluids by reducing the output of urine.

It increases blood pressure by causing vasoconstriction.

ii. **Oxytocin:**

**Functions:** It stimulates contraction of uterus during parturition. It stimulates ejection or release of milk thus, it is also known

as birth hormone or milk ejecting hormone.

13. Significance of Transpiration:

- i. It removes excess of water.
  - ii. It helps in the passive absorption of water and minerals from soil.
  - iii. It helps in the ascent of sap.
  - iv. As stomata are open, gaseous exchange required for photosynthesis and respiration is facilitated.
  - v. It maintains turgor of the cells.
  - vi. Transpiration helps in reducing the temperature of leaf and in imparting cooling effect.
14. The nucleosome core is an octamer made up of two molecules of each of four types of histone proteins viz. H2A, H2B, H3 and H4. Histone protein H1 binds the DNA thread where it enters (arrives) and leaves the nucleosome.

**Section C**

15. Following are the characteristics of Neanderthal man:

- i. They were advance prehistoric man.
- ii. Their fossils were collected from Neanderthal valley, Germany.
- iii. They existed in late Pleistocene epoch about 100000 to 400000 years ago.
- iv. Cranial capacity of Neanderthal Man was 1400 cc.
- v. These were short and had heavy built.
- vi. They had short prominent brow ridges, the skull bones were thick, forehead was low and slanting, the jaw was deeper than that of modern man with no chin. They had outwardly curved thigh bones
- vii. They were quite intelligent to use and construct flint tools.
- viii. They buried their dead bodies.

16. Answer the following:

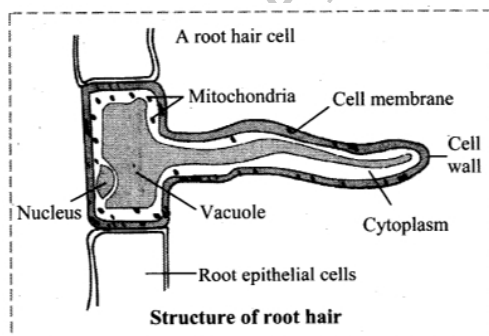
- (i) **Microsporogenesis** is a process in which each microspore mother cell divides meiotically to form tetrad of haploid microspores (pollen grains).

**OR**

The process of formation of microspores from diploid microspore mother cell through meiotic cell division inside the microsporangia or pollen sacs is called microsporogenesis.

- (ii) Adaptations in entomophilous flowers:

- a. They are large, showy and often brightly coloured
  - b. The flowers produce sweet odour (smell) and have nectar glands.
  - c. The stigma is rough due to presence of hair or is sticky due to mucilaginous secretion.
  - d. The pollen grains are spiny and surrounded by a yellow sticky substance called pollenkitt.
17. i. Water has high specific heat, high heat of vaporization and high heat of fusion. Due to this, it acts as thermal buffer.
- ii.



- a. Root hair is cytoplasmic extension (prolongation) of epiblema cell.
  - b. Each root hair may be approximately 1 to 10 mm long and tube like structure.
  - c. It is colourless, unbranched, short-lived (ephemeral) and very delicate.
  - d. It has a large central vacuole surrounded by thin film of cytoplasm, plasma membrane and thin cell wall, which is two layered.
  - e. Outer layer is composed of pectin and inner layer is made up of cellulose.
  - f. Cell wall of a root hair is freely permeable but plasma membrane is selectively permeable.
18. i. **Opioids** bind to opioid receptors present in central nervous system and gastro-intestinal tract.
- ii. **Heroin (diacetyl morphine)** is a depressant and slows down the activity of body.

iii. **Cannabinoids** interact with receptors present in brain. Inhalation and ingestion of these substances affect the cardiovascular system.

19. Answer the following:

- (i) Emigration is the number of individuals of the population who left the habitat during the time period.
- (ii) i. Lichen: Mutualism  
ii. A protozoan living in the digestive tract of a flea living on a dog: Parasitism

20. **Advantages of Single Cell Protein:**

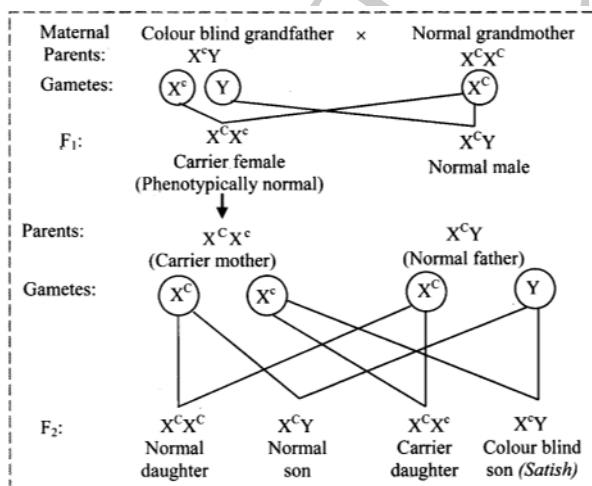
- i. Microorganisms have a high rate of multiplication that means a large quantity of biomass can be produced in a comparatively short duration.
  - ii. The microbes can be easily genetically modified to vary the amino acid composition. They have high protein contents- 43% to 85% (W/W basis).
  - iii. A broad variety of raw materials, including waste materials, can be used as a substrate for SCP. This also helps in decreasing the number of pollutants.
  - iv. SCP serves as a good source of vitamins, amino acids, minerals, crude fibres, etc.
  - v. The single-cell proteins can be readily used as fodder for achieving fattening of calves, pigs, in breeding fish and even in poultry and cattle farming.
21. i. Ethylene is the only gaseous growth regulator.  
ii. Following are the physiological effects and applications of ethylene:
- a. It promotes ripening of fruits like bananas, apples and mangoes.
  - b. It stimulates initiation of lateral roots in plants and breaks the dormancy of bud and seed.
  - c. It accelerates the abscission activity in leaves, flowers and fruits by forming of abscission layer.
  - d. Ethylene inhibits the growth of lateral buds and causes apical dominance and retards flowering.
  - e. It is associated with the enhancement of process of senescence of plants organs.
  - f. It inhibits flowering in most of the plants except pineapple.
  - g. It causes epinasty (drooping) of leaves and flowers.
  - h. It increases activity of chlorophyllase enzyme causing degreening effect in banana and Citrus fruits.

22. **Criss-cross inheritance:** The inheritance of characters from the father to his grandson through his daughter is called criss-cross inheritance.

Criss-cross inheritance can be explained with the help of two examples: colour blindness and haemophilia.

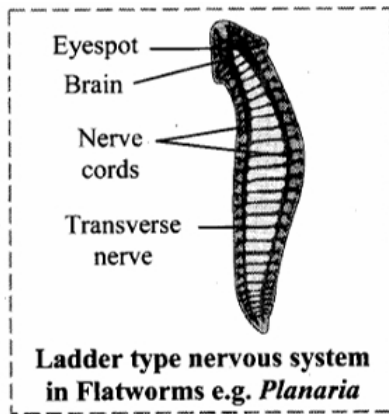
In the given situation, since the father has normal vision, the mother must be a carrier.

Also, as the maternal grandmother has normal vision but the maternal grandfather is colour blind, the mother (Satish's mother) is a carrier.



23. i. Planaria (flatworm) belongs to phylum Platyhelminthes. It is among the most primitive animals which have developed central nervous system (CNS).
- ii. The central nervous system of Planaria consists of cerebral or cephalic ganglion appearing like an inverted *U* shaped brain and ventral nerve cords (VNC) or long nerve cords.
  - iii. Cerebral ganglia lie in the anterior or head region. Each ganglion gives rise to nine branches towards the outer side.
  - iv. A pair of ventral nerve cords arises ventrally from below the ganglia. They are interconnected to each other in a ladder like manner by transverse nerves or commissure.

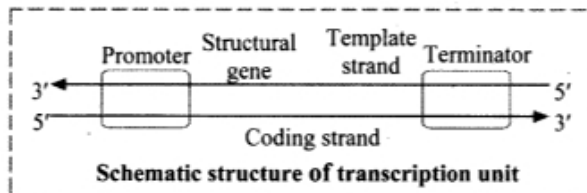
- v. The peripheral nerve plexus arise laterally from ventral nerve cord.
- vi. The peripheral nervous system (PNS) includes sensory cells arranged in lateral cords in the body. Also, single sensory cells are scattered in the body.
- vii. A pair of photosensory structures - eyes is present on the dorsal side of brain.



24. Answer the following:

(i) Cloverleaf structure of tRNA possesses an anticodon loop that has bases complementary to the codon. It is called anticodon.

(ii) **Structure of transcription unit:**



25. **Neutrophils:**

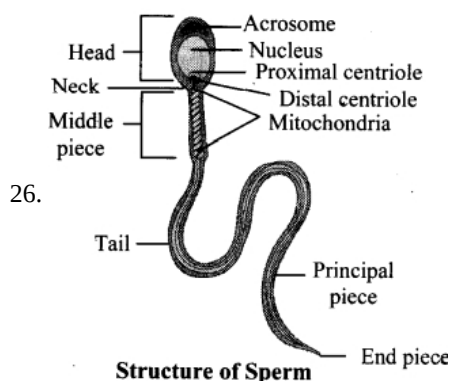
- i. Granules are very fine, large in number, evenly distributed and stained with neutral stains (dyes).
- ii. Neutrophils are about 70% of total WBCs.
- iii. These cells are spherical with multi-lobed nucleus (2-7 lobes).
- iv. They perform amoeboid movements. They destroy pathogens by the process of phagocytosis. 'Pus' is mixture of dead neutrophils, damaged tissues and dead microbes.

**Eosinophils / Acidophils:**

- i. Acidophils contain lysosomal granules that stains red with acidic stains like eosin.
- ii. Eosinophils are about 1 - 3 % of total WBCs.
- iii. Nucleus is bilobed. They destroy antigen antibody complex by phagocytosis. Their number increases in allergic condition and they show antihistaminic property. They are also responsible for detoxification as they produce antitoxins.

**Monocytes:**

- i. Monocytes are the largest of all the WBCs. Its nucleus is large and bean or kidney shaped.
- ii. They form 3-5% of WBCs. Monocytes are actively motile and give rise to macrophages.
- iii. They are mainly phagocytic and destroy the bacteria and dead or damaged tissue by phagocytosis.



**For structure of human sperm:**

**Human sperm:**

Sperm is the male gamete. It is a motile, microscopic and elongated cell.

The sperm is divisible into three parts: Head, middle piece and tail.

a. **Head:** The sperm head is oval in shape and contains haploid nucleus.

Above the nucleus, there is a cap like structure called acrosome which is formed from the Golgi body. Acrosome contains hydrolytic enzymes like hyaluronidase and proteolytic enzymes like zona lysins and corona penetrating enzymes.

b. **Neck:** It is a very short region having two centrioles i.e. proximal centriole and distal centriole.

c. **Middle piece:** It has an axial filament surrounded by 10-14 spiral turns of mitochondria (Nebenkern). It produces energy necessary for the movement of sperm.

d. **Tail:** It is a long, slender and tapering part containing cytoplasm and fine thread i.e. axial filament.

The axial filament arises from the distal centriole and travels throughout the length of tail. It is partly surrounded by plasma membrane (main piece).

The part without plasma membrane is called end piece.

#### Section D

27. Answer the following:

(i) The blind spot is the region of retina where rods and cones are absent.

(ii) i. Calcitonin is secreted when concentration of calcium rises in the blood.

ii. It lowers the concentration of calcium and phosphorus in the plasma by decreasing their release from the bones and accelerating the uptake of calcium and phosphorus by the bones.

(iii) VI : Abducens cranial nerve

VII: Facial cranial nerve

28. **Gastrulation** is the process of formation of 'gastrula' from the blastocyst.

In the gastrula stage, rate of cleavage or divisions slows but there are two important events that take place actively:

i. **Differentiation of blastomeres:** This process results in the formation of three germinal layers i.e. ectoderm, mesoderm and endoderm from the cells of the embryoblast.

ii. **Morphogenetic movements:** These are different types of movements to reach their definite place in the embryo.

**Development of extraembryonic membranes:** On about 8<sup>th</sup> day after fertilization, cells on the free end of inner cell mass called hypoblasts (primitive endoderm) become flattened, start dividing and grow downwards towards the blastocoel, cavity of blastocyst.

It grows within the blastocoel and forms a sac called yolk sac.

The remaining cell of the inner cell mass, in contact with cells of Rauber are called epiblasts (primary ectoderm).

Both the layers form a flat, bilaminar embryonic disc.

After the formation of endoderm the second layer to be differentiated is the ectoderm.

Cells of epiblast divide and re-divide and move in such a way that they enclose the amniotic cavity.

The floor of this cavity has the embryonic disc and the roof of amniotic cavity is lined by amniogenic cells (amnion forming cells).

Later, the amniogenic cells divide and re-divide to form the amnion.

Amnion is an extra embryonic membrane that surrounds and protects the embryo.

As a result of all these changes, the bilaminar embryonic disc is positioned in between amniotic cavity and Yolk sac.

**Process of gastrulation:** Gastrulation occurs about 15 days after fertilization, in which the bilaminar embryonic disc (consisting of hypoblast and epiblast) is transformed into trilaminar embryonic disc (consisting of three primary germ layers i.e. ectoderm, mesoderm and endoderm).

This transformation occurs by division, rearrangement and migration of cells of epiblast. It begins with formation of primitive streak and a shallow groove on the surface is called primitive groove.

This streak progresses from posterior to anterior end of embryo.

Anterior end of primitive groove communicates with yolk sac by an aperture called blastopore (future anus).

Cells of the epiblast move inwards below the primitive streak and detach from the epiblast (invagination). Some of these invaginated cells displace the hypoblast forming the endoderm.

After formation of endoderm the remaining cells of the epiblast now result in the formation of the second layer, the ectoderm.

From the site of a primitive streak, a third layer of cells called mesoderm extends between ectoderm and endoderm. Anterior end of primitive groove communicates with yolk sac an aperture called blastopore.

The embryonic disc now has differentiated into three layers ectoderm, mesoderm and endoderm. Gastrulation is followed by organogenesis.

29. Answer the following:

- (i) i. The valve present between the left atrium and left ventricle is the Bicuspid valve (Mitral valve).
- ii. During ventricular contraction, the bicuspid valve prevents backward movement of the blood from the left ventricle into the left atrium.
- (ii) T wave represents ventricular diastole.
- (iii) QRS complex represents ventricular depolarization.

30. Following are the examples of biopiracy:

- i. **Texmati case:** A strain of Basmati rice was patented by Texas based company Rice Tec Inc with trade name Texmati. This patenting was illegal and unethical as Basmati is a longgrained, aromatic variety of rice indigenous to the Indian subcontinent. India fought a long legal battle after which the patent was cancelled.
- ii. **Turmeric:** Since ancient times, Indians have been using Haldi (Turmeric powder) as antiseptic for healing wounds for killing pests and medicinal purposes. However, American companies have patented Turmeric and many medicinal plants of India. After a long legal battle, most of the patents have been revoked.
- iii. **Neem (Azadirachta indica):** The patenting of the fungicidal properties of Neem was an example of biopiracy. The USDA and an American MNC W.R. Grace in the early 90s sought a patent from the European Patent Office (EPO) on the "method for controlling on plants by the aid of hydrophobic extracted neem oil."

Anemophily	Entomophily
Pollination carried out by wind is called as anemophily.	Pollination carried out by insects is called as entomophily.
Anemophilous flowers are small, inconspicuous, colourless	Entomophilous flowers are large, showy and often brightly coloured.
The stigma is feathery to trap pollens carried by wind currents.	The stigma is rough due to presence of hair or is sticky due to mucilaginous secretion.
The flowers are without nectar and fragrance (odour).	The flowers produce sweet odour (smell) and have nectar glands.
It occurs in wheat, rice, corn, rye, barley, oats and other plants like palms.	It occurs in Rose, Jasmine, Cestrum, Salvia, etc.