

# Maharashtra Board Class 12 Biology Solutions 2022

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## Section A

**Question 1. Select and write the correct answer for the following multiple choice type of questions:**

**i. How many meiotic and mitotic divisions occur during the development of male gametophyte from the microspore mother cell?**

- (A) One meiotic and two mitotic**
- (B) Two meiotic only**
- (C) Two mitotic only**
- (D) One mitotic and one meiotic**

**Answer. A**

**Solution.** The correct answer is (A) One meiotic and two mitotic.

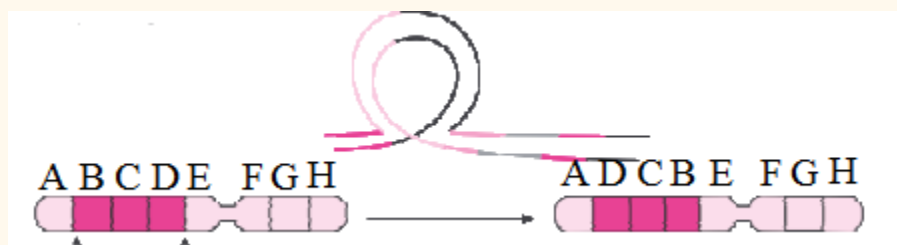
**ii. During replication of DNA, the separated strands are prevented from recoiling by using \_\_\_\_\_.**

- (A) single strand binding protein**
- (B) reverse transcriptase**
- (C) endonuclease**
- (D) polymerase**

**Answer. A**

**Solution.** The correct answer is: (A) single strand binding protein

iii.



Which event is represented by the above diagram, related to chromosomal aberrations?

- (A) Deletion
- (B) Duplication
- (C) Inversion
- (D) Translation

**Answer. C**

**Solution.** The correct answer is: (C) Inversion

iv. \_\_\_\_\_ hormone responsible for efflux of  $K^+$  ions from guard cells and act as antitranspirant.

- (A) Gibberellins
- (B) Cytokinin
- (C) Ethylene
- (D) Abscissic acid

**Answer. D**

**Solution.** The correct answer is (D) Abscissic acid.

Abscissic acid (ABA) is a plant hormone that plays a key role in regulating water loss through transpiration. When ABA levels are high, guard cells lose  $K^+$  ions, which causes them to close their stomata. This reduces the rate of transpiration and helps to conserve water.

v. Test tube baby technique is called \_\_\_\_\_.

- (A) In-vitro fertilization
- (B) In-situ fertilization
- (C) In-vivo fertilization
- (D) Artificial insemination

**Answer. A**

**Solution.** The correct answer is (A) In-vitro fertilization.

In-vitro fertilization (IVF) is a process by which eggs and sperm are fertilized outside the body in a laboratory. The fertilized eggs are then transferred to the woman's uterus, where they implant and grow into a baby.

In-situ fertilization, in-vivo fertilization, and artificial insemination are all processes by which fertilization occurs inside the body.

vi. While playing cricket Raju faces problem of severe pain and heaviness in the chest. Pain spreads from neck, lower jaw, left arm and to left shoulder. From above symptoms identify disease

- (A) Malaria
- (B) Angina pectoris
- (C) Kidney failure
- (D) Typhoid

**Answer. B**

**Solution.** Based on the symptoms described, the most likely condition is (B) Angina pectoris. Angina is chest pain or discomfort that occurs when the heart muscle doesn't get enough oxygen-rich blood. The pain may spread to the neck, lower jaw, left arm, and left shoulder, which are symptoms often associated with heart-related issues. It's important for Raju to seek medical attention promptly, as chest pain can be a sign of a serious heart condition.

vii. \_\_\_\_\_ layer is in close contact of CNS in human being.

- (A) Cranium
- (B) Dura matter
- (C) Arachnoid matter
- (D) Pia matter

**Answer. B**

viii. Cellular factors in innate immunity is provided by \_\_\_\_\_.

- (A) phagocytes
- (B) antibody
- (C) T - lymphocyte
- (D) B - lymphocyte

**Answer. A**

**Solution.** The correct answer is (A) phagocytes.

Phagocytes are a type of white blood cell that plays a crucial role in innate immunity, the first line of defense against invading pathogens. They engulf and destroy microorganisms, effectively eliminating them from the body. Phagocytes include neutrophils, macrophages, and dendritic cells, each with distinct functions and contributions to the immune response.

Antibodies, T lymphocytes, and B lymphocytes are components of the adaptive immune system, which is a more sophisticated and specific defense mechanism that develops over time upon exposure to pathogens. Antibodies are specialized proteins produced by B lymphocytes, while T lymphocytes directly attack infected cells or regulate the immune response.

Therefore, phagocytes are the primary cellular factors involved in innate immunity, providing immediate protection against a wide range of pathogens.

ix. Pick out the appropriate association representing brood parasitism.

- (A) Hermit crab and sea anemone
- (B) Asian koel and common Indian crow
- (C) Algae and fungi
- (D) Buffalo and cattle egret

**Answer.** B

**Solution.** The appropriate association representing brood parasitism is (B) Asian koel and common Indian crow.

Brood parasitism is a reproductive strategy where one species lays its eggs in the nest of another species, leaving the host to raise the parasitic young. In the case of the Asian koel and the common Indian crow, the koel lays its eggs in the crow's nest, and the crow then incubates and raises the koel chicks as if they were its own.

The other options are incorrect:

- (A) Hermit crab and sea anemone is an example of mutualism, where both species benefit from the relationship.
- (C) Algae and fungi is an example of lichen, a symbiotic relationship where algae and fungi live together in a mutually beneficial relationship.
- (D) Buffalo and cattle egret is an example of commensalism, where one species benefits from the relationship while the other is unaffected.

x. Annealing step of PCR, operates at \_\_\_\_\_ °C.

- (A) 90 – 98
- (B) 40 – 60
- (C) 70 – 75
- (D) 100 – 120

**Answer. B**

**Solution.** The annealing step of PCR operates at 40 – 60 °C.

The annealing step is a crucial step in the polymerase chain reaction (PCR) process. During this step, the temperature is lowered to allow the primers to bind to their complementary sequences on the target DNA template. The optimal annealing temperature depends on the melting temperature ( $T_m$ ) of the primers, which is the temperature at which half of the DNA duplexes in a solution have dissociated into single strands. The annealing temperature is typically set 3-5 °C below the  $T_m$  of the primers.

The other options are incorrect:

- (A) 90 – 98 °C is the denaturation temperature, which is the temperature used to separate the double-stranded DNA template into single strands.
- (C) 70 – 75 °C is the extension temperature, which is the temperature used to synthesize new DNA strands from the primers.
- (D) 100 – 120 °C is too high for any of the steps in PCR.

**Question 2. Answer the following questions:**

**i. Name the part of gynoecium that determines the compatibility of pollen grains.**

**Answer.** Stigma of the pistil determines the compatibility of the pollen grains.

**ii. Which is the primary precursor of IAA in plants?**

**Answer.** Tryptophan is the precursor for the production of the plant growth hormone indole-3-acetate, or auxin

**iii. Name the cell which is responsible for nitrogen fixation in cyanobacteria.**

**Answer.** Some filamentous nitrogen-fixing cyanobacteria have the ability to differentiate specialized nitrogen-fixing cells, named heterocysts

**iv. How many Biodiversity hotspots have been identified around the world?**

**Answer.** There are currently 36 recognized biodiversity hotspots.

**v. Name the plant disease caused by Agrobacterium tumefaciens.**

**Answer.** Agrobacterium tumefaciens causes crown gall disease on various plant species

**vi. Identify the trophoblast cells which are in contact with embryonal knob during blastulation.**

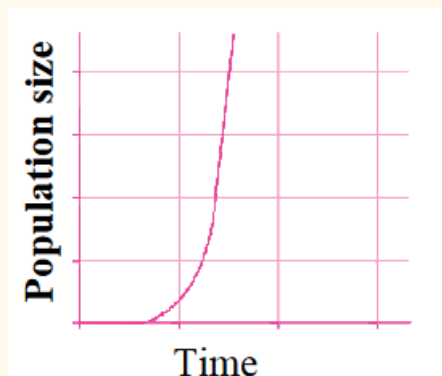
**Answer.** The Rauber cells

**Solution.** The Rauber cells are the trophoblast cells that are in contact with the embryonal knob.

- The transition from the morula to the blastocyst is marked by the appearance of a fluid-filled inner cavity and is accompanied by cellular differentiation: the surface cells develop into the trophoblast (and give rise to extraembryonic structures, including the placenta), and the inner cell mass develops into the embryo.
- The blastula, or 64-celled embryo, has a trophoblast as its outer layer. The blastocyst name refers to the embryo. It is made up of an outer layer of cells called the trophoblast and an inner cell mass that is linked to the embryonic pole.
- The endoderm, ectoderm, and mesoderm are the three germ layers. Each germ layer's cells undergo differentiation to become tissues and embryonic organs.

- The blastocyst's trophoblast layer adheres to the endometrium. The blastocyst's inner cell mass transforms into the embryo and gives rise to foetal tissue.

vii. From the given diagram, identify the type of population growth curve:



**Answer.** Exponential graph

viii. What do you mean by Pioneer species?

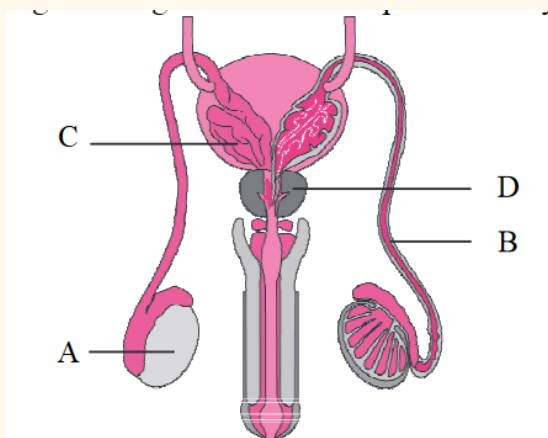
**Answer.** Pioneer species are hardy species which are the first to colonize previously biodiverse steady-state ecosystems.



## SECTION B

Attempt any EIGHT of the following questions:

**Question 3. Identify A, B, C, D, in the given diagram of human reproductive system:**



**Answer. A-** testis

**B-** Vas deferens

**C-** Seminal vesicle

**D-** Prostate gland

**Question 4. Identify chromosomal disorder caused due to non-disjunction of 21st number of chromosome and enlist its symptoms.**

**Answer.** Down syndrome is usually caused by an error in cell division called “nondisjunction.”

Nondisjunction results in an embryo with three copies of chromosome 21 instead of the usual two.

Some common physical features of Down syndrome include:

- A flattened face, especially the bridge of the nose.
- Almond-shaped eyes that slant up.

- A short neck.
- Small ears.
- A tongue that tends to stick out of the mouth.
- Tiny white spots on the iris (colored part) of the eye.
- Small hands and feet.

**Question 5. Write the aims of human genome project.**

**Answer.** Aims of the human genome project

- Optimization of the data analysis.
- Sequencing the entire genome.
- Identification of the complete human genome.
- Creating genome sequence databases to store the data.
- Taking care of the legal, ethical and social issues that the project may pose

**Question 6. Match the parts of ovule given in column I with parts of seed given in column II:**

	Column I		Column II
(a)	egg	(1)	testa
(b)	nucellus	(2)	tegmen
(c)	outer integument	(3)	perisperm
(d)	inner integument	(4)	embryo

**Answer.**

	Column I		Column II
(a)	egg	(1)	embryo
(b)	nucellus	(2)	perisperm
(c)	outer integument	(3)	testa
(d)	inner integument	(4)	tegmen

**Question 7. Enlist the characteristics of Neanderthal Man.**

**Answer.** Neanderthals had strong, muscular bodies, and wide hips and shoulders. Adults grew to about 1.50-1.75m tall and weighed about 64-82kg. Early Neanderthals were taller on average than later Neanderthals, but their weight was about the same. Model of a Homo neanderthalensis skeleton (front and back views).

**Question 8. Define the following:**

- (a) Gravitational water
- (b) Hygroscopic water
- (c) Combined water
- (d) Capillary water

**Answer.**

A) **Gravitational water:** The water which percolates deep in the soil, due to gravity is called 'gravitational water'.

B) **Hygroscopic water:** It is the water which is absorbed by the particles of dry soil from the atmosphere and is held as a very thin film on the surface of the soil due to adhesion or attraction between the surface of particle and water molecules.

C) **Combined water:** a small portion of soil water is chemically bound with soil materials. It is called combined water.

D) **Capillary water:** water that remains in the soil after gravitational water

is drained out, that is subject to the laws of capillary movement, and that is in the form of a film around the soil grains.

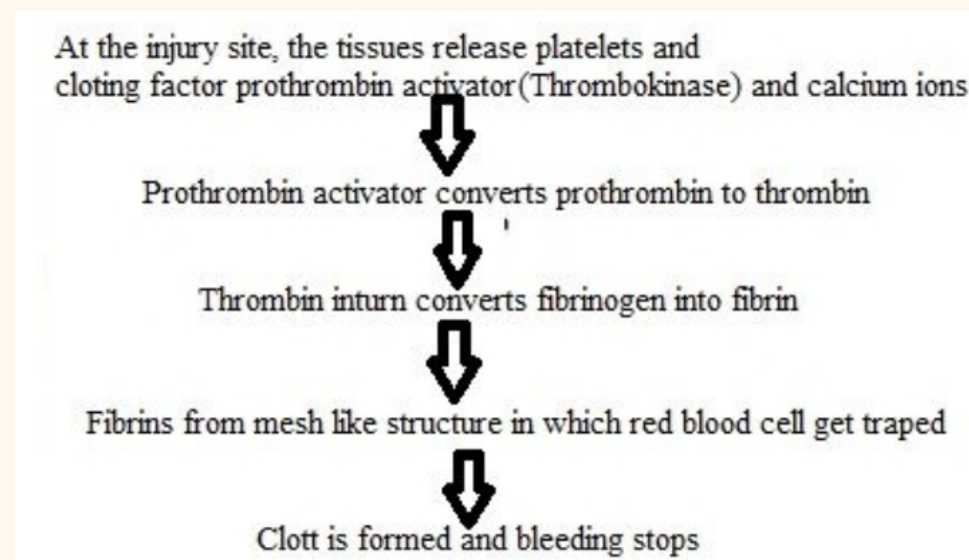
**Question 9. Give different properties of water.**

**Answer.** Unique properties of water

- Water is polar
- Water is an excellent solvent
- Water has high heat capacity
- Water has high heat of vaporization
- Water has cohesive and adhesive properties
- Water is less dense as a solid than as a liquid

**Question 10. A person met with a small accident and bleeds, but very soon stops bleeding. Explain the physiological process responsible for this.**

**Answer.**



**Question 11. Match the antibiotics in column I with their microbial sources in column II:**

	Column I		Column II
(a)	Chloromycetin	(1)	Streptomyces griseus
(b)	Erythromycin	(2)	Streptomyces aurifaciens
(c)	Streptomycin	(3)	Streptomyces Venezuelae
(d)	Terramycin	(4)	Streptomyces erythreus

**Answer.**

	Column I		Column II
(a)	Chloromycetin	(1)	Streptomyces Venezuelae
(b)	Erythromycin	(2)	Streptomyces erythreus
(c)	Streptomycin	(3)	Streptomyces griseus
(d)	Terramycin	(4)	Streptomyces aurifaciens

**Question 12. Abscissic acid is the common name given to two identical substances isolated separately. Name them. Give the chemical features of abscissic acid.**

**Answer.** Abscissin and dormin C<sub>15</sub>H<sub>20</sub>O<sub>4</sub>

Physico-chemical Properties

Molecular Formula	C <sub>15</sub> H <sub>19</sub> O <sub>4</sub>
Molar Mass	263.31
Melting Point	183-186°C
Boling Point	458.7°C at 760 mmHg

Flash Point	245.4°C
Vapor Pressure	2.41E-10mmHg at 25°C
Physical and Chemical Properties	Melting point 183-186°C sublimation point 120°C

**Question 13. What are the effects of biotechnology with relation to human health?**

**Answer.** a) Allergies: GMO crops potentially have negative effects. Consumers have developed unexpected allergic reactions  
 B) Long term effects: It have been introduced within such a short time and relatively little research have been conducted.  
 C) New Proteins: Proteins never have been ingested have now become the daily need na use of the human beings.  
 D) Food additives: GMOs now a days have been introduced in the form of nutritional supplements, antibiotics etc.This can help in boosting the immunity, however it can also lead to the increase the disease resistant strain due to the continuous practice.

**Question 14. Give the adaptations shown by desert animals.**

**Answer.**

- long eye lashes, hairy ears and closing nostrils help to keep out sand
- thick eyebrows which stand out and shade eyes from the sun
- wide feet so they don't sink in the sand
- they can go without water for over a week because they can drink gallons in one go
- they can go months without food - they store fat in their humps
- body temperature can change to avoid losing water through sweating
- they are well camouflaged
- thick fur helps to keep them warm at night

## SECTION C

Attempt any EIGHT of the following questions:

**Question 15. Explain natural selection with example of industrial melanism.**

**Answer.** The theory of natural selection was proposed by Charles Darwin. The theory explains that nature has its own way to eliminate the organisms which cannot survive. It states that in a population, there always exists a number of variations based on different combinations of traits, now carrying capacity of the environment is not unlimited. Hence, nature selects the best-suited organisms that have a greater chance to become parents for the next generation. The event of industrial melanism is one of the phenomena which explains the natural selection. There were more number of white coloured moths which camouflaged on the trees. The black coloured moths were easily visible. After the industrial revolution, due to the deposition of the soot on the trees, the white coloured moths were easily killed by the predators. This is a form of natural selection which favours the survival of the organism which can adapt to the surrounding.

**Question 16. Describe physiological effect and applications of gaseous hormone in plants.**

**Answer.** The physiological effects of ethylene are:

- 1 Ethylene breaks seed and bud dormancy.
- 2 Ethylene is highly effective in fruit ripening.
- 3 Ethylene enhances the rate of respiration during fruit ripening.
- 4 Ethylene promotes senescence and abscission of leaves and flowers.
- 5 Ethylene initiates flowering and regulates so many physiological processes.
- 6 Ethylene initiates germination in peanut seeds and sprouting of potato tubers.
- 7 Ethylene also promotes root growth and root hair formation, thus helping

the plants to increase their absorption surface.

**Question 17. What is ecological succession?**

**Name various seral stages from pioneer species to climax community with suitable example in hydrarch succession.**

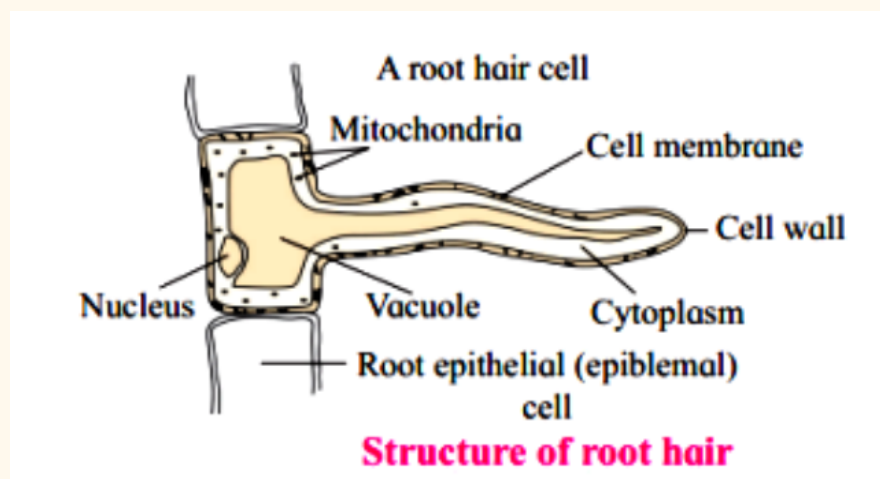
**Answer.** The gradual and fairly predictable change in the species composition of a given area is called ecological succession.

Seral stages of hydrarch succession:

- 1) Plankton stage- Diatoms, Algae
- 2) Submerged plants - Hydrilla, Vaslislitaria
- 3) Floating plants - Victoria, Trapa
- 4) Reed Swamp stage - Sagittaria, Typha
- 5) Marsh meadow stage - Carex, Cyprus
- 6) Woodland stage - Populus, Slix
- 7) Forest stage - Woody trees

**Question 18. With the help of a neat, labelled diagram describe the structure of root hair.**

**Answer.**



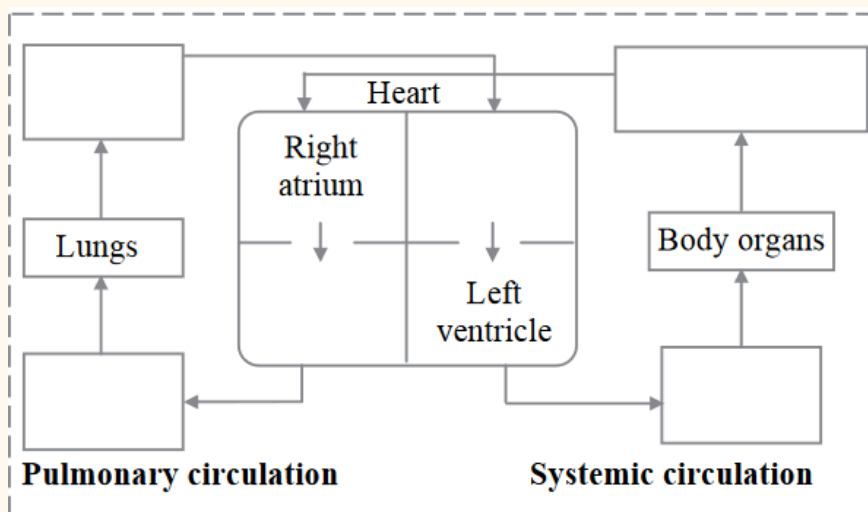
1. Water from soil is absorbed by plants with the help of root hairs.
2. Root hairs are present in zone of absorption.
3. Epidermal cells form unicellular extensions which are short lived



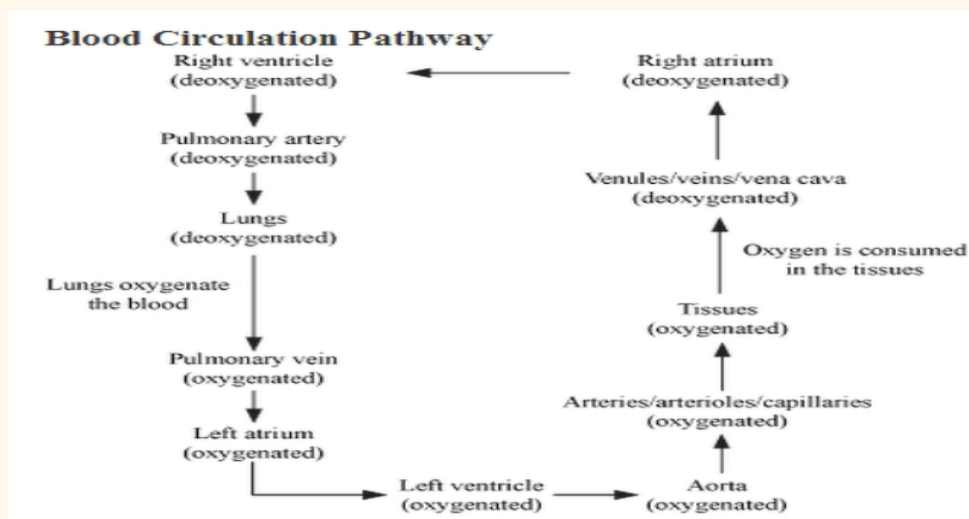
(ephemeral) structures i.e. root hairs.

4. Root hairs are nothing but cytoplasmic extensions of epiblema cell.
5. Root hairs are long tube like structures of about 1 to 10 mm.
6. They are colourless, unbranched and very delicate structures.
7. A large central vacuole is surrounded by thin layer of cytoplasm, plasma membrane and outer cell wall.
8. The cell wall of root hair is thin and double layered with outer layer of pectin and inner layer of cellulose which is freely permeable.

**Question 19. Complete the following flow diagram of double circulation:**



**Answer.**



## Question 20. Distinguish between hyperthyroidism and hypothyroidism.

**Answer.**

Hypothyroidism	Hyperthyroidism
<b>Definition</b>	
The hormonal disorder is in which the thyroid gland is underactive and produces very few quantities of the thyroid hormone.	The hormonal disorder is in which the thyroid gland is overactive and produces large quantities of the thyroid hormone.
<b>Rate of Metabolism</b>	
Very low and decreased.	High and increased
<b>TSH Levels</b>	
Lower than the normal level.	Higher than the normal level.
<b>Types</b>	
The three forms of hypothyroidism include primary, secondary and tertiary hypothyroidism.	The most common forms of hyperthyroidism include Graves disease, Plummer disease and toxic adenoma.
<b>Common Causes</b>	
Genetics Low-iodine diet. Exposure to radiation. Side effects caused by medications. Underactive, damage or removal of the thyroid gland.	Thyroid nodules. Swollen thyroid gland. An autoimmune disorder.
<b>Diagnosis</b>	
Thyroid hormone level test, blood	Thyroid hormone level tests, blood

test and other physical examinations.	tests and other tests for hyperthyroidism are based on an individual basis
<b>Signs and Symptoms</b>	
Fatigue Depression Mood swings. Memory problems. Severe hair loss. Coarse and dry hair. Coarse and pale skin. Frequent constipation. Weight gain or trouble in losing weight. Muscle cramps with frequent muscle aches.	Fatigue Anxious Weight loss. Nervousness Itching red skin. Excessive sweating. Decreased concentration. Unexplained weight loss. Irregular and scanty periods. Rapid or irregular heart rate
<b>Treatment</b>	
Medications to regulate thyroid levels, along with proper diet and physical activities to keep weight under control.	Medications include antithyroid drugs, Radioiodine and removal of the thyroid gland through surgery in very rare cases.

**Question 21. Give the applications of DNA fingerprinting.**

**Answer.** Applications Of DNA Fingerprinting are –

DNA analysis in forensic tests

- Can be used to establish paternity tests
- In criminal investigations
- To determine the frequency of specific genes in a population which gives rise to diversity
- Can be used to trace the role of genetic drift in evolution
- Personal identification

**Question 22. Write a note on In-situ and Ex-situ conservation.**

**Answer.** It is the methods of conserving all the living species, especially the wild and endangered species in their natural habitats and environment. In-situ conservation of Biodiversity includes biosphere reserves, national parks, wildlife sanctuaries, etc. It is the methods of conserving all the living species in the artful habitats that reflect their natural living habitats. Examples of ex-situ conservation of biodiversity include aquariums, botanical gardens, cryopreservation, DNA banks, zoos, etc.

**Question 23. Explain the properties of nerve fibres.**

**Answer.** Properties of Nerve Fiber:

i. Excitability: When a stimulus is applied, the nerve fiber demonstrates a change in its electrical activity from its resting state.

ii. Conductivity:

It is the ability of the nerve fiber to transmit impulses all along the whole length of axon without any change in the amplitude of the action potential. This type of conduction is termed as decrementless conduction.

iii. Refractory period: It is the duration after an effective stimulus, when a second stimulus is applied, there will be no response for the second stimulus.

a. From the time of the application of the stimulus till the initial one-third of the repolarization phase, the nerve fiber excitability will be zero and is completely refractory for the second stimulus. This duration is known as absolute refractory period.

b. Relative refractory period is the duration after an effective stimulus, when a second stimulus, which is slightly above threshold, is applied there will be response for the second stimulus as well.

iv. All or none law: It states that, when the tissue is stimulated with threshold or more than threshold strength, the amplitude of response will remain the same but for a stimulus of less than threshold strength, there will not be any response.

All or none is obeyed by:

a. A single nerve fiber.

- b. A single skeletal muscle fiber.
- c. A motor unit.
- d. Whole of cardiac muscle.
- e. A single fiber of multi-unit smooth muscle.
- f. Whole of visceral smooth muscle.

**Question 24. Give the causative agent, mode of transmission and symptoms of typhoid.**

**Answer.** Typhoid is an infectious bacterial disease that mainly spreads through contaminated food or water. It can also spread due to poor hygienic conditions. The major symptoms of this disease are characterized by high fever, loss of appetite and diarrhoea. *Salmonella typhi* is the bacterium responsible for this disease and humans are the only carriers. The first case of typhoid fever was reported in the United States in the early 1900s. Overall, about 21 million people are infected with this disease annually, and about 200,000 are fatal. Furthermore, scientists have identified 2 types of typhoid causing bacterium, namely:

1. ST1
2. ST2

### Causes Of Typhoid

Also called as *Salmonella enterica serotype Typhi*, this microbe is the causative agent for this “*Salmonella enterica serotype Typhi*”, this microbe is the causative agent for this ”, this microbe is the causative agent for this disease. It is a gram-negative bacteria characterized by a thin cell wall and an outer membrane. The cells are reddish in colour, with some having black stains in the centre. It is rod-shaped and grows in the small intestine of the human body. Human beings are the main hosts of these bacteria. This type of species can survive in environments which are rich in oxygen and also, they are found in sewage, water bodies and some eventually make their own on to food.

The bacteria enter the human body through the contaminated foods and

water, where it then enters into the intestinal cells of the human body. Later, it passes through the bloodstream and destroys the lymphatic system and spreads throughout the body. This bacterium is mainly carried by the white blood cells present in the liver and also the bone marrow. There, they multiply and re-enter the blood cells, which in turn, causes a number of symptoms to appear in the later stages

### Symptoms of Typhoid

The first symptoms of typhoid typically begin to show up after an 8-14 day incubation period. However, the infective dose and the person's inherent immunity can cause the incubation period to vary. Overall, about 21 million people are infected with this disease annually, and about 200,000 die. The following are symptoms characteristic of typhoid:

1. Chills.
2. Ulcers.
3. Sweating
4. Weakness.
5. High fever.
6. Skin Rashes.
7. Dehydration.
8. Constipation.
9. Weight loss.
10. Muscle aches.
11. Stomach pain.
12. Loss of appetite.
13. Severe headache.
14. Delirium/hallucinations.
15. Extremely swollen abdomen

**Question 25. Match the following products with their microbial sources:**

Products		Microbial Sources	
(a)	Vitamin B <sub>2</sub>	(1)	Rhizopus arrhizus
(b)	Fumaric acid	(2)	Candida lipolytica
(c)	Vitamin B12	(3)	Trichoderma Konigii
(d)	Lipase	(4)	Neurospora gossypii
(e)	Cellulase	(5)	Psuedomonas denitrificans
(f)	Citric Acid	(6)	Aspergillus niger

**Answer.**

Products		Microbial Sources	
(a)	Vitamin B <sub>2</sub>	(1)	Neurospora gossypii
(b)	Fumaric acid	(2)	Rhizopus arrhizus
(c)	Vitamin B12	(3)	Psuedomonas denitrificans
(d)	Lipase	(4)	Candida lipolytica
(e)	Cellulase	(5)	Trichoderma Konigii
(f)	Citric Acid	(6)	Aspergillus niger

**Question 26. Explain any three examples of biopiracy.**

**Answer.** Biopiracy is the practice of commercial exploitation of biochemicals or genetic materials which occur naturally. Typically, indigenous people have traditional cognition primarily consisting of biological features and genetic diversity of the natural environment from

one generation to another. Few of the traditional knowledge relevant to global survival has the elements listed below:

- 1 Farming or Agriculture.
- 2 Medicinal Plants.
- 3 Varieties of Food crops

EXAMPLES:

1. Biopiracy of African super-sweet berries: A plant, *Pentadiplandra brazzein* found in the west of South Africa. It is a vital source of a protein referred to as Brazzein. People there utilize it as a low-calorie sweetener. It is cognized to be much sweeter than sugar (approximately two thousand times). Recent developments involve isolation of the gene encoding brazzein that has been sequenced and patented in the USA.
2. Patenting of *Azadirachta indica* – Neem: Since ancient times, Neem has proved to be useful in several ways. Indians have shared their knowledge regarding neem across the globe. In the year 1994, U.S. Department of Agriculture and an American company – W.R. Grace received a European patent that included various methods that are used for controlling fungal infections in plants by using a composition extracted from neem.
3. Biopiracy of the Enola bean: It was named after the wife of Larry Proctor, who patented it in 1999. Enola bean is a variation of Mexican yellow bean. The sales of this bean were commercialised in North Mexico. Subsequently, the patent-holder sued many importers of the Mexican yellow beans. Thereby, farmers faced an economic crisis. A lawsuit was filed by farmers and the result was in favour of farmers as ruled by U.S. Patent and Trademark Office.
4. The rosy periwinkle: The rosy periwinkle was originally found in Madagascar. Now, it has been introduced to several other tropical countries across the globe. This implements that researchers can obtain knowledge from one nation and plant samples in other nations.

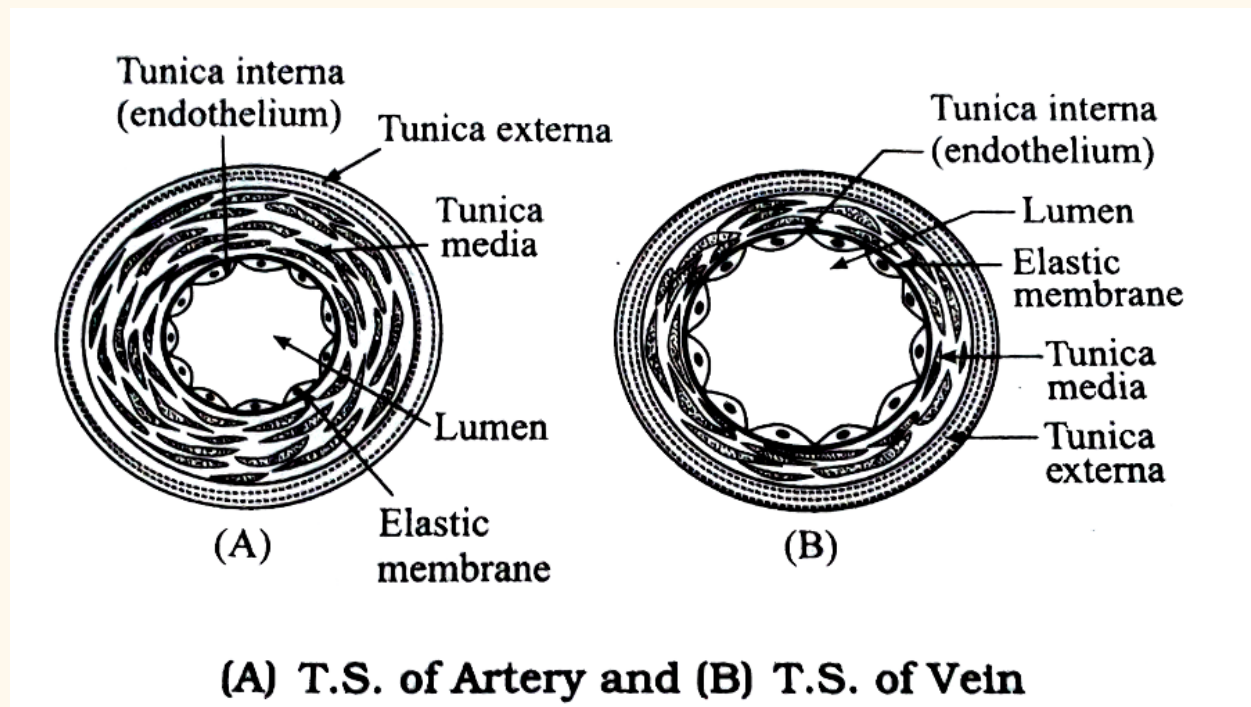


## SECTION D

Attempt any THREE of the following questions:

Question 27. With the help of neat and labelled diagrams, distinguish between artery and vein.

Answer.



ARTERIES	VEINS
<b>Functions</b>	
Involved in carrying oxygenated blood except for pulmonary arteries	Involved in carrying deoxygenated blood except for pulmonary veins
<b>Walls</b>	
Consists of three distinct layers, which are rigid, thicker and highly muscular	Consists of three distinct layers, which are thinner and less muscular.

<b>Position</b>	
Located deep within the body.	Peripherally located closer to the skin.
<b>Appearance</b>	
Red in colour.	Blue in colour.
<b>Transports</b>	
Carry blood away from the heart to various parts of the body.	Carry blood towards the heart from the various parts of the body.
<b>Rate of pressure</b>	
High pressure, as the blood flows by the pumping pressure of the heart.	Low pressure, as the blood flows by the capillary action of the veins.
<b>Oxygen Level</b>	
Comparatively higher oxygen level	Comparatively low oxygen level.
<b>Carbon dioxide Level</b>	
The level of carbon dioxide is low	The level of carbon dioxide is high
<b>The direction of Blood Flow</b>	
In the downward direction from the heart to the body tissues.	In the upward direction from the body tissues to the heart.
<b>Lumen</b>	
Lumen is narrow.	Lumen is wide.
<b>Valves</b>	
Valves are absent	Valves are present
<b>Disorders</b>	
Arteries are at a greater risk of	Veins are less susceptible to

certain diseases like angina pectoris, atherosclerosis, etc.	diseases such as varicose veins
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**Question 28. State the names of hormone and glands secreting them:**

**(a) Growth of thyroid gland.**

**(b) Controls tubular absorption of water in kidney.**

**(c) Stimulates liver and muscles for glycogenesis.**

**(d) Development of immune system and maturation of T-lymphocyte.**

**Answer.** (a) Growth of thyroid gland - Pituitary gland and TSH Hormone

(b) Controls tubular absorption of water in kidney - Posterior Pituitary gland and ADH Hormone

(c) Stimulates liver and muscles for glycogenesis - Pancreas and insulin hormone

(d) Development of immune system and maturation of T-lymphocyte - Thymus gland and thymosine hormones

**Question 29. Describe outbreeding devices which encourages cross pollination.**

**Answer.** Self-pollination is common and more likely to happen in the case of hermaphrodite flowers but a successive series of self-pollination affects negatively and causes inbreeding depression. This also results in homozygous genes. Thus plants are adapted to promote cross-pollination. This is known as outbreeding. Factors which encourages cross-pollination are as follows:

- Unisexual flower: If a flower is unisexual i.e., contain only one sex either female or male, cross-pollination is the only choice.

- Non-Synchronization: Timing is important for successful pollination. Pollen release and receptivity of stigma should happen simultaneously.

Sometimes, pollen matures and releases before the stigma is open which leads to loss of pollen vitality or vice-versa. This prevents self-pollination;

even though the flower is hermaphrodite.

· Self-incompatibility: Incompatibility within a flower (or plant) includes self-sterility; structural barrier. Self-sterility means even though pollination takes place it can't proceed to fertilization due to further pollen growth failure. Structural barriers include height difference between gynoecium and androecium and some structures which hinder the stigma from receiving pollen. These are the more or less genetic mechanism

**Question 30. Explain the law of dominance and compare how it differs from incomplete dominance and co-dominance.**

**Answer.** The law of dominance states that one of the pairs of inherited traits will be dominant and the others recessive unless both the factors are recessive.

Example of the law of dominance.

Parents that are pure for contrasting characters are crossed, only one form of the trait will appear the dominant trait appeared in the next generation.

This best explains the law of dominance. In complete dominance, only one allele in the genotype is seen in the phenotype. In codominance, both alleles in the genotype are seen in the phenotype. In incomplete dominance, a mixture of the alleles in the genotype is seen in the phenotype. Dominance is the situation in which dominant allele is fully expressed while suppressing the recessive allelic effect on the phenotype. Codominance is the situation in which both alleles work independently and express their effects in the phenotype without mixing the effects.

**Question 31. Describe hormonal control in various phases of menstrual cycle.**

**Answer.** Phases of Menstruation Cycle

Each cycle of menstruation occurs in four different phases-

1. Menstrual Phase

It's the phase when the uterus lining or the endometrial lining is shed off from the body. It's marked as the day1 of periods which normally lasts for 3

to 7 days. The endometrial fluid is composed of the blood, cells from the lining of the uterus (endometrial cells), and mucus.

## 2. Follicular Phase

Followed by hormonal stimulation, the ovary produces around 5 to 20 follicles (tiny nodules or cysts), which bead on the surface. Each follicle consists of an immature egg. Out of these, only one follicle matures into an egg. Finally, a mature egg follicle releases an egg from one of the two ovaries. The follicular growth also stimulates the lining of the uterus to thicken in preparation for a possible pregnancy.

## 3. Ovulatory Phase

This is also known as the Mid-cycle phase. It is marked by the release of a mature egg from the surface of the ovary. Day 13-17 is mostly the period of ovulation. Various hormones trigger ovulation and simultaneously release the egg into the fallopian tubes. The egg swiftly moves through the fallopian tubes towards the uterus. If fertilization occurs within 24 hours, the egg turns into an embryo. If not, it dies and disintegrates.

## 4. Luteal Phase

The ruptured follicle that had stayed behind on the surface of the ovary during the ovulatory phase starts to develop into a structure called the corpus luteum. This layer releases hormones to thicken the uterine lining for any possible implantation of a fertilized egg. Corpus luteum is maintained if pregnancy is established. If pregnancy doesn't occur, it disintegrates. This usually occurs at 22-28 days. Another set of hormonal changes causes the uterine lining to fall away, thus causing menstruation. The next cycle starts with this.

## Hormonal Control of Menstrual Cycle

Hormones are chemical messengers in the body, directing the body what to do and when. They are produced and released by endocrine organs. The menstrual cycle is also a process controlled by hormones in the female body. Some exclusive female hormones are released to bring about every cycle of menstruation. Varying levels of hormones- Estrogen, Progesterone, Luteinizing Hormone (LH), and Follicle Stimulating Hormone (FSH) different direct phases of the menstrual cycle.

- FSH: It is released by the pituitary gland on signalling from the hypothalamus. It stimulates the ovary to produce egg follicles.

- LH: Rising levels of LH which are also prompted by the hypothalamus and released by the pituitary gland trigger ovulation and lead to the release of the egg in fallopian tubes.
- Estrogen: It is the hormone that prompts the growth of the uterine lining or the endometrial lining.
- Progesterone: The corpus luteum releases some amounts of progesterone to maintain the thick lining of the uterus for a possible healthy pregnancy.

Thus, various female hormones do their part in keeping the menstrual cycle regular and making the ovaries release one egg every month for fertilization.