
2012

Part: I

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Part II

Section: A

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Part I

Answer all questions.

Question: 1

a. Give one difference between each of the following:

[5]

i. Ventricular systole and Ventricular diastole. **

ii. Sertoli cells and Spermatids.

Answer:

Difference between Sertoli cells and Spermatids

Sertoli Cells	Spermatids
Sertoli cells provide nutrition to developing sperms.	Spermatids are dividing cells produces spermatozoa.

iii. Dwarfism and Cretinism. **

iv. Antibodies and interferons.

Answer:

Difference between antibodies and Interferons.

Antibodies	Interferons
These are specific proteins generated in response to the foreign substances and producing immunity against infections.	These are proteins released by the cells against viral infections by which they help to combat against that viral infection.

iv. Glucocorticoids and Mineralocorticoids.**

b. Give reasons for the following:

[5]

i. Nerve impulse travels in one direction.**

ii. Jamming of wooden doors and windows takes place during rainy season.

Answer:

Jamming of wooden door and window takes place during rainy season is due to imbibition. It increases their volume.

iii. A cut plant wilts fast even if its cut end is dipped in water.

Answer:

Rapid exosmosis of water takes place which causes wilting very fast.

iv. Urine excreted during summer months is hypertonic.**

v. A person has difficulty in focusing on nearer objects, as the age increase.**



vi.

a. Give a scientific term for each of the following:

[3]

i. A single isolated contraction of muscle fibre. **

ii. Inhibition of lateral bud growth by terminal bud,

Answer:

Apical dominance.

iii. Specialised structure through which guttation occurs.

Answer:

Hydathode

iv. Development of embryo from the without the process of fertilization.

Answer:

Parthenocarp.

v. Process of splitting of water molecules during photosynthesis.

Answer:

Photolysis.

vi. Passing out of urine. **

d. Mention the most significant function of each of the following:

[3]

i. Tapetum cells

Answer:

Tapetum cells serves as a nutritive tissue for microspores and pollen mother cells.

ii. Serotonin

Answer:

Serotonin causes intestinal secretion and play important role in homeostasis.

iii. Lenticels

Answer:

Cerebrospinal fluid maintains a constant pressure in and around the brain and protects the brain against shocks and mechanical injury.

iv. Cerebrospinal fluid **

v. Iselets of Langerhans **



vi. Bundle sheath

Answer:

Bundle sheath provides protection and strength to the vascular bundles.

e. State the most significant contribution of the following scientists:

[2]

i. Hans Berger

Answer:

Discovered Electroencephalogram (EEG)

ii. Dixon and Jolly

Answer:

Proposed transpiration pull cohesive force theory.

iii. J. B. Lamarck

Answer:

Proposed theory of inheritance of Acquired characters or Lamarkism.

iv. William Harvey

Answer:

The man who first correctly explained the process of blood circulation in our bodies and the role of heart in the process

f. Expand the following:

[2]

i. OP

Answer:

OP – Osmotic Pressure

ii. RuBP

Answer:

RuBP – Ribulose bi phosphate

iii. IBA

Answer:

IBA – Indole butyric Acid

iv. PEP

Answer:

PEP – Phospho-enol Pyruvate.



Part II

Section A (Answer any three questions)

Question: 2

- a. Give any four anatomical differences between monocotyledonous and dicotyledonous leaf. [4]

Answer:

Four anatomical differences between monocotyledonous and dicotyledonous leaf.

Monocotyledonous Leaf	Dicotyledonous Leaf
1. Stomata are equally distributed on both surface.	1. Stomata are mostly present on lower surface
2. Mesophyll is not differentiated into spongy and palisade parenchyma.	2. Mesophyll is differentiated into spongy and palisade parenchyma.
3. Vascular bundles have phloem on the upper side and xylem on the lower side.	3. Vascular bundles have xylem towards upper epidermis and phloem towards lower side.
4. Both surfaces are equally cutinized.	4. The upper surface has thick cuticle as compared to lower surface.

- b. Explain the phases of growth in meristem of plants. [3]

Answer:

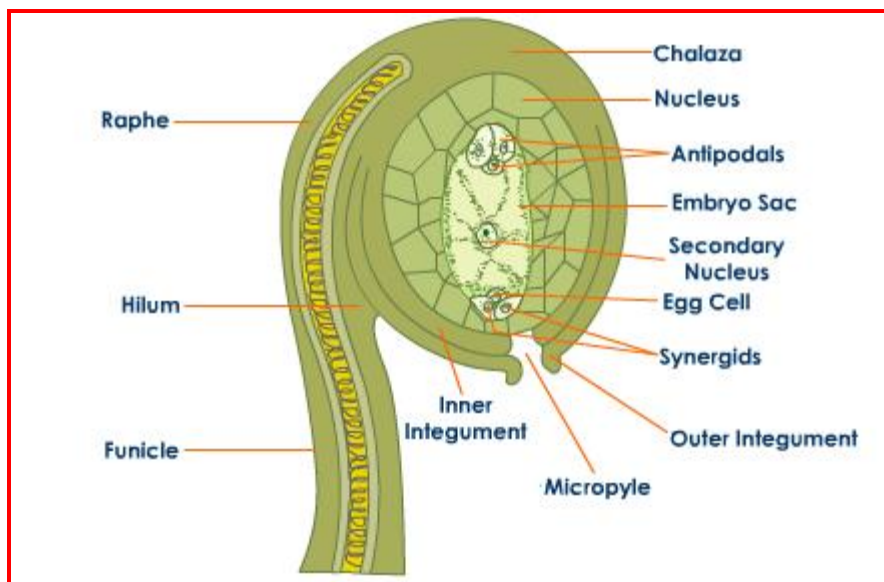
Meristem is a localized region in which active cell divisions occur. Primary meristem derived from the promeristem and retains its meristematic activity. It is located in the apices of roots, stems and leaf primordia. It is represented by apical meristem, intercalary meristem and intra-fascicular meristem. Primary meristem give rise to the primary permanent tissues and secondary permanent tissues. The growth by the activity of apical and intercalary meristems results in longitudinal growth and is called primary growth. The growth resulting by the activity of intrafascicular meristem (cambium) is called secondary growth.

Secondary meristem develops in the primary permanent tissues and give rise to the secondary permanent tissues which add to the girth of plant. The secondary meristem is represented by cork cambium or phellogen, interfascicular cambium in dicot stems, vascular cambium in dicot roots, wound cambium and accessory cambium.

- c. Draw a neat labeled diagram of matured anatropous ovule before fertilization. [3]

Answer:





Question: 3

- a. Give an account of activity of cambium in the secondary growth of the stem.

[4]

Answer:

The growth of secondary vascular tissues occurs after the maturation of primary phloem and xylem. Here the cambium is represented by a single layer of cells. The fusiform initials of the cambium divide vertically each forming two daughter cells. One of the daughter cells remains meristematic while the other differentiates into xylem or phloem elements.

The cells which are produced outward from phloem elements, and those inward from xylem elements. They say initials of cambium cut plates of parenchymatous cells both outward and inward. These are called secondary medullary rays.

As the secondary growth continues, the primary tissues lying outside the secondary vascular tissues are pushed outside and eventually crushed as they are subjected to pressure from inside by the enlarging secondary vascular cylinder. The primary xylem persists and can be seen inner to the secondary vascular cylinder.

- b. Write three differences between C_3 and C_4 cycles

[3]

Answer:

Difference between C_3 Cycle and C_4 Cycle:

C_3 Cycle	C_4 Cycle
1. The leaves of these plants do not show Kranz anatomy.	1. The leaves of these plants show Kranz anatomy.
2. Energy (ATP) required for fixation of CO_2 is low.	2. Energy (ATP) required for the fixation of CO_2 is comparatively high.
3. There is only one CO_2 acceptor Rubisco, which occurs in all green cells of the plants.	3. There are two CO_2 acceptors. PEP carboxylase, in the mesophyll cells and Rubisco, in bundle sheath cells.



4. They operate only Calvin cycle.	4. They also operate Hatch and Slack cycle in addition to Calvin cycle.
5. They can perform photosynthesis only when stomata are open.	5. They can perform photosynthesis even when stomata are nearly closed.
6. The bundle sheath cells do not contain chloroplast.	6. The bundle sheath cells contain large chloroplasts.

c. Mention two advantages each of the following:

[3]

i. Hydroponics

Answer:

Advantages of Hydroponics:

1. Plants can grow without soil and much longer shelf life.
2. Grow more plants in a small space. Plants mature more rapidly and gives greater yields.

ii. Turgidity to plants

Answer:

Advantages of Turgidity in Plants:

1. Opening and closing stomata are regulated by the turgidity of the guard cells.
2. Turgidity is essential for plants to live and grow and keeping leaves erect and fully expanded.

iii. Cross pollination.

Answer:

Advantages of cross-pollination:

1. Cross pollination results in healthy and stronger offsprings.
2. New varieties with useful characters are produced.

Question: 4

a. Explain the movement of water cell to cell across the root from the soil to the xylem.

[4]

Answer:

Water is absorbed by the root hair from the soil due to high osmotic pressure. Water moves from the soil to roots when water potential of the soil solution is more than that of the cell sap. As a consequence the OP and DPD of root hair are more which causes endosmosis of soil-water through the plasma membrane into the cell sap of root hair. From here, water passes through the chain of cortical cells along their increasing DPD upto endodermis. Passing through the cells water now enters the pericycle. Since, there is no turgor pressure in xylem vessel, their DPD is very high, therefore, water from the cells of pericycle is passed on to xylem vessels. According to non-osmotic theory, absorption of water occurs due to non-osmotic reasons and against DPD. This process requires the expenditure of energy.

b. Draw a labeled diagram of T.S. of hyaline cartilage. Write a brief note on its functions. **

[3]

c. What is the full form of ADH? How does ADH control osmoregulation in human kidney? **

[3]

Question: 5

a. Explain the process of oogenesis in humans.

[4]



Answer:

The formation of haploid ova from the diploid egg mother cell of the ovary is called oogenesis. The process is completed in three phases:

- i. **Multiplication phase:** The primordial germ cells divide by mitosis and the daughter cells detach to produce oogonia. These oogonia divide and form clusters called ovigerous cords. The final products of division are called oocytes. In each cluster, only one oocyte enters growth phase and is called primary oocyte while the surrounding oocytes form follicle cells.
- ii. **Growth phase:** It is very long and elaborate phase, varies from few days to few years. In human females, the oogonia are already formed at the time of birth and show growth only after attaining sexual maturity.
- iii. **Maturation:** The nucleus undergoes two maturation divisions. The first is a reduction division reducing the number of chromosomes to half, the larger one is called secondary oocyte and smaller one the first polar body. The secondary oocyte divides again (second meiotic division) and give rise to haploid ootid or ovum and the second polar body. Thus, one ovum is formed from the primary oocyte as a result of oogenesis.

- a. State three differences between red muscle fibre and white muscle fibre. ** [4]

Answer:

- b. Mention a causes and symptom of each of the following: ** [2]

- i. Amphysema
- ii. Renal calculi
- iii. Diarrhoea.

Question: 6

- c. Describe the structure of an artery and a vein. Explain how their structure helps in their functioning. ** [4]
- d. Write three differences between short day and long day plants. [3]

Answer:

Short Day Plants	Long Day Plants
1. They flower when exposed to day lengths shorter than a certain minimum.	1. They flower when exposed to day lengths longer than a certain critical minimum.
2. A continuous dark period is required.	2. A continuous light period is required
3. Interruption by dark during long light period does not stimulate flowering.	3. Interruption by dark during long light period does not inhibit flowering.
4. They do not flower if dark period is interrupted by a flash of light.	4. Flowering is stimulated if dark period is interrupted by a flash of light.
5. Flowering is not induced if plants are subjected to short light and short dark periods.	5. Flowering is induced if plants are exposed to short light periods and shorter dark periods.

- e. Name the 2nd 3rd and 8th cranial nerves in man and write a function of each. ** [3]



Section B

Answer any two questions.

Question: 7

- a. Explain mass selection and pure line selection. How is pure line selection a better method for crop improvement? [4]

Answer:

Mass Selection: This the common and old method in which a number of similarly appearing plants are selected for the desired traits and their seeds are mixed together. The mixture of seeds so obtained is sown to raise the new plant. The seeds of such plants are multiplied and supplied to farmers.

Pure Line Selection: The single plant with desired traits is selected out of variable population in the field. Seeds from selected plants are sown in separated rows to produce a progeny. This is continuing for several generations for obtaining superior crop plants.

Pure line selection is better method of crop improvement than mass selection because in this method, The fewer plants are selected and each selected plat is tested separately. The variety so developed is genetically pure and durable

- b. Write short notes on: [4]

- i. Atavism

Answer:

It is also known as reversion. It is sudden reappearance of a certain ancestral but not parental structure which has either completely disappeared or greatly reduced. Example: The occurrences of rudimentary tail in new borne babies, power of moving pinna etc.

- ii. Protoplast fusion

Answer:

Protoplast fusion is a tissue culture technique in which protoplasts of two parents are isolated and then fused by electrofusion method and cultured in a suitable artificial medium to regenerate new plants.

- iii. Rh factor.

Answer:

Rh factor is an antigen protein present on the surface of human RBCs. It is found in 85% of the people and they are referred as Rh positive (Rh^{+ve}). The remaining 15% who lack this antigen are known as Rh negative (Rh^{-ve}). Rh factor inherited and important during blood transfusion.

- c. Mention the chromosomal abnormalities concerned with the following conditions in humans: [2]

- i. Turner's Syndrome

Answer:

Turner's Syndrome: It is due to the monosomy of the sex chromosome, i.e., it is an aneuploidy condition ($2n=45$). The genotype is XO.

- i. Klinefelter's Syndrome



Answer:

This is due to the presence of an extra X chromosome in males, i.e., $2n=47$ or $44+XXY$ instead of $44+XY$. It is trisomy.

ii. Down's Syndrome.

Answer:

It is also known as mongolian idiocy. In this abnormality, $2n=47$ because of trisomy of the 21st chromosome.

Question: 8

a. How does the human body protect itself from infections?

[4]

Answer:

Human body has the following strategy of protecting itself from invading pathogen leading to infection. First of all the skin of human body provides the first line of defence. The seromucus surfaces of body such as the conjunctiva and oral cavity, are protected by a variety of antibacterial substances, including the enzyme, lysozyme, secreted in tears and saliva. The respiratory tract is protected by a layer of surface mucus which is continuously disposed of by ciliary action and replaced by goblet cell activity.

After the failure of body's first line of defence, now comes the second line of defence. Macrophages and neutrophils are the principal cells which carry out this function.

After these two failures comes the most important immune system which protects the body against infections by producing the lymphocytes. Lymphocytes protect the body against invading pathogen (antigen) by following two ways:

Firstly, lymphocytes produce antibodies in response to the recognition of a particular antigen. Antibodies bind to antigens to promote destruction of antigen by a variety of mechanism. It is called as humoral immune response. Secondly some lymphocytes are stimulated by antigens to produce a response in which circulating antibodies are not formed but in which lymphocytes and macrophages cooperate in the direct destruction of pathogenic organisms. This is called as the cellular immune response.

b. Write short notes on the following:

[4]

i. Biomedical Engineering

Answer:

It is advancement of medical technology. A number of instruments and devices have been developed that revolutionised the medical world. It helps the human population to overcome sufferings to large extent.

ii. Stem cells

Answer:

Stem cells are unspecialized cells that can multiply indefinitely and develop into mature cells with specialized functions. They are widely used for curing various diseases and regeneration of organs.

iii. Cryopreservation

Answer:

The preservation of germplasm at ultra low temperature around -196°C is called cryopreservation. At this temperature, the cell division stops, biological activities cease and genetic changes do not occur.



-
- c. Give an account of Darwin's finches.

[2]

Answer:

Darwin studies the environmental conditions, fauna and flora of Galapagos islands. He observed nearly 20 related varieties of small birds in these islands which differed mainly in the shape and size of their beaks and in the colour of their plumage. These birds are now known as Darwin's finches. In general, bird fauna of these islands shows affinity with American species, but the Darwin's finches differ considerably from American finches. However, a related species of Darwin's finches was reported from South American mainland. Darwin thus concluded that the American mainland species was the original one from which different forms migrated to the different islands of Galapagos and adapted to different environmental conditions of these islands. These adapted forms are considered to be new species.

Question: 9

- a. Explain the convergent and divergent evolution with suitable examples.

[4]

Answer:

The study of homologous organs indicates that homologous organs are found in the organism, which have evolved from some common ancestor but have got adapted to different habitats to which they had migrated. This is called adaptive divergence or adaptive radiation. It represents divergent evolution.

The analogy indicates that the distantly related or totally unrelated animals develop similar adaptations for living in the same habitat. This is called adaptive convergence or convergent evolution.

The arm of a man; leg of a horse, wing of a bird or bat and flipper of a seal are the homologous organs. These are examples of divergent evolution. The wings of insects, birds, pterodactyl and bat are analogous organs, perform same function but their structure is entirely different. These are example of convergent evolution

- b. What is manure? How does green manure differ from biofertilizers?

[3]

Answer:

Manures are organic materials, added to the soil to increase crop productivity. Manures are three types: Farmyard manure, compost and green manure. Manure supply essential elements and humus to the soil. Green manure is prepared from the young green crop plants like Dhaincha, sunbemp etc. by ploughing them into the crop field to mix with the soil. They increase fertility of the soil and maintain aeration and hydration of the soil. On the other hand, biofertilizers are the micro-organisms, which cause enrichment of soil nutrients, maximize the ecological benefits and minimize environmental hazards. Biofertilizers are some bacteria, cyanobacteria and fungi.

- c. What is IPM? Give an example of bioinsecticides and bioherbicides and how do they help in pest control.

[3]

Answer:

Integrated Pest Management (IPM): IPM is a technique which integrates the various cultured and biological methods of pest control to ensure continued production of crops without the excessive use of pesticides. IPM approach is eco-friendly. Lady-bug and praying mantis are bioinsecticides can combat aphids. A toxin produce by a bacteria *Bacillus thuringiensis* kills the larvas of insects and pests. Cochineal insect is a bioherbicides which feed on weeds like opuntia. A fungus *Phytophthora palmivora* controls the growth of milkweed vines in citrus orchards.

Question: 10



a. What is mental illness? Explain any three methods of treatment of mental illness.

[4]

Answer:

Mental illness is characterized by abnormal behavior. A person is said to be mentally ill when he exhibits abnormal changes in the behavior and thinking, which causes embarrassment, suffering and distress to him and his family members.

The following method of the treatment of mental illness can be followed:

a. Psychotherapy: It is slow method of treating the mind involving patience and care. It involves understanding and coordinating with the patient and his problems.

b. Chemotherapy: It involves the use of tranquilizers to slow down the brain activity is very disturbed patients. Drugs are used in very acute cases of psychosis. In recent years, carefully monitored uses of tranquilizers have enabled patients to return home after many years of treatment in mental hospitals.

c. Antidepressants: They are also used to changes the mood of vary depressed patients. Their administration should be carried out only under the supervision of a skilled doctor.

b. What are Koch's postulates? Why are they not applicable to viruses?

[3]

Answer:

The Koch's postulates are as follows:

i. The organism must be regularly found in animals that the disease and must be absent in healthy individuals.

ii. The organism must be isolated and grown in pure culture on the artificial medium.

iii. The pure culture of the pathogen must produce the disease when injected into a susceptible animal.

iv. It should be possible by laboratory procedure to recover the injected pathogen from the experimentally infected animal.

There are some diseases in which all the four rules cannot applied. It is not possible to use a healthy human host to reproduce a disease for which there is no susceptible animal, for example typhoid fever. Koch's postulates are not applicable to virus or viral diseases as they cannot be cultured on artificial media.

c. Name the causative agent and the main symptom of each of the following diseases:

[3]

i. Filariasis,

ii. Rabies,

iii. Chicken pox

Answer:

Diseases	Causes agents	Symptoms
1.Filariasis	Wuchereria (bancrofti)	Enlargement of limbs, scrotum inflammation in lymph vessels and lymph gland fever with chills.
2.Rabies	Rabies virus	Fever, headache, pain in muscle and throat stiffness in neck and back
3.Chicken pox	Varicella Zoster	Rashes on body and turn pink spot and change to watery blisters and temperature slightly raised.

*** Out of syllabus. Answer will be provided up on request*

