

Inter (Part-II) 2014

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| Biology | | PAPER: II |
| Time: 20 Minutes | (OBJECTIVE TYPE) | Marks: 17 |

Note: Four possible answers, A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink. Cutting or filling two or more circles will result in zero mark in that question.

- 1-(i) **Maximum speed of nerve impulse transmission is:**
(a) 100 m/s (b) 110 m/s
(c) 120 m/s ✓ (d) 130 m/s
- (ii) **Genomic library is a collection of bacterial or bacteriophage:**
(a) Genotype (b) Genome
(c) Gene pool (d) Clones ✓
- (iii) **Vehicle for transport of male gamete in land plants is:**
(a) Water (b) Pollen tube ✓
(c) Pollen grain (d) Wind
- (iv) **Synapsis occurs during:**
(a) Pachytene (b) Leptotene
(c) Zygotene ✓ (d) Diplotene
- (v) **A diluted solution compared to the cell concentration is termed as:**
(a) Hypertonic (b) Hypotonic ✓
(c) Isotonic (d) Paratonic
- (vi) **Morphological characteristics of chromosomes are collectively called:**
(a) Holotype (b) Karyokinesis
(c) Karyotype ✓ (d) Neotype
- (vii) **Air in motion is called:**
(a) Atmosphere (b) Wind ✓
(c) Gas (d) Weather
- (viii) **Archaeobacteria can tolerate temperature:**
(a) 45 °C (b) 85 °C
(c) 100 °C (d) 120 °C ✓

- (ix) Desert ecosystem of Bhakkar and Mianwali is called:
(a) Thar (b) Thal ✓
(c) Cholistan (d) Rohi
- (x) Number of Ammonia molecules required to produce one molecule of urea is:
(a) 1 (b) 2 ✓
(c) 3 (d) 4
- (xi) Optimum temperature for growth of plants is:
(a) 30 – 40 °C (b) 25 – 30 °C ✓
(c) 10 – 20 °C (d) 20 – 40 °C
- (xii) Biome is a:
(a) Simple community
(b) Complex community
(c) Regional community
(d) Climax community ✓
- (xiii) Apoptosis is:
(a) Division of cells
(b) Death of cells by tissue damage
(c) Suicide of cells ✓
(d) Weakness of cell
- (xiv) All the genes found in a breeding population constitute:
(a) Genotype (b) Genome
(c) Gene frequency (d) Gene pool ✓
- (xv) Most efficient way of supporting the body is seen in:
(a) Fishes (b) Aves
(c) Reptiles (d) Mammals ✓
- (xvi) Reproduction is necessary for the survival of:
(a) Individual (b) Species ✓
(c) Community (d) Biome
- (xvii) Which one of the following is not a joint disease:
(a) Arthritis (b) Sciatica ✓
(c) Disc slip (d) Spondylosis

Inter (Part-II) 2014

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|------------------|-------------------|-----------|
| Biology | | PAPER: II |
| Time: 3.10 Hours | (SUBJECTIVE TYPE) | Marks: 83 |

SECTION-I

2. Write short answers to any EIGHT (8) questions: 16

(i) Compare osmoconformers and osmoregulators.

Ans Osmoconformers:

Animal body fluids are kept isotonic to the external environment even for marine saltwater environment. These animals thus do not require actively to adjust their internal osmotic state, so are known as osmoconformers.

Osmoregulators:

The animals whose body fluid concentrations differ noticeably the outside environment actively regulate to discharge excess water in hypotonic and excrete salts in hypertonic conditions therefore, are called as osmoregulators.

(ii) What are flame cells? Give their role.

Ans Tubular system of planaria is spread throughout the body and branches are capped by a cellular setup termed as flame cell. Each flame cell has a tuft of cilia, whose beating propels interstitial fluid into the tubular system.

(iii) What is extracorporeal shock wave lithotripsy?

Ans Extracorporeal shock wave lithotripsy involves high concentrations of X-ray or ultrasound are directed from a machine outside the body to the stone inside. The shock waves break the stone in tiny pieces or into sand, which are passed out of the body in urine.

(iv) How callus is formed?

Ans After hematoma formation, next "soft callus" begins to form in 3-4 weeks. Capillaries grow into the hematoma and clear up the debris. Fibroblasts and osteoblasts migrate into the fracture site and begin to construct bone.

(v) What is a synovial joint?

Ans **Synovial Joints:** These joints contain a cavity filled with fluid and are adapted to reduce friction between the moving joints. The joint is surrounded by a layer of connective tissue called "fibrous capsule" and their inner layer the synovial membrane. Some parts of capsule may be modified to form distinct ligament, holding the bones together.

(vi) What are sources of energy for muscle contraction?

Ans Energy for muscle contraction comes from the ATP. Supply of ATP is maintained by the aerobic breakdown of glucose in muscle cell, which comes from stored glycogen in the cell. When more energy is required due to high metabolism, it is provided by another energy storing substance called creatine phosphate. Sometime during oxygen deficiency or very high metabolic activity such as ATP requirement is met by anaerobic breakdown of glucose into lactic acid.

(vii) Give symptoms of aging.

Ans Loss of hair pigment, development of small pigmented areas in the skin of face and arms, dryness and wrinkling of skin, loss of agility, increased weight due to fat poor vision and forgetfulness, general weakness and decreased body immunity are symptoms of aging.

(viii) Describe causes and symptoms of Down's syndrome.

Ans **Causes:**

It is one of the consequences of autosomal non-disjunction in man, during which 21st pair of chromosome fails to segregate, resulting in gamete with 24 chromosome. When this gamete, fertilizes normal gamete the new individual will have 47 ($2n + 1$) chromosomes. Non-disjunction appears to occur in the ova and is related to the age of mother.

Symptoms:

The affected individuals have flat, broad face, squint eyes with the skin fold in the inner corner, and protruding tongue, mental retardation, and defective development of central nervous system.

(ix) Differentiate between apoptosis and necrosis.

Ans Internal programme of events and sequence of morphological changes by which cell commits suicide is collectively called as apoptosis.

In contrast to suicide, the cell death due to tissue damage is called necrosis, during which the typical cell swells and bursts, releasing the intracellular contents, which can damage neighbouring cells and cause inflammation.

(x) **State theory of special creation.**

Ans According to the theory of special creation, all living things came into existence in their present forms especially and specifically created by Nature.

(xi) **Describe membrane invagination hypothesis of eukaryotic cell evolution.**

Ans Hypothesis for the evolution of eukaryotic cells proposes that the prokaryotic cell membrane invaginated (folded inward) to enclose copies of its genetic material. This invagination resulted in the formation of several double-membrane – bound entities (organelles) in a single cell. These entities could then have evolved into the eukaryotic mitochondrion, nucleus, chloroplast, etc.

(xii) **What is modern synthesis?**

Ans The modern synthesis or Neo-Darwinism is called a synthesis because it integrated discoveries and ideas from many different fields, including paleontology, taxonomy, biogeography, and of course, population genetics. It involves the birth of population genetics, which emphasizes the extensive genetic variation within populations and recognizes the importance of quantitative characters.

3. Write short answers to any EIGHT (8) questions: 16

(i) **Differentiate between biorhythms and diurnal rhythms.**

Ans In living things, the behaviour activities occur at regular intervals which are called biorhythms or biological rhythms. Biorhythms may occur showing periodicity of about 24-hours. These are called circadian (Latin circa = about, dies = day) which means about one day, so they are also called diurnal rhythms.

(ii) **Give role of 2, 4 dichlorophenoxy acetic acid.**

Ans Selective weed killer: Kills broad leaved species (dicots). Used in cereal crops and lawns to eliminate weeds. Inhibits

sprouting of potatoes. Prevents premature fruit drop (retards abscission).

(iii) Write functions of photoreceptors and nociceptors.

Ans Photoreceptors: (Electromagnetic receptors), these respond to stimuli of light; for example, in eyes, rods and cones.

Nociceptors: (Undifferentiated endings) which produce the sensation of pain.

(iv) How identical twins and fraternal twins are produced?

Ans Identical twins:

Zygote after fertilization, undergoes cleavage (cell division by mitosis). When embryo is at two-celled stage, the two blastomeres, instead of remaining together, may separate and behave as two independent zygotes, each giving rise to a new individual. Both the organisms are products of mitosis. Thus, they have identical genetic make up and are called identical twins. They are produced mitotically (asexually).

Fraternal Twins:

These zygotes develop into new off-springs, but with different genetic combinations. Such a twins or triplets are called fraternal twins or triplets. They are produced sexually.

(v) Explain oestrous cycle.

Ans Oestrous cycle is a reproductive cycle found in all female mammals except human being. In this cycle, the estrogen production prepares the uterus for conception partly and also follicle develops ova. At this stage, female needs a physical stimulus of mating for ovulation. She exhibits the desire for mating or is said to be on "heat".

(vi) What is meant by lactation, how it is controlled?

Ans During placenta formation, pituitary gland produces luteotropic hormone (LTH). Placenta also secretes human placental lactogen. Both these hormones stimulate mammary development in preparation for lactation.

(vii) Differentiate between plasmides pSC 101 and pBR 322.

Ans pSC 101 has antibiotic resistance gene for tetracycline, whereas, pBR 322 has antibiotic resistance genes for tetracycline as well as ampicillin. Inserting gene of interest in tetracycline resistant gene of plasmid, pBR 322 would enable

separating out colonies of bacteria in a medium containing ampicillin and vice versa.

(viii) **What is probe? Give its use.**

Ans A probe is a single stranded nucleotide sequence that will hybridize (pair) with a certain piece of DNA. A particular probe can be used to search a genetic library for a certain gene. Location of the probe is possible because the probe is either radioactive or fluorescent.

(ix) **What is limnetic zone? Mention its life.**

Ans In this zone, enough light penetrates to support photosynthesis. Here, phytoplankton includes cyanobacteria (blue-green algae) which serve as producers. These are eaten by protozoa and small crustaceans, which in turn are consumed by fishes.

(x) **Give location of Tundra Ecosystem in Pakistan.**

Ans The location of Tundra Ecosystem in Pakistan is Mountains of Kara-Koram and Hindukush.

(xi) **Write four ways for energy conservation.**

Ans Here are some ways in which we can save energy:

- Develop and use energy efficient machines, engines and manufacturing processes.
- Reduce wastage by recycling.
- Drive less, walk and use public transport more.
- Switch off lights and electrical appliances, when they are not in use.
- Minimize the use of air-conditioner.

(xii) **Define population pressure. Give one example of its effect on ecosystem.**

Ans Many of the problems of the world are caused by or made worse by an increasing human population. More people, more agriculture and more industrialization is stressing the environment. Rapid population growth in less developing countries like Pakistan increases poverty and burdens on its limited resources. This is called population pressure.

As the human population increases, there is an increased demand for food. When humans need food, they convert natural ecosystem to artificially maintained agricultural

ecosystem. The natural mix of plants and animals are destroyed and replaced with species useful to humans.

4. Write short answers to any SIX (6) questions:

12

(i) Define point mutation.

Ans Point mutations are mutational changes which affect the message itself, producing alterations in the sequence of DNA nucleotide. If alterations involve only one or a few base pairs in the coding sequence, they are called point mutations. Sickle cell anemia and phenylketonuria are well-known examples of point mutation.

(ii) What is translation?

Ans The transfer of information from RNA to proteins, which occurs when the information contained in the mRNA is used to direct the synthesis of polypeptides by ribosomes is called translation. The nucleotide sequence of the mRNA is translated into an amino acid sequence in the polypeptide.

(iii) Define karyotype.

Ans The particular array of chromosomes that an individual possesses is called its karyotype. Karyotypes show marked differences among species and sometimes even among individuals of the same species.

(iv) Differentiate between gene and gene pool.

Ans Gene is the basic unit of biological information. In fact, DNA stores all sorts of biological information coded in the sequence of its bases in a linear order, and genes are actually parts of DNA comprising its base sequences.

All the genes/alleles found in a breeding population at a given time are collectively called the gene pool. It is the total genetic information encoded in the total genes in a breeding population existing at a given time.

(v) Compare monohybrids with dihybrids.

Ans After establishing 14 pure-breeding lines of seven characters, Mendel cross-fertilized plants that differed in one character only. The offspring of such a cross were called monohybrids.

After, plants were cross-fertilized, that differed in two characters. The offspring of such a cross, were called dihybrids.

(vi) Differentiate between homozygous and heterozygous.

Ans **Homozygous:** Being a homozygote having two identical alleles of the same gene. The term is usually applied to one or more specific loci as in "homozygous with respect to the locus W" (that is the genotype is W/W or w/w).

Heterozygous: Having two different alleles of the same genes. The term is usually applied to one or more specific loci as in "heterozygous with respect to the W locus" (that is the genotype is W/w).

(vii) Compare population with community.

Ans Population is a group of interbreeding individuals (same species) occurring together in space and time. Populations of plants and animals in the ecosystem do not function independently of each other. All population within an ecosystem are known as a community and are in one or another manner interconnected to one another.

(viii) Define biosphere.

Ans Biosphere is a thin layer of earth in which all living organisms exist. Organisms within the biosphere not only adapt themselves to the environment but also interact to modify and control chemical and physical conditions of the biosphere.

(ix) Differentiate between consumers and decomposers.

Ans Consumers are all the organisms, primarily animals, which obtain energy directly or indirectly from the producers as ready-made organic food. They are mainly heterotrophic organisms.

Decomposers are mainly the fungi and bacteria, which obtain their energy from the dead and decaying plants and animals. They release chemical elements as ion. The main chemical ions are nitrates, ammonia, phosphates, potassium and calcium.

SECTION-II

NOTE: Attempt any Three (3) questions.

5.(a) Write a note on osmoregulation in marine animals. (4)

Ans **Osmoregulation in Marine:**

Most marine invertebrates are osmoconformers. Among the vertebrates hagfishes are isotonic with the surrounding

sea's water. Most cartilaginous fishes maintain lower internal salt concentration than that of sea's water. Their kidneys for osmoregulation excrete salts through gills and also possess salt excreting organs such as rectal glands. These employ active transport mechanism to remove salt against osmotic gradient. Some fishes have relatively low salts in body fluids but have rendered these hypertonic to that of sea's water by retaining urea in adequate concentration. Because urea in high concentration is damaging so these fishes retain another chemical trimethylamine oxide for protection against urea. Bony fishes, the descendants of freshwater ancestors but later became marine constantly lose water from their hypotonic body fluids to hypertonic environments. These fishes have adapted themselves to drink large amount of sea's water and excrete concentrated urine resulting in maximum salt excretion and minimum water loss.

(b) Write a note on wildlife.

(4)

Ans **Wildlife:**

Wildlife refers to all non-cultivated plants and non-domesticated animals. Game animals and plants have been major source of food for humans. All living organisms are interdependent. There is a delicate balance between living organisms and environment. Man has been disturbing this balance since very long. Man's decisions regarding the usefulness or harmfulness of the wild life have led to severe disturbances in natural habitats. As a result, many animals and plants have either become extinct or else in their number as to be on the verge of extinction. These are known as the endangered species.

Today there are thousands of endangered plants and animals. Wildlife again is non-renewable resource. Water reserves where fishing is prohibited have also been set up to protect marine life. Rare species are sometime kept in zoo, where they can safely breed.

Wildlife plays very important role in food chain. Without these, the food chain can be disturbed to such an extent that it will be very difficult to maintain the balance. The effects of changes in the environment brought about by man are becoming more and more apparent with the passage of time.

He must keep the wild life balance, otherwise, it may also jeopardize his own existence.

6.(a) Describe the evidences of evolution from comparative anatomy. (4)

Ans **Comparative Anatomy:**

Anatomical similarities between species grouped in the same taxonomic category bring another support to the theory of the Descent with modification. For example, the same skeletal elements make up the forelimbs of human, cats, whales, bats, and all other mammals, although these appendages have very different functions. The basic similarity of these forelimbs is the consequence of the descent of all mammals from a common ancestor. The arms, wings, flippers, and forelegs of different mammals are variations on a common anatomical theme that has been modified for divergent functions. Similarity in characteristics resulting from common ancestry is known as homology, and such anatomical signs of evolution are called homologous structures.

Homologous organs are functionally different but structurally alike e.g., Fore limbs of man, bat, horse, whale, etc. are example of divergent evolution. Analogous organs are functionally alike but structurally different e.g., wings of bat, birds and insects etc. are examples of convergent evolution.

Comparative anatomy supports that evolution is a remodeling process in which ancestral structures that functioned in one capacity become modified as they take on new functions. The flower parts of a flowering plant are homologous. They are considered to have evolved from leaves, to form sepals, petals, stamens and carpels.

The oldest homologous structures are vestigial organs, rudimentary structures of marginal, if any, use to the organism. Vestigial organs are historical remnants of structures that had important functions in ancestors but are no longer essential presently. For instance, the skeletons of whales and some snakes retain vestiges of the pelvis and leg bones of walking ancestors, vermiform appendix in carnivores, ear muscles in man, etc.

(b) Give an account of paratonic movements in plants.(4)

Ans **Paratonic Movements:**

These movements are due to external causes. These are of following types:

(a) Tropic Movements:

The word tropic is derived from Greek word 'Tropos' meaning 'turn'. It is the movement in curvature of whole organ towards or away from stimuli such as light, gravity and touch.

Following are common tropic movements:

- (i) **Phototropism:** It is the movement of part of plant, in response to stimulus of light and is caused by the differential growth of part of a plant like stem or root.
- (ii) **Thigmotropism:** It is the movement in response to stimulus of touch, for example climbing vines. When they come in contact with some solid object, the growth on the opposite side of contact increases and the tendril coils around the support.
- (iii) **Chemotropism:** The movement in response to some chemicals is called chemotropism. The hyphae of fungi are chemotropic.
- (iv) **Hydrotropism:** The movement of plant parts in response to stimulus of water is called hydrotropism. The growth of roots toward water is due to positive hydrotropism and growth of shoot away from water is negatively hydrotropic.
- (v) **Geotropism:** It is the response to gravity. Roots display positive geotropism and shoots negative geotropism.

(b) Nastic Movements:

These are the non-directional movements of parts of plant in response to external stimuli.

These are of two types:

- (i) **Nyctinasty:** The nyctinastic movements are shown by the organs in response to external stimuli leading to differential growth. These are due to turgor and growth changes.

It may be of two types:

- a) **Photonasty:** The principal stimulus is the photoperiod. The flowers open and close due to light intensity.
 - b) **Thermonasty:** It is due to temperature. The flowers of tulip close at night because of rapid growth in the lower side by upward and inward bending of the petals.
- (ii) **Haptonastic:** These movements occur in response to contact. Examples include the action of the Venus fly trap.

7.(a) Define and explain "Nerve Impulse".

(4)

Ans Nerve Impulse:

Nerve impulse is a wave of electrochemical changes, which travels along the length of the neuron involving chemical reactions and movement of ions across the cell membrane. Electrical potential is a measure of the capacity to do electrical work. It represents a type of stored energy which is manifested during separation of charges across a barrier. In the case of neuron, the charges are positive and negative ions, and the charge separating barrier is the plasma membrane. The electrical potential that exists across a cell membrane is known as membrane potential. A typical neuron at rest is more positive electrically outside than inside the cell membrane. This net difference in charge between the inner and the outer surface of a non-conducting neuron is called the resting membrane potential. The major factors which are involved in resting membrane potential are:

1. **Sodium and potassium ions:**

Of the many kinds of ions present in the nerve cells and the surrounding fluid, sodium (Na^+) and potassium (K^+) ions are the most important. Sodium ions are tenfold higher in concentration outside than inside the membrane surface, whereas potassium ions are twenty times more concentrated inside than outside. All the neurons have very active sodium and potassium pumps located in their cell membranes. Driven by the splitting of ATP, these pumps transport Na^+ out and K^+ into the cell, both against their respective concentration gradients. For every two K^+ that are actively transported inward, three Na^+ are pumped out. So inside becomes more negative than the outside of the cell membrane of neurons.

2. **Negative organic ions:**

The large negative organic ions (such as proteins, organic acids, etc.) are much more inside the membrane than outside, where they are only in negligible concentration. This makes the inside of neuron membrane more negative.

3. **Leakage of K^+ ions from neurons:**

The cell membrane is virtually impermeable to all ions except K^+ . Since the membrane is slightly permeable to K^+ , some of it leaks out of the cell. The loss of this positive ion from

the neuron by diffusion accounts for more negative⁻ charges inside than outside the cell membrane of neuron.

4. No conduction of nerve impulse.
5. **Membrane potential of -0.07 volts (-70 mV) exists.**

Initiation of nerve impulse:

Under normal conditions, a nerve impulse is initiated by an appropriate stimulus (called threshold stimulus) applied at one end of the neuron and it results in a remarkable localized change in the resting membrane potential. It disappears for a brief instant and is replaced by a new potential called action or active membrane potential which is in the form of impulse. During this state, the inner membrane surface becomes more positive than the outside. This change is so brief (for perhaps a millisecond) that only a portion of the neuron is in the active membrane potential state.

The major factors involved in changing the resting membrane potential to active membrane potential are:

1. Na^+ and K^+ ions movement:

The passage of nerve impulse is associated with increase in permeability of Na^+ ions moving inwards upsetting the potential momentarily, making the inside more positive than outside. Neurophysiologists believe that the increased permeability is due to the opening of specific pores in the membrane, termed "sodium gates". When these gates open, sodium ions rush into the neuron by diffusion. Some K^+ moves out.

2. Charges are reversed:

The inner side of the cell membrane has excess of positive ions (thus positive charges) at its internal surface, and the outer surface becomes more negative.

3. Passage of nerve impulse:

During active membrane potential, the neuron conducts the impulse in the form of nerve impulse.

4. Membrane potential:

Active membrane potential of $+0.05$ volts ($+50$ mV) exists.

These changes occur along the length of neuron till the impulse reaches synapse. Soon after passage of the impulse, the resting membrane potential is restored by the movement of

a small number of ions especially K^+ moving out. This neuron now is ready to conduct another impulse.

(b) Write a short note on "Grazing". (4)

Ans Many animals like rabbits, goats, sheeps, cows, buffaloes and horses feed on grasses. This mode of feeding is called grazing and these animals are called grazers. These animals live in pastureland where they feed on grasses, herbs and shrubs. If too many animals are kept on pasture, they eat the grasses down to the root though grasses are more resistant than herbaceous plants and have ability to regrow very fast, but the hooves of grazing animals trample the soil into hard layer as a result of which rain water will not penetrate this soil. It runs off from the upper surface removing the topsoil with it. The final result of over-grazing is totally barren land. Grazing is very important factor in determining the ecosystem. Moderate grazing is very helpful to maintain grassland ecosystem. It destroys the competitors and helps the grass to grow well. Over-grazing may lead to the transformation of a grassland into a desert.

8.(a) Give an account of sexually transmitted diseases in man. (4)

Ans Unhealthy attitudes and low moral values sometimes lead to serious complication. The carrier may transmit this disease to their healthy partners.

(i) **Gonorrhoea:**

It is caused by a gram positive bacterium *Neisseria gonorrhoeae*, mainly affecting the mucous membrane of urinogenital tract. New born infants may acquire serious eye infections if they pass through the infected birth canal. It is highly contagious through sexual contacts.

(ii) **Syphilis:**

It is caused by a spirochaete, *Treponema pallidum*. It damages the reproductive organs, eye bones joints, central nervous system, heart and skin. Sexual contact is the major source of its dissimulation.

(iii) **Genital Herpes:**

It is caused by a herpes simplex type 2 virus, most frequently transmitted by sexual contact causing infection of the

genitalia. It produces genital soreness and ulcers in the infected areas. In infected pregnant women, virus can be transmitted to infant during birth, causing damage to eyes and CNS of the infant.

AIDS (Acquired Immune Deficiency Syndrome):

Sexual contact is one of the major sources of its spread.

(b) Explain double helical structure of DNA. (4)

Ans Learning informally of Franklin's results, before they were published in 1953, James Watson and Francis Crick, two young researchers in University of Cambridge, quickly worked out a likely structure of the DNA molecule. They proposed that molecule is a simple double helix, with the basis of two strands pointed inward toward each other, forming base-pairs. In their model, base pairs always consist of purines, which are large, pointing toward pyrimidines which are small, keeping the diameter of the molecule a constant 2 nm. Because hydrogen bonds exist between the bases in a base pair, the double helix is stabilized as a duplex DNA molecule composed of two antiparallel strands, one chain running 3' to 5' and the other 5' to 3'. The base pair are planar (flat) and stack 0.34nm apart as a result of hyperphobic interactions contributing to the overall stability of the molecule. In the double helix, adenine forms two hydrogen bonds with thymine, while guanine forms three hydrogen bonds with cytosine. Adenine will not form proper hydrogen bonds with cytosine and guanine will not form hydrogen bonds with thymine. Consequently, adenine and thymine will always occur in the same proportion in any DNA molecule, as well guanine and cytosine, because of this base pairing.

9.(a) Write a note on abnormal development. (4)

Ans **Abnormal Development:**

Sometimes, under unfavourable conditions, some parts of the body show abnormal development. Teratology is the branch of biology, which deals with these abnormal developments and their causes. Anything which interferes with the normal process of development is the factor causing abnormalities.

The normal process of development is disturbed by abnormalities inherited from parents, abnormalities due to

chromosomes or genes, environmental factors or metabolic defect.

Abnormalities are inherited from parents through abnormal or defective gene(s). Abnormality of development is also related to the presence of defective gene(s) on sex chromosomes e.g., in haemophilia only males suffer from this disease. It again, depends whether the gene is dominant or recessive, homozygous or heterozygous.

Chromosomal abnormalities result when one of the sex chromosomes (x or y) is missing or extra and these abnormalities lead to syndromes. Klinefelter's Syndrome (xxy) is an example of trisomy of the sex chromosome while Turner's Syndrome (xo) is the condition in which one of the sex chromosomes is missing. Another condition, xyy leads to tallness, aggressiveness, mental defect and antisocial behavior. These abnormalities arise during the formation of gametes, when these gametes unite to form zygote.

Environmental factors causing or contributing to abnormal development are grouped together as teratogens. Ionization radiations (x rays) are well-known for their teratogenic action. Because, they often have their effect on the developing ovum or spermatozoan, causing damage or changes (mutations) in the genes. Nutritional deficiencies, absence of certain substances (e.g., vitamins and trace elements), toxins and drugs even ingested by mother, affect the differentiation of every tissue in the foetus. If such deficiency is high, a cell may cause death of foetus.

Metabolic defects lead to structural deviations from the normal. During organogenesis, when various body organs are formed, sometimes, one organ or its part is missing or it is repeated and it can result into abnormal organs or body parts and the individual born is malformed.

In microcephaly, the individuals are born with small skull. Individuals with cleft palate have their upper lip folded or the individual has harelip. In abnormal conditions of the fingers in hand or feet are more or less than five.

(b) Describe the genetics of colour-blindness in humans.

Ans Genetics of colour-blindness:

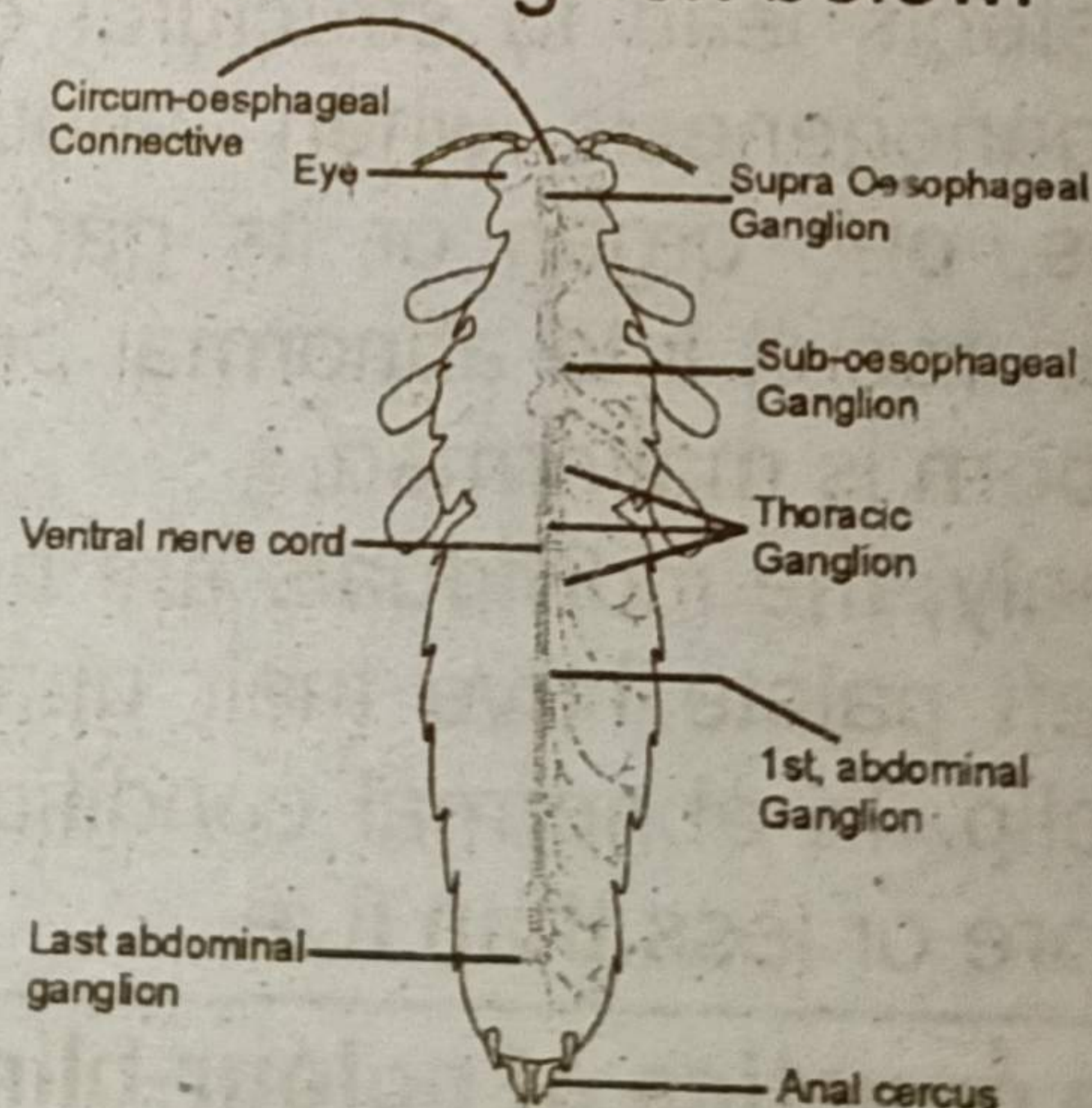
Normal trichromatic colour vision is based on three different kinds of cone cells in the retina, each sensitive to only one of the three primary colours, red, green or blue. Each type of cone cell has specific light absorbing proteins called opsins. The genes for red and green opsins are on X chromosome, while the gene for blue opsin is present on autosome 7. Mutations in opsin genes cause three types of colour-blindness. A dichromat can perceive two primary colours but is unable to perceive the one whose opsins are missing due to mutation. Protanopia is red blindness, deuteranopia is green blindness, while tritanopia is blue blindness. Some people can detect red and green but with altered perception of the relative shades of these colours. They have abnormal but still partially functional opsins. They are protanomalous and deuteranomalous for red and green weakness respectively. A monochromat can perceive one colour. Monochromacy is true colour-blindness. Blue cone monochromacy is an X-linked recessive trait in which both red and green cone cells are absent. That is why it is also called red-green colour-blindness. It is a common hereditary disease. Like any sex-linked recessive trait, it also zigzags from maternal grandfather through a carrier daughter to a grandson. It never passes direct from father to son. This type of colour-blindness is more common in men than women, because chances for a male to be affected by it are much more than a female.

SECTION-III (Practical Part)

NOTE: Attempt any Three (3) questions.

(A) Sketch and label the nervous system of cockroach.(5)

Ans Diagram of cockroach is given below:



(B) Draw the labeled diagram of fore-limb of frog. (5)

Ans Diagram of fore-limb of frog is given below:

Fore-limb of Frog

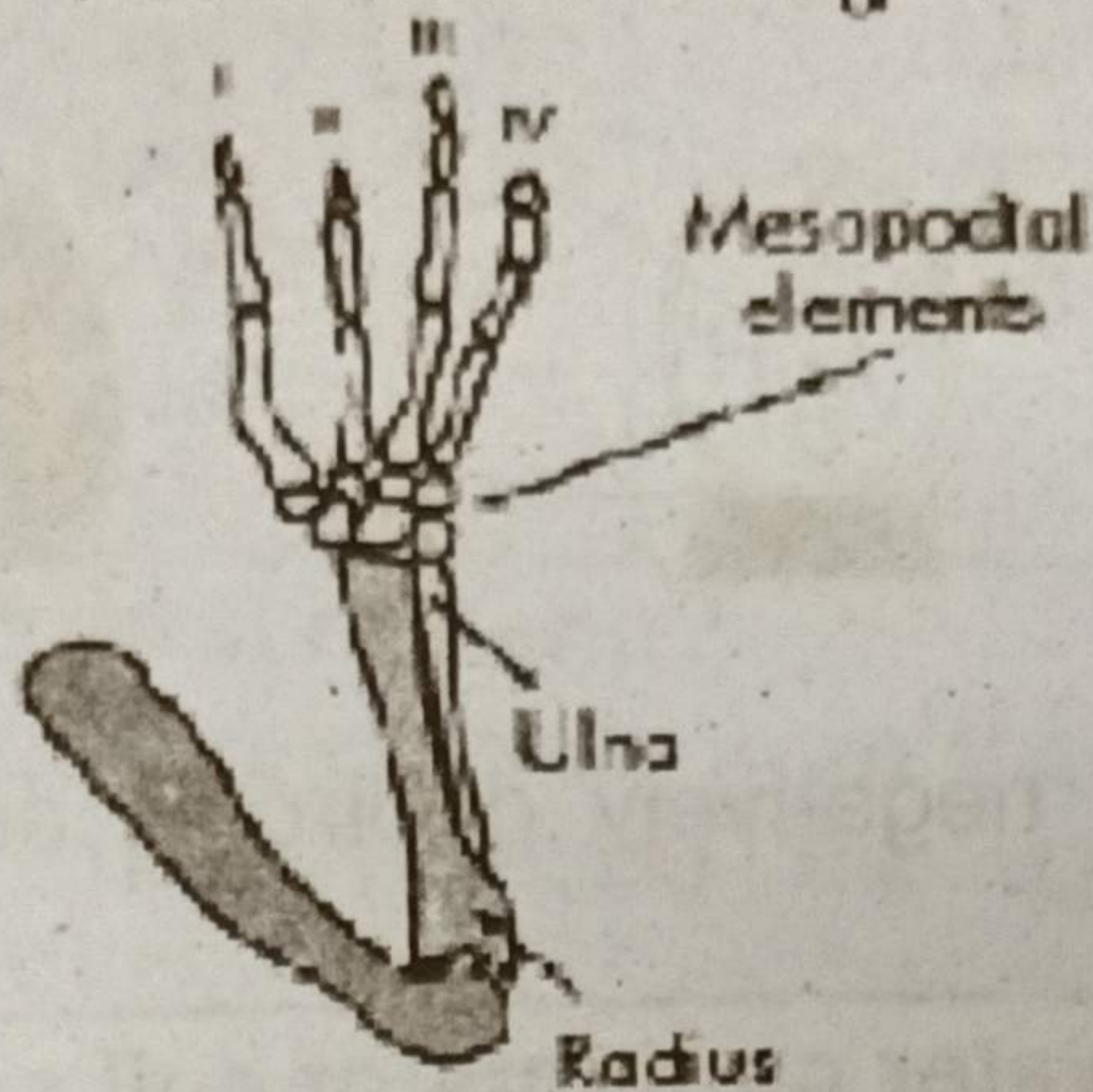


Fig Fore-limb

(C) Write a brief procedure for demonstration of geotropism, supposed observations and results.

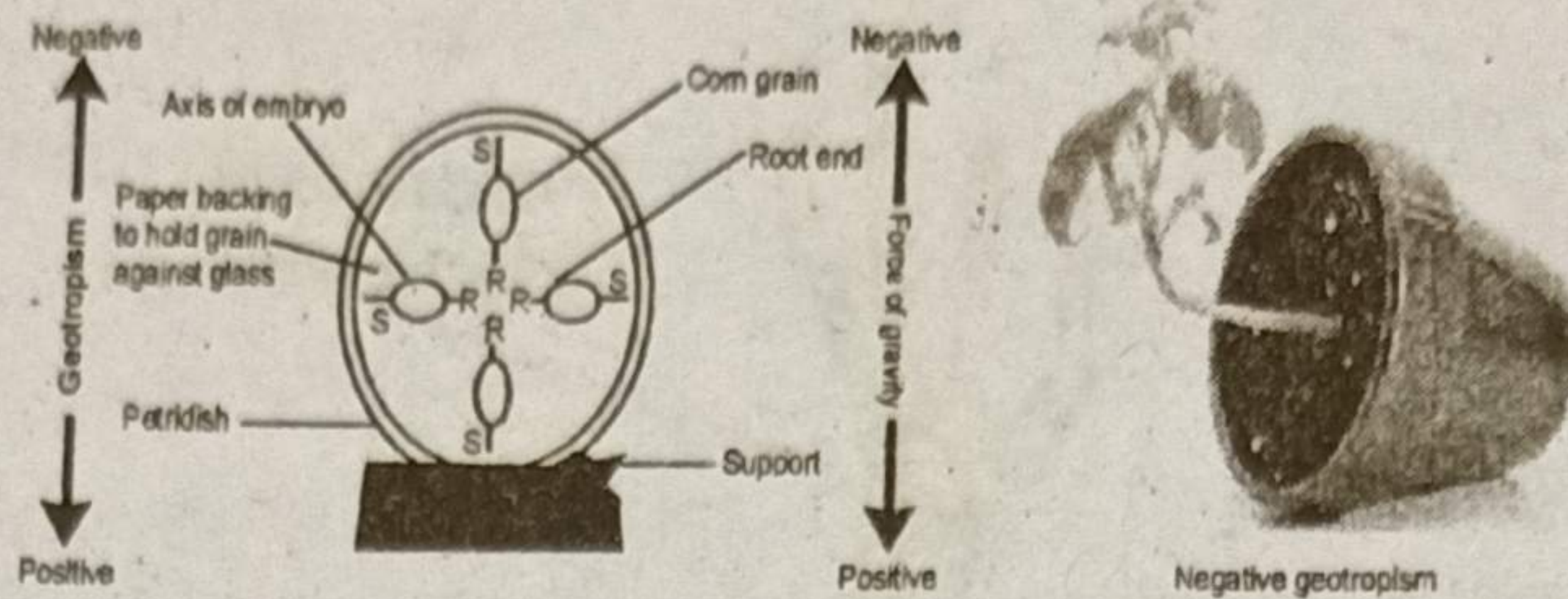
(5)

Ans Procedure:

1. Take a petridish and an ink marker.
2. Draw two intersecting lines on the bottom of the petridish.
3. Place four soaked corn grains, one on each radius of the petridish, with their pointed ends directed towards the center and the broader ends towards outside as shown in the figure.
4. Cover the grains with the filter paper, keeping in mind that the paper should fit tightly in petridish.
5. Place cotton on the paper and sprinkle a little water on it and cotton.
6. Close the dish and seal it with the strips of cellophane tape.
7. Make the dish to stand on its edge with the help of clay in such a way that one grain lies above, one lies below and two lie at the sides.
8. Place this set up in the laboratory for 3-4 days.

Observations:

After 3-4 days, the shoot of all the seedlings have grown upwards and the roots downwards.

**Result:**

The shoot is negatively geotropic and root is positively geotropic.

(D) Investigate water contents of soil samples. (5)**Ans** Material:

Aluminum foil dish or evaporating basin (or crucible), Balance with weight box, Oven; Water bath, Beakers, Desiccator, Bunsen burner or spirit lamp, Tripod stand, Wire gauze; Tongs.

Methods:

1. Take an evaporating dish or tray and weigh it (a).
2. Place the soil sample in the tray and reweigh it (b).
3. Now place the tray containing wet soil sample in oven at 100°C for about 24 hours.
4. Remove the sample from the oven and cool in a desiccator.
5. Re-weight the oven dried soil along with tray (c).
6. The percentage of moisture or water in the soil sample is calculated.

Observations and Calculations:

| | |
|-------------------------------------|--|
| Weight of tray | = a gm 10 gm |
| Weight of tray + wet soil | = b gm 50 gm |
| Weight of tray + oven dried soil | = c gm 46 gm |
| Weight of wet soil | = b - a = d gm 40 gm |
| Weight of dry soil | = c - a = e gm 46 - 10 = 36 gm |
| Amount of moisture | = d - e = f gm 40 - 36 = 4 gm |
| %age of moisture in the soil sample | = $100 \times \frac{4}{40} \times 100$ |
| | = 11.1 % |

(E) Write the short answers of the following questions:(5)

- (i) Differentiate between sensory and motor nerves.

Ans

| Sensory nerves | Motor nerves |
|---|---|
| Sensory nerves are the bundles of axons or dendrites bounded by connective tissue. They take the impulse from receptors to the brain. | Motor nerves are the bundles of axons or dendrites bounded by connective tissue. They take the impulse from the brain to effectors. |

(ii) **What is vertebral column?**

Ans → Vertebral column extends from the skull to the pelvis to form backbone, which protects the spinal cord. Vertebral column has 4 curvatures and 33 vertebrae.

(iii) **From which part of the seed, root is developed?**

Ans → Root develops from the radical which is the part of seed.

(iv) **What are abiotic components of an ecosystem?**

Ans → Abiotic components include all non-living components air, water and soil.

(v) **Define incubation.**

Ans → When an egg has been laid, the development ceases unless the temperature of egg is kept nearly up to the body temperature of the mother, which is called incubation.