

Inter (Part-II) 2016

Biology		Group-II	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 in the answer book. Cutting or filling two or more circles will result in zero mark in that question.

- 1-1- For the formation of fragmoplast, the vesicles originate from:
 - (a) Endoplasmic reticulum
 - (b) Golgi complex ✓
 - (c) Chloroplast
 - (d) Mitochondria
- 2- A group of inter-breeding individuals, belonging to same species and sharing a common geographic area, is called:
 - (a) Community
 - (b) Biome
 - (c) Population ✓
 - (d) Ecosystem
- 3- Which of the following is a bone of axial skeleton:
 - (a) Humerus
 - (b) Femur
 - (c) Tibia
 - (d) Rib ✓
- 4- Lichens are an example of:
 - (a) Parasitism
 - (b) Mutualism ✓
 - (c) Predation
 - (d) Commensalism
- 5- The plant hormone that inhibit the growth of lateral shoots:
 - (a) Cytokinin
 - (b) Gibberellin
 - (c) Auxin ✓
 - (d) Ethene
- 6- Which of the following biomes is increased by human activities:
 - (a) Grassland
 - (b) Desert ✓
 - (c) Coniferous forest
 - (d) Savana
- 7- Which one of the following is a type of asexual reproduction:
 - (a) Fertilization
 - (b) Vernalization
 - (c) Apomixes ✓
 - (d) Photoperiodism

- 8- Urine leaves the kidney through a duct called:
(a) Urethra (b) Pelvis
(c) Ureter ✓ (d) Nephron
- 9- The gene that triggers developmental process towards maleness, is:
(a) tfm (b) SRY ✓
(c) MODY (d) BOB
- 10- *Thermus aquaticus* is a / an:
(a) Fungus (b) Protozon
(c) Alga (d) Bacterium ✓
- 11- Which of the following is a "Start" codon:
(a) AUG ✓ (b) UAA
(c) UAG (d) UGA
- 12- Bundle caps in sunflower stem, are formed by:
(a) Sclerenchyma ✓ (b) Parenchyma
(c) Mesenchyma (d) Collenchyma
- 13- Towards the end of pregnancy, the reduction in progesterone level, stimulates pituitary gland to produce:
(a) Oxytocin ✓ (b) Oestrogen
(c) Androgen (d) Prolactin
- 14- Nissl's granules are groups of:
(a) Mesosomes (b) Lysosomes
(c) Ribosomes ✓ (d) Chromosomes
- 15- In which stage of prophase-I, crossing over occurs:
(a) Leptotene (b) Zygotene
(c) Pachytene ✓ (d) Diplotene
- 16- Environmental buffer is a:
(a) Desert (b) Grassland
(c) Community (d) Forest ✓
- 17- Contractile vacuoles are found in:
(a) Plants (b) Freshwater protozoa ✓
(c) Terrestrial animals
(d) Marine plants

Inter (Part-II) 2016

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

SECTION-I

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

(i) Name the unpaired facial bones.

Ans The unpaired facial bones are mandible and vomer.

(ii) Differentiate between osmoconformers and osmoregulators.

Ans 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.

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.

(iii) What is lithotripsy?

Ans The kidney stones have been removed by kidney surgery. Presently, lithotripsy is used for non-surgical removal of kidney stone. It is the technique used to break up stones that form in the kidney, ureter or gall bladder. There are several ways to do it, although the most common is extracorporeal shock wave lithotripsy.

(iv) Differentiate between photonasty and thermonasty.

Ans Photonasty:

1. The principal stimulus is the photoperiod.
2. The flowers open and close due to light intensity.

Thermonasty:

1. It is due to temperature.
2. The flowers of tulip close at night because of rapid growth in the lower side by upward and inward bending of the petals.

(v) **What are heat shock proteins?**

Ans Most plants have adapted to survive in heat stress as the plants of temperate regions face the stress of 40°C and above temperature. The cells of these plants synthesize large quantities of special proteins called heat-shock proteins. These proteins embrace enzymes and other proteins thus help to prevent denaturation.

(vi) **What is hematoma formation?**

Ans **Hematoma formation:**

When a bone breaks, the blood vessels in the bone itself, and perhaps in surrounding are torn resulting hemorrhage. As a result, a hematoma, a mass of clotted blood, forms at the fracture site. Soon after, bone cell deprived of food begin to die and the tissue at the fracture site becomes swollen and hence painful.

(vii) **What is discoidal cleavage?**

Ans In bird's egg, the process of cell division is confined to the small disc of protoplasm lying on the surface of the yolk at the animal pole. This type of cleavage is referred as **discoidal cleavage**.

(viii) **Differentiate between apical meristem and lateral meristem.**

Ans **Apical Meristem:**

The apical meristems are found at the tips of roots and shoot and are primarily concerned with the extension of plant body. These are perpetual growth zones found at the apices of roots and stems. They are responsible for increase in the number of cells at the tips of roots and stem, so they play important role in primary growth.

Lateral Meristems:

Lateral meristems are cylinders of dividing cells. They are present in dicots and gymnosperms. Vascular and cork cambium are the examples of lateral meristem. They play an important role in the increase in diameter of stem and root and in secondary growth are determinate i.e., they grow to certain size and then stop e.g., leaves, flowers and fruits; while others are indeterminate i.e., they grow by meristems that continually replenish themselves, remaining youthful e.g., vegetative root and stem.

(ix) What is mitotic apparatus?

Ans The specialized microtubule structure including aster and spindle is called mitotic apparatus.

(x) What is metastasis?

Ans In contrast, the cells composing a malignant tumor or cancer, divide more rapidly, mostly invade surrounding tissues, get into the body's circulatory system, and set up areas of proliferation, away from their site of original appearance. This spread of tumor cells and establishment of secondary areas of growth is called as **metastasis**.

(xi) What is genetic drift?

Ans It is the change in frequency of alleles at a locus that occurs by chance. In small populations, such fluctuations may lead to the loss of particular alleles. This may occur in a small population when a few individual fail to reproduce and then genes are lost from the population.

(xii) Name any four animals, declared extinct in Pakistan.

Ans In Pakistan, following four animals, declared extinct:
1. Cheetah 2. Tiger 3. Asian lion 4. Indian rhino

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

(i) Define diurnal rhythms. How they are different from circannual rhythms?

Ans

Diurnal Rhythms	Circannual Rhythms
If biorhythms are of about one day, these rhythms in activity are called diurnal.	If biorhythms are of about 365 days, these rhythms in activity are called circannual.

(ii) Write commercial application of cytokinins.

Ans Cytokinins delay aging of fresh leaf crops, such as cabbage and lettuce (delay of senescence) as well as keeping flowers fresh. They can also be used to break dormancy of some seeds.

(iii) What are effectors? Give their types.

Ans These are the structures which respond when they are stimulated by impulse coming via motor neuron. The principal effectors are glands, which respond by secreting, and muscles which respond by contracting.

Following are the types of effectors:

1. Reflex arc
2. Nerve impulse
3. Synapse

(iv) **Describe 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".

(v) **Differentiate between oviparous and viviparous animals.**

Ans In terrestrial conditions, fertilization is internal. Sperms are lodged in the female body where fertilization occurs. This may lead to external development as in reptiles and birds. They lay shelled eggs to protect the developing embryo from harsh terrestrial conditions. Such animals are called oviparous.

In mammals, internal fertilization leads to internal development and development of embryo is accomplished inside the female body, which gives birth to young one. Such animals are called viviparous.

(vi) **What is haploid parthenogenesis? Give one example.**

Ans The eggs may be fertilized or may not be fertilized from the stored sperms. The haploid egg develop into haploid offspring, it is called haploid parthenogenesis. e.g., in aphids, diploid parthenogenesis may occur, in which the egg-producing cells of the female undergo a modified form of meiosis involving total non-disjunction of the chromosomes, they retain the diploid number of chromosome. Egg (diploid) develops into young females.

(vii) **What are palindromic sequences? Give their significance.**

Ans Bacteria produce a variety of such restriction enzymes, which cut the DNA at very specific sites characterized by specific sequence of four or six nucleotides arranged symmetrically in the reverse order. Such sequences are known as palindromic sequences.

(viii) **Define genomic library.**

Ans A genomic library is a collection of bacterial or bacteriophage clones, each clone containing a particular segment of DNA from the source cell. For making a genomic library, an organism's DNA is simply sliced up into pieces, and

(ii) What is heterochromatin and euchromatin?

Ans Highly condensed portions of the chromatin are called heterochromatin. Some of these portions remain permanently condensed, so that their DNA is never expressed. The remainder of the chromosome called euchromatin.

(iii) What are Okazaki fragments?

Ans In contrast, the lagging strand which elongates away from the replication fork, is synthesized discontinuously as a series of short segments that are later connected. These segments, called Okazaki fragments.

(iv) Name types of RNA.

Ans The class of RNA found in ribosome is called ribosomal RNA (rRNA). During translation, rRNA provides the site where polypeptides are assembled. In addition to rRNA, there are two other major classes of RNA in the cells: transfer RNA (tRNA) and messenger RNA (mRNA). Transfer RNA molecules transport the amino acids to the ribosomes for use in building the polypeptides and also position each amino acid at the correct place on the elongating polypeptide chain. Human cells contain about 45 different kinds of tRNA molecules. Messenger RNA are long strands of RNA that are transcribed from DNA and that travel to the ribosomes to direct precisely which amino acids are assembled into polypeptides.

(v) What is Bombay Phenotype?

Ans The expression of ABO blood type antigens by I^A or I^B gene depends upon the presence of another gene H. The recessive allele h cannot insert sugar molecule to glycoprotein. Therefore, hh individuals lack the site of attachment for antigen A or antigen B. Thus A and B antigens cannot adhere to their RBC and fall away. Their RBC lack A and B antigens although they do not lack I^A and I^B genes. They are phenotypically like O, but are not genotypically O. Their phenotype is called Bombay phenotype.

(vi) What is MODY?

Ans MODY is known as Maturity Onset Diabetes of the Young.

pieces are put into vectors (*i.e.*, plasmids or viruses) that are taken up by host bacteria. The entire collection of bacterial or bacteriophage clones that result contains all the genes of that organism.

(ix) Write down the types of living organisms found in limnetic zone.

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) Differentiate between climate and weather.

Ans Life on earth, specially on land, is affected by both weather and climate.

Weather refers to short-term fluctuations in temperature, humidity, cloud cover, wind and precipitation over periods of hours or days. Climate, in contrast, refers to overall patterns of weather that prevail from year-to-year even century-to-century in a particular region.

(xi) Define renewable and non-renewable resources.

Ans Air, water, food, land, forests and wild life are renewable resources because they are never depleted. They are recycled in nature.

Non-renewable resources include various metals, non-metallic minerals and fossil fuels (coal, oil and natural gas). These resources are exhaustible and once consumed cannot be replaced.

(xii) Write names of diseases caused due to nutritional deficiency.

Ans Following are the names of diseases caused due to nutritional deficiency:

Scurvy, beriberi, anaemia, goiter, Kwashiorkor.

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

12

(i) What is sickle cell anaemia?

Ans In sickle cell anaemia, a point mutation leads to the change of amino acid glutamic acid into valine at position 6 from N terminal end in haemoglobin β chain. This consequently alters the tertiary structure of the haemoglobin molecule, reducing its ability to carry oxygen.

(vii) What is predation? Give its significance.

Ans - An animal that preys on other animals is a predator. A predator is a consumer. The animal that is caught and eaten is the prey. The overall process is called predation.

The sizes of populations of predator and prey are related to each other. The size of each population is determined by the size of the other. If the number of prey is large, this leads to an increase in the number of predators, as predator feeds upon the prey, the number of prey begins to fall.

(viii) Define autecology with the help of an example.

Ans A single population's relationship to its environment is called as autecology. For example, we studying 50 to 100 plants of soybean in order to know the effect of water pollution on their growth and yield, when we studying the single or one population of soybean plant, this study is autecology.

(ix) Define succession.

Ans Succession is a sequence in the community structure of an ecosystem over a period of time. Community changes alter the ecosystem in ways that favours the competitors and species replace their predecessors in somewhat predictable manner until a stable, self-sustaining climax community is reached.

SECTION-II

NOTE: Attempt any Three (3) questions.

Q.5.(a) Discuss secretion in cockroach.

(4)

Ans Terrestrial arthropods particularly in the insects, the excretory structures are adapted to collect excretory products from haemolymph in sinuses through suspended tubular structures called Malpighian tubules. These Malpighian tubules remove nitrogenous waste from the haemolymph. These are the only excretory structures in animal kingdom that are associated with digestive tract. The epithelial lining of the tubules transports solutes including salts and nitrogenous waste from haemolymph into tubules lumen. Fluid then passes to hind gut into the rectum. Rectum reabsorbs most of the salts and water, thus nitrogenous wastes are excreted as solid excreta, in the form of uric acid crystals along the faeces. This kind of adaptation in excretion is the success of these animals on land with acute shortage of water.

(b) Write a note on wild life.

(4)

Ans For Answer see Paper 2014, Q.5.(b).

Q.6.(a) Write note on human appendicular skeleton.

(4)

Ans The appendicular skeleton consists of pectoral girdle and appendages (fore limbs), and pelvic girdle and appendages (hind limbs).

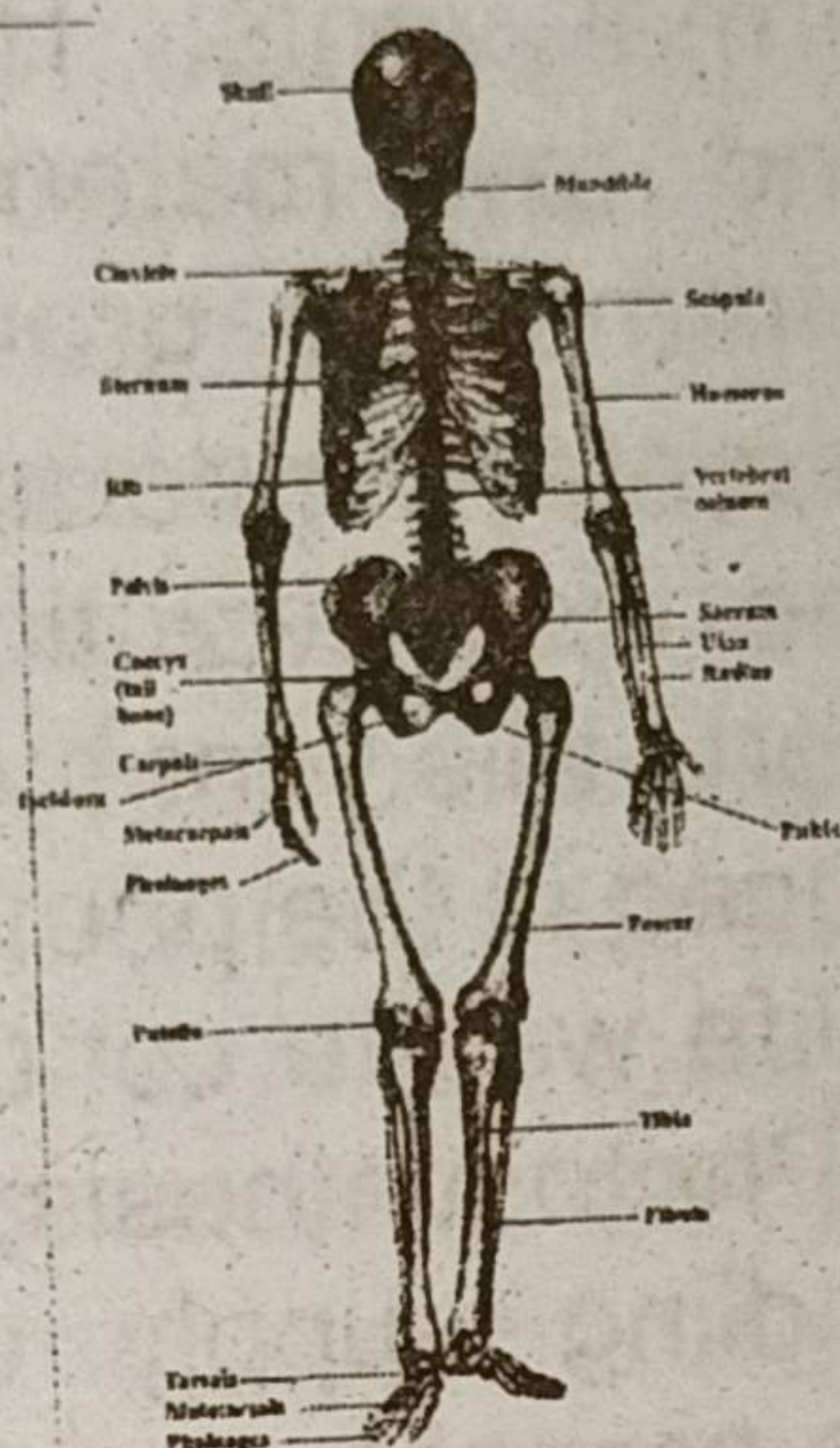


Fig. Human skeleton.

Pectoral Girdle and Fore Limb:

Pectoral girdle comprises scapula, suprascapula, and clavicle. The clavicle connects scapula with sternum.

The fore limb consists of humerus, radius and ulna, 8 carpals, 5 metacarpals and 14 phalanges.

Humerus forms ball and socket joint with scapula, while at distal end humerus forms hinge joint with radius and ulna. The radius and the ulna at their distal end form multistage joint with eight wrist bones called carpals. Five metacarpals form the framework of palm of the hand. Five rows of the phalanges are attached to the metacarpals. They support the fingers.

Pelvic Girdle and Hind Limb:

Pelvic girdle attaches the hind limb to the vertebral column. It consists of two coxal bones. Each is formed by the fusion of three bones ilium, ischium and pubis. The pelvic girdle supports the pelvic region.

The hind-limb consists of 1 femur, 2 tibia and fibula, 7 tarsals 5 meta-tarsals and 14 phalanges. Femur is the proximal bone which forms a hip joint with the hipbone, it is a ball and socket joint. At the distal end, the femur forms knee joint with the proximal end of two parallel bones called tibia and fibula. The distal end of the tibia and fibula forms a joint with eight

tarsals, which are also distally attached to five metatarsal bones of ankle. Five rows of the fourteen phalanges of the toes are attached to metatarsals.

(b) Explain evolution from prokaryotes to eukaryotes (4)

Ans One of the speculations trying to explain the origin of life is that it may have begun deep in the oceans, in underwater hot springs called hydrothermal vents. These vents could have supplied the energy and raw materials for the origin and survival of early life forms. A group of bacteria, called archaeobacteria, that tolerate temperatures up to 120°C and seem to have undergone less evolutionary change than any other living species supports this vent hypothesis.

The nutrients produced in the primitive environment would have limited early life. If life was to continue, another source of nutrients was needed. Photosynthesis, probably freed living organisms from a dwindling supply of nutrients. The first photosynthetic organisms probably used hydrogen sulphide as a source of hydrogen for reducing carbon dioxide to sugars. Later, water served this same purpose and oxygen liberated by photosynthetic reaction began to accumulate in the atmosphere. Earth and its atmosphere slowly began to change. Ozone in the upper atmosphere began to filter ultraviolet radiations from the Sun, the reducing atmosphere slowly became an oxidizing atmosphere, and at least some living organisms began to utilize oxygen. About 420 million years ago, enough protective ozone had built up to make life on land possible. Ironically, the change from a reducing atmosphere to an oxidizing atmosphere also meant that life could no longer arise abiotically. The first cells were most likely very simple prokaryotic forms. The prokaryotes may have arisen more than 3.5 billion years ago. Eukaryotes are thought to have first appeared about 1.5 billion years ago. The eukaryotic cell might have evolved when a large anaerobic (living without oxygen) amoeboid prokaryote ingested small aerobic (living with oxygen) bacteria and stabilized them instead of digested them. This idea is known as the endosymbiont hypothesis and was first proposed by Lynn Margulis. According to this hypothesis, the aerobic bacteria developed into mitochondria, which are the sites of aerobic respiration and most energy conversion in

eukaryotic cells. The possession of these mitochondria-like endosymbionts brought the advantage of aerobic respiration to the host.

Flagella (whiplike structures) may have arisen through the ingestion of prokaryotes similar to spiral-shaped bacteria called spirochetes. Ingestion of prokaryotes that resembled present-day cyanobacteria could have led to the endosymbiotic development of chloroplasts in plants.

Another 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, nucleus, chloroplast, etc.

Whatever the exact mechanism for the evolution of the eukaryotic cell might be, the formation of the eukaryotic cell led to a dramatic increase in the complexity and diversity of life-forms on the earth. At first, these newly formed eukaryotic cells existed only by themselves. Later, however, some probably evolved into multicellular organisms in which various cells

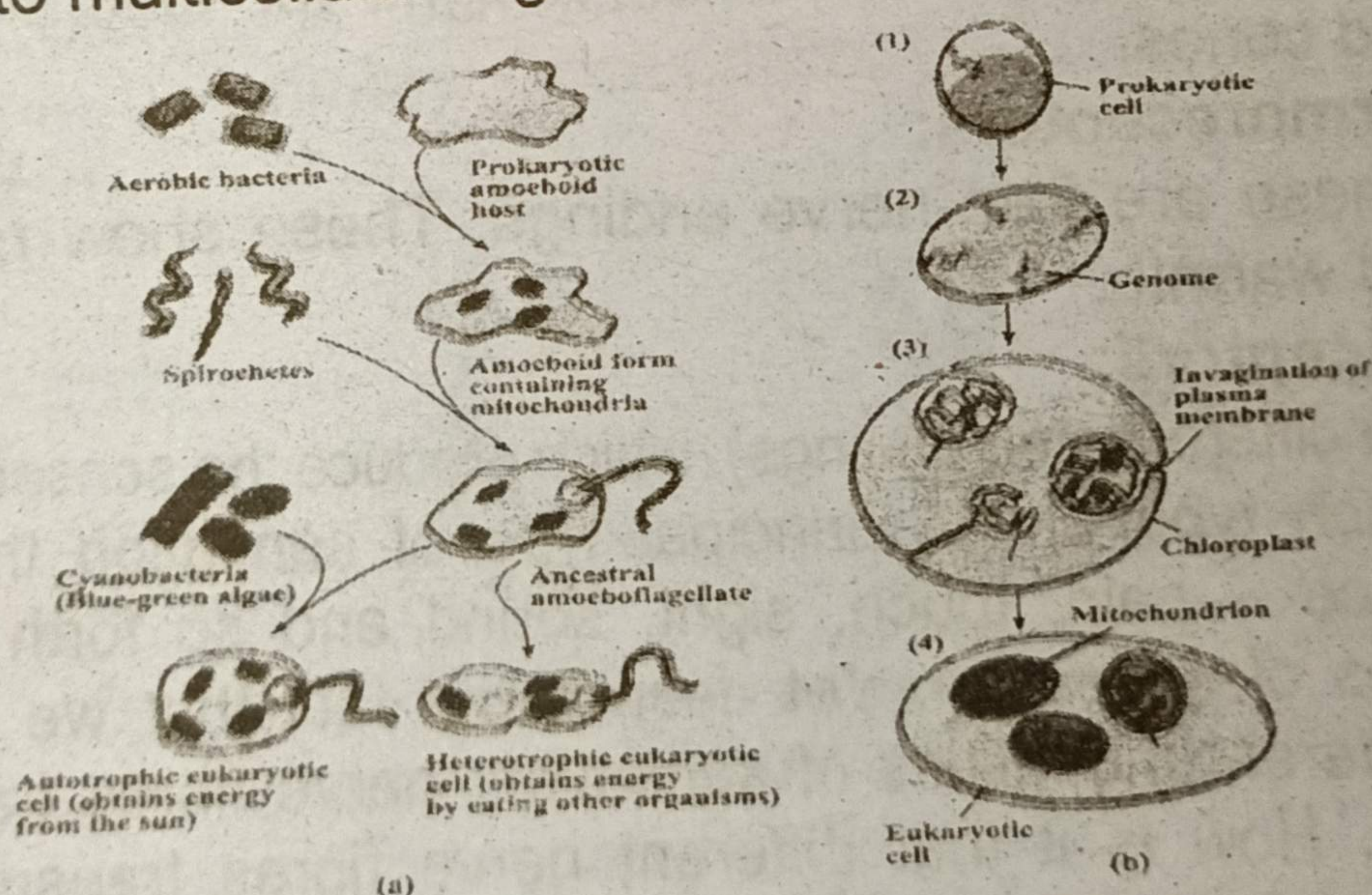


Fig. Two hypothesis on the evolution of the eukaryotic cell.
 (a) Endosymbiont hypothesis, (b) Membrane invagination hypothesis. (1) A prokaryotic cell (2) Duplicates its genetic material (genome) (3) The plasma membrane then invaginates to form double membrane-bound organelles, and the individual genomes separate from each other (4) The nuclear genome eventually enlarges, while the other organelle genomes lose many of their genes, resulting in a eukaryotic cell.

became specialized into tissues, which, in turn, formed organs for many different functions. These multicellular forms then adapted themselves to life in a great variety of environments.

Q.7.(a) What are receptors? Describe their different types.

(4)

Ans The neuron fibres and cell bodies can be excited by small electric shocks, mechanical, chemical, light and temperature stimuli. Receptors detect changes in the external and internal environment of the animal. The receptor may be a cell, or neuron ending or a receptor organ. Receptors are classified as follows:

(a) Chemoreceptors:

These are for smell, taste and for blood CO_2 oxygen, glucose, amino acids and fatty acids (e.g., receptors in the hypothalamus).

(b) Mechanoreceptors:

These detect stimuli of touch, pressure, hearing and equilibrium (e.g., Free nerve endings + expanded tip endings + stray endings).

(c) Photoreceptors (Electromagnetic receptors):

These respond to stimuli of light; for example: in eyes, rods and cones.

(d) Thermoreceptors:

These are free nerve endings. These show response to cold and warmth.

(e) Nociceptors:

(Undifferentiated endings), which produce the sensation of pain.

Each type of the principal type of sensation that we can experience -- pain, touch, sight, sound and so forth are called modalities of sensation. Yet despite the fact that we experience these different modalities of sensation; nerve fibres transmit only impulses. How is it that different nerve fibres transmit different modalities of sensation? The answer to this questions is:

1. Each nerve tract terminates at a specific point in the CNS; and the type of sensation is determined by the point in the nervous system to which the fibre leads. So touch stimulus is carried by nerve impulse in the 'touch' area of the brain. Similarly, fibres from the eyes (retina) terminate in the visual cortex of the brain.

2. Moreover, each receptor organ is specialised to receive a particular type of stimulus and this is carried to the particular area of the brain.

(b) Describe nitrogen cycle.

(4)

Ans For Answer see Paper 2015 (Group-II), Q.7.(a).

Q.8.(a) Write a note on test tube babies and identical twins. (4)

Ans Recent biotechnical advantages has led to many improvements in human life. One of the important aspect is the test tube babies. Parents which are unable to enjoy the normal process fertilization and birth of their offspring due to some physiological and physical abnormalities in any of the two parents are being benefited with this method.

Parental sperm and ovum is fertilized in vitro -- outside the female body and then the zygote is implanted back into the mother uterus, placenta establishes and remaining development takes place in the body of the mother leading to normal birth.

(b) What are chromosomes? What do you know about their types? (4)

Ans Typically a chromosome is made of chromatids, centromere, (primary constriction), and a secondary constriction.

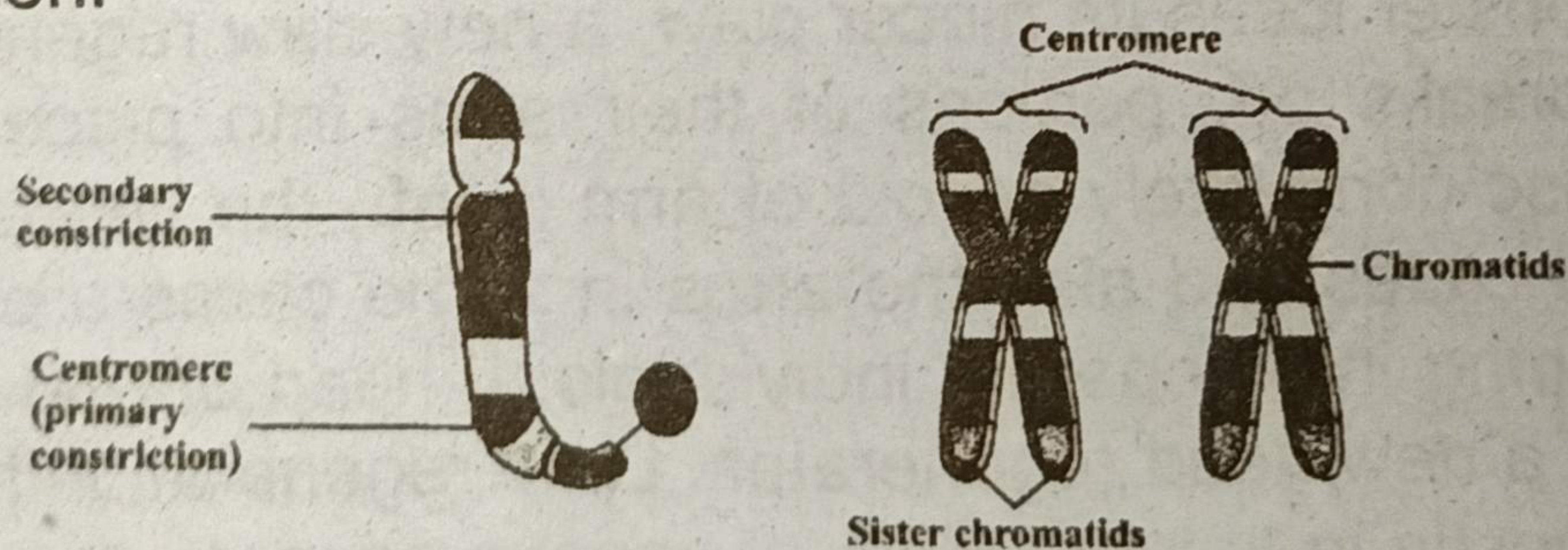


Fig. Structure of a chromosome.

Chromosomes may widely differ in appearance. They vary in size, staining properties, the location of centromere, the relative length of the two arms on either side of centromere, and the position of constricted regions along the arms. 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.

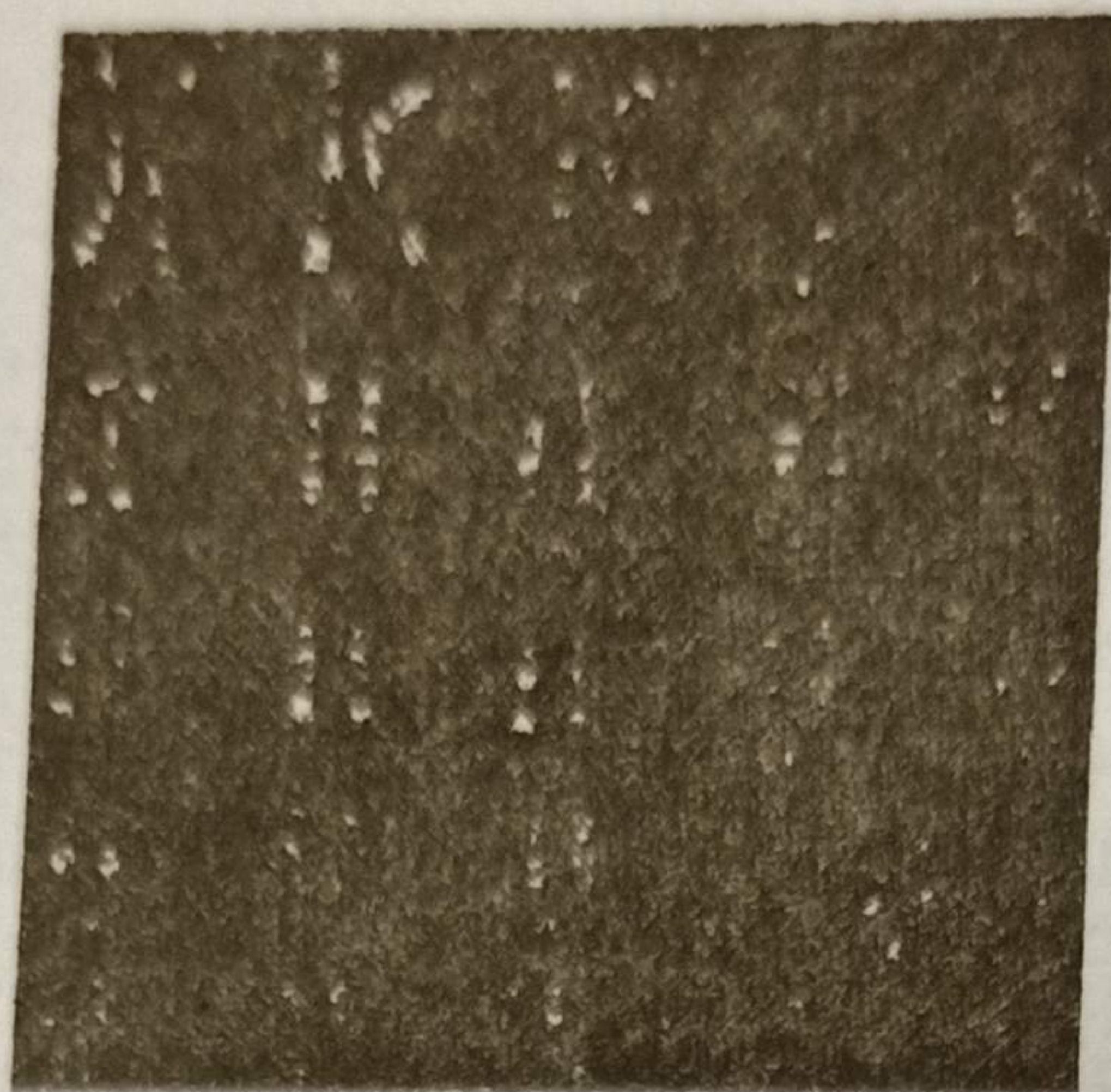


Fig. A human karyotype.

The chromosomes are called telocentric, acrocentric, submetacentric and metacentric depending upon the location of centromere between the middle and tip of the chromosomes.

Q.9.(a) Write detailed note on regeneration.

(4)

Ans The ability to regain or recover the lost or injured part of the body of an organism is called regeneration. Due to simple organization, sponges possess great power of regeneration. These not only replace the parts lost during injury, but any piece of the body is capable of growing into a complete sponge. The process is, however, very slow and requires months or years for the complete development.

If lobster loses its pincer claw, a new claw regenerates. If starfish breaks off, portions of their arms into pieces till the central disc completely devoid of arm is left, the central disc in almost all cases and also the arms in some cases are capable of developing into separate individuals. If head of earthworm is removed, a new head regenerates. Limb regeneration has been studied mostly in salamanders of various ages. In these forms, the limbs are readily regenerated throughout life, more rapidly when the amphibian is young and small. Besides limb, other parts of the body also have considerable regeneration capacity e.g., tail in the larva of amphibians and in lizards. For example, lizard can easily discard its tail but tail can be regenerated by special features of its tail.

Healing of fracture and repair of a skin wound are some other examples of regeneration.

In plants, regeneration is the basis of plant propagation. Almost any part or even a very small fragments of a plant e.g.,

a piece of stem or leaf or even a single tissue cell may develop into a full plant. A part of the stem with a few leaves may be taken from many kinds of plants and when planted in soil form a complete plant.

We know regeneration is the development and formation of the missing organ in adult animal, so during their formation and development, same embryological process is repeated as was in embryo *i.e.*, the retention of undifferentiated cells and differentiation of cells. In the process of regeneration, many of the various cell types which were present in the missing part of the body are replaced by the differentiation of cells *e.g.*, in flatworms, and planaria the unspecialized cells, neoblasts, which are always present in the body of adult are mobilized and migrate to the site of amputation, where they differentiate into specialized cell types. But in other organisms like salamanders or newts, some of the specialized tissue cell types in the stump of an amputated limb apparently dedifferentiate (become less specialized) and then proceed to differentiate into the same and probably different types of cells.

(b) Define and explain Mendel's Law of Segregation. (4)

Ans Mendel proposed that each contrasting form of a trait, *e.g.*, roundness or wrinkledness of seed was determined by *particulate hereditary factors*, which he called 'elementen'. These factors carrying hereditary information were transmitted from parents to offspring through gametes. Each pea plant had a pair of these factors, one derived from male parent and the other from female parent. Both of these factors together controlled expression of a trait. He designated dominant factor with a capital letter and recessive factor with a small letter; *e.g.*, R for roundness factor and r for wrinkledness factor. Johannsen renamed them as 'genes'.

The true-breeding round seed plant of P_1 generation carried 'RR' alleles while the true-breeding wrinkled seed plant of P_1 carried 'rr' alleles. When both the alleles of a gene pair in an organisms, are same, the organism is homozygous for that gene pair. An individual with a homozygous genotype is a homozygote.

Mendel inferred that the factors of a pair (alleles) separated from each other during gamete formation so that

each gamete got only one factor (allele) for each trait. So, half the gametes got one allele, and the other half carried the other allele. Fertilization was random. When male gamete carrying factor (R) fertilized female gamete with factor (r), the complete set of the two factors (Rr) for the trait was restored in zygote. The zygote developed into F_1 offspring that was heterozygous 'Rr', because the two alleles of its gene pair were different from each other. An individual with a heterozygous genotype is a heterozygote. F_1 offspring (Rr) was a monohybrid for seed shape; it was round in phenotype but heterozygous in genotype. Its alleles also segregated during gamete formation.

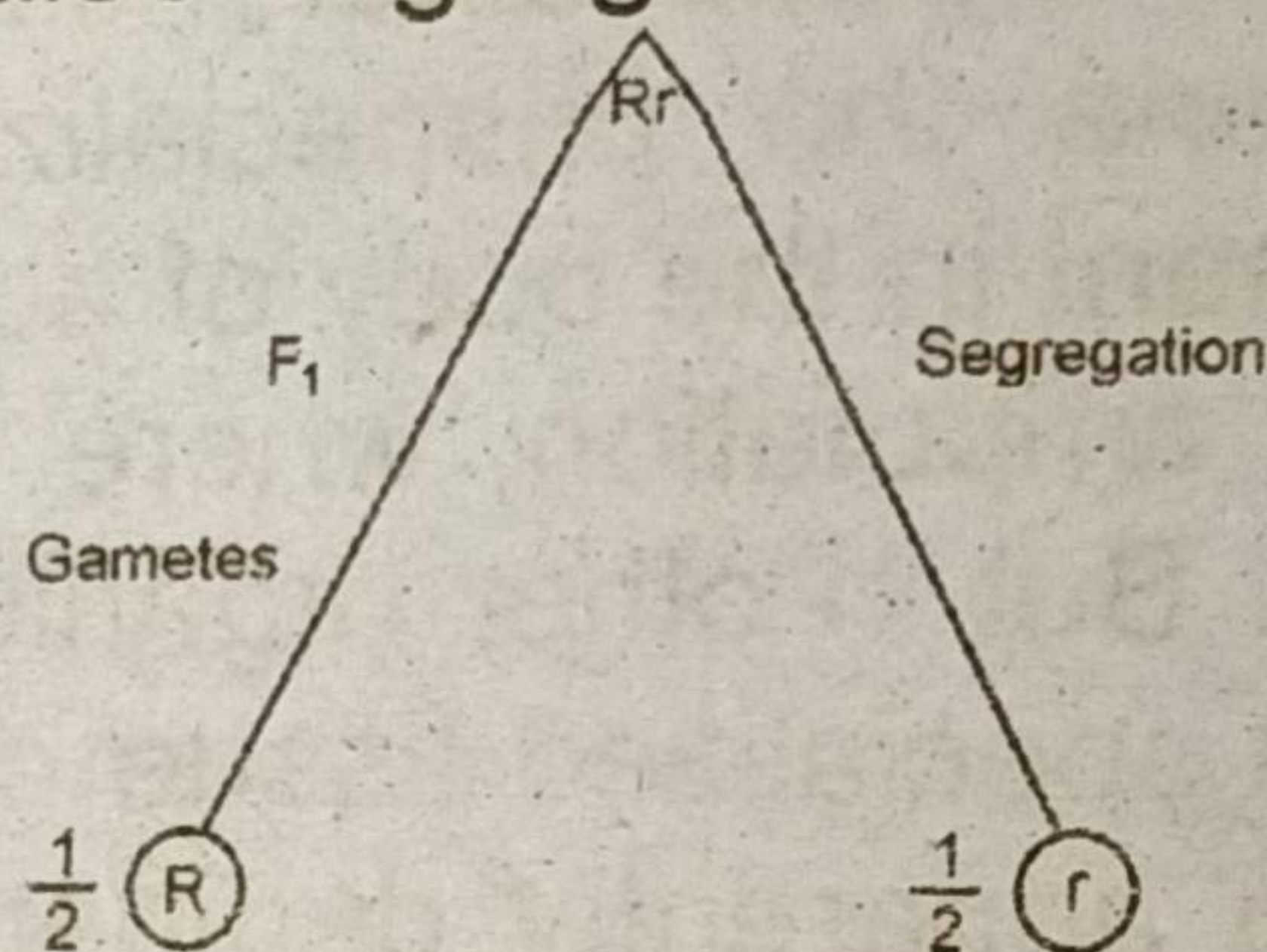


Fig. Segregation of alleles during gamete formation.

Punnett square indicates that $\frac{1}{4}$ of F_2 progeny would have been 'RR' (homozygous round), $\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$ Rr (heterozygous round), and $\frac{1}{4}$ rr (wrinkled).

Mendel actually observed 3 : 1 phenotypic ratio in F_2 . His phenotypic data of F_3 can also be explained on the basis of 1 : 2 : 1 genotypic ratio of F_2 . Mendel compared the results of all the seven separately studied characters, and found them strikingly similar to formulate law of segregation.

Law of Segregation:

According to law of Segregation, the two co-existing alleles, for each trait in an individual segregate (separate) from each other at meiosis, so that each gamete receives only one of the two alleles. Alleles unite again at random fertilization of gametes when zygote is formed.

SECTION-III

(Practical Part)

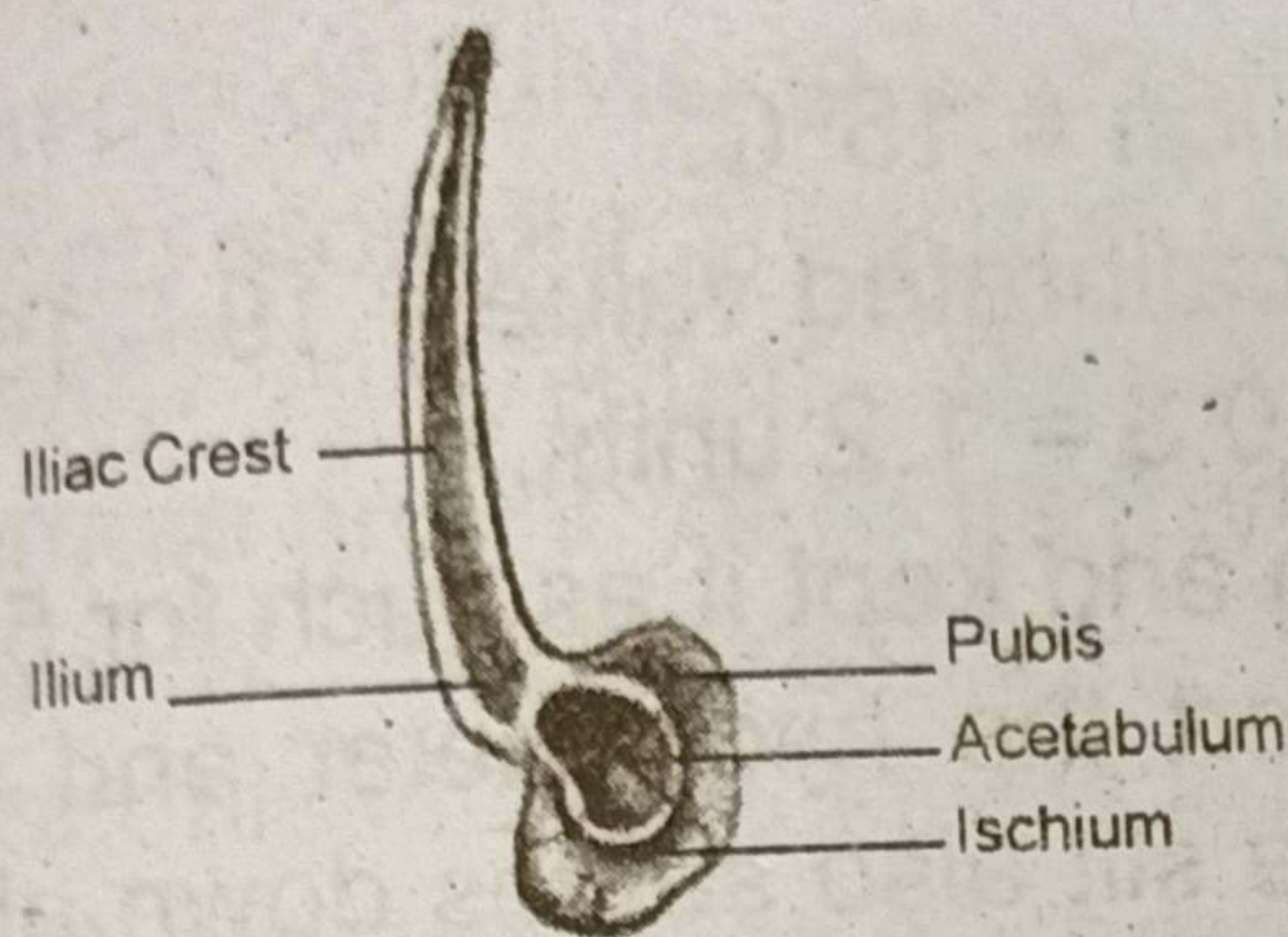
NOTE: Attempt any Three (3) questions.

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

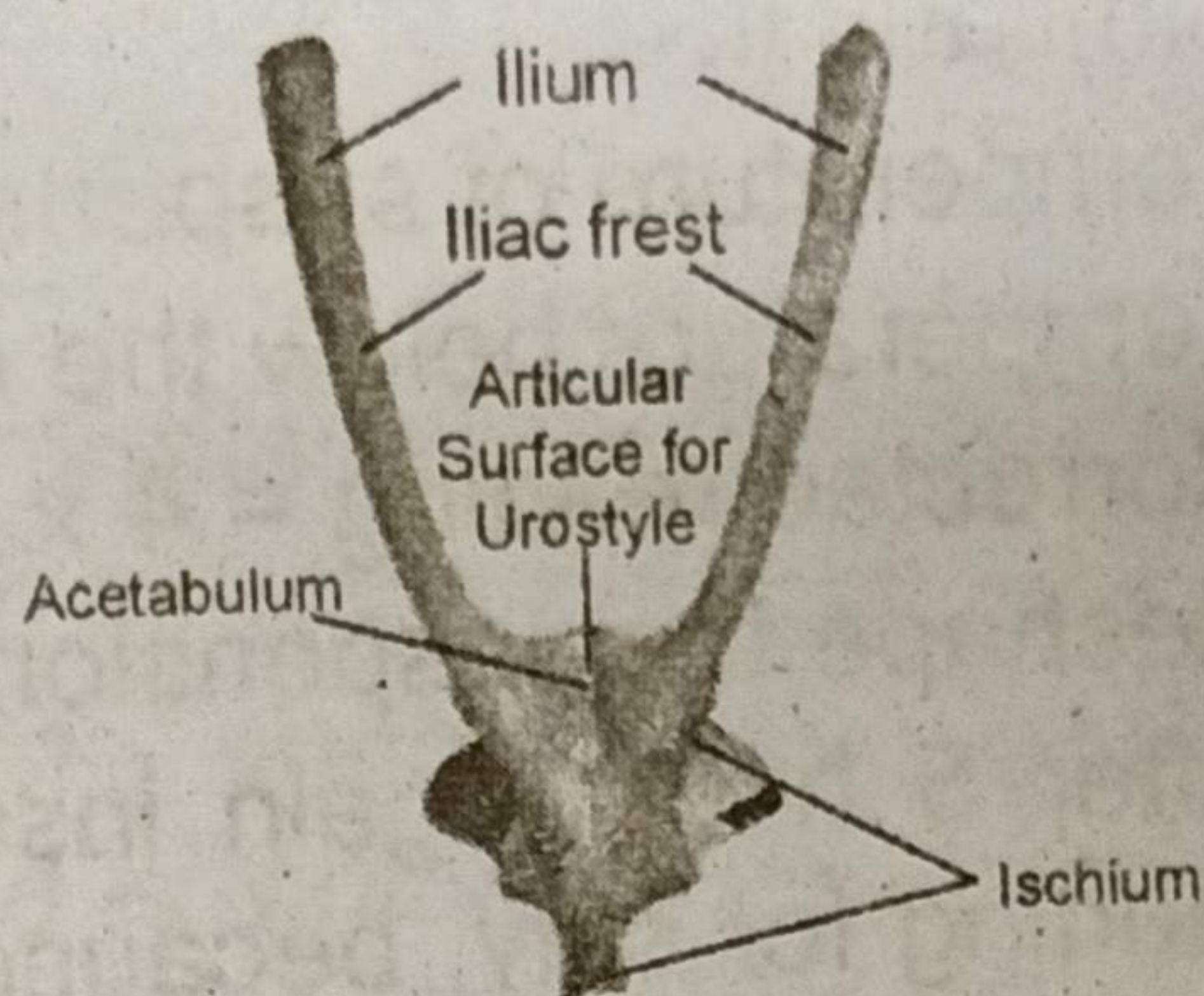
Ans For Answer see Paper 2016 (Group-I), Q.A.

(B) Sketch and label pelvic girdle of frog. (dorsal view) (5)

Ans



Pelvic Girdle (Slide View).



Dorsal view of pelvic girdle.

(C) Write down procedure to investigate soil texture. (5)

Ans

Material:

- | | |
|---|-------------------------|
| (i) Oven-dried soil | (ii) Mechanical stirrer |
| (iii) Measuring cylinder (1000 ml) | (iv) Beaker (250 ml) |
| (v) Saturated sodium oxalate solution or sodium hexametaphosphate | |
| (vi) Distilled water | (vii) Hydrometer |
| (viii) Soil texture triangle chart | |

Procedure:

1. Take 40 gms of oven-dried soil.
2. Grind and sieve it.
3. Put this soil in a 250 ml beaker and add to it 200 ml distilled water and 20 ml of sodium oxalate solution or sodium hexametaphosphate.
4. Stir the mixture with a mechanical stirrer for about 15 minutes. Then transfer the soil suspension into a 1000 ml measuring cylinder and make up the volume up to 1 liter.
5. Stir the contents of cylinder with a stirrer completely. Then place a hydrometer in the soil suspension. Note the reading of upper meniscus after 5 minutes. This reading is for silt and clay taken as gms / litre.
6. Remove the hydrometer and note the temperature by immersing a centigrade thermometer.
7. Also note the temperature at which the hydrometer is calibrated.
8. Temperature correction in the hydrometer reading either by adding or subtracting 0.3 units for every rise or fall in temperature at which hydrometer is calibrated.

For Example:

Hydrometer calibrated at 19°C.

(iii) What is the role of auxins?

Ans Auxins:

These are indole acetic acid (IAA) or its variants:

1. In stem, promote cell enlargement in region behind apex. Promote cell division in cambium.
2. In root, promote growth at very low concentrations. Inhibit growth at higher concentrations. e.g., geotropism. Promote growth of roots from cuttings and calluses.
3. Promote bud initiation in shoots but sometimes antagonistic to cytokinins and is inhibitory.

(iv) What are polytene chromosomes?

Ans Polytene chromosomes are giant chromosomes common to many dipteran flies. They began as normal chromosomes, but through repeated rounds of DNA replication without any cell division, they become large, banded chromosomes.

(v) Define peripheral nervous system.

Ans It comprises of sensory neurons and motor neurons, which may form ganglia and the nerves. Ganglia are the concentrations of cell bodies of neurons. The nerves are the bundles of axons or dendrites, bounded by connective tissue.

Temperature of suspension = 25°C .

Temperature above the calibrated value = $25 - 19 = 6^{\circ}\text{C}$

Corrected reading = $6 \times 0.3 = 1.8$ units to the hydrometer reading.
Similarly if:

Temperature of suspension = 15°C .

Temperature below the calibrated value = $19 - 15 = 4^{\circ}\text{C}$.

Corrected reading = $4 \times 0.3 = 1.2$ units.

9. Reshape the suspension and kept it as such for 5 hours.
10. After 5 hours again insert the hydrometer and note the reading for clay, because slit also settles down above the sand during this time.
11. Remove the hydrometer, note reading and make temperature correction.

(D) Draw and label the hen's egg.

(5)

Ans Diagram of hen's egg is given below:

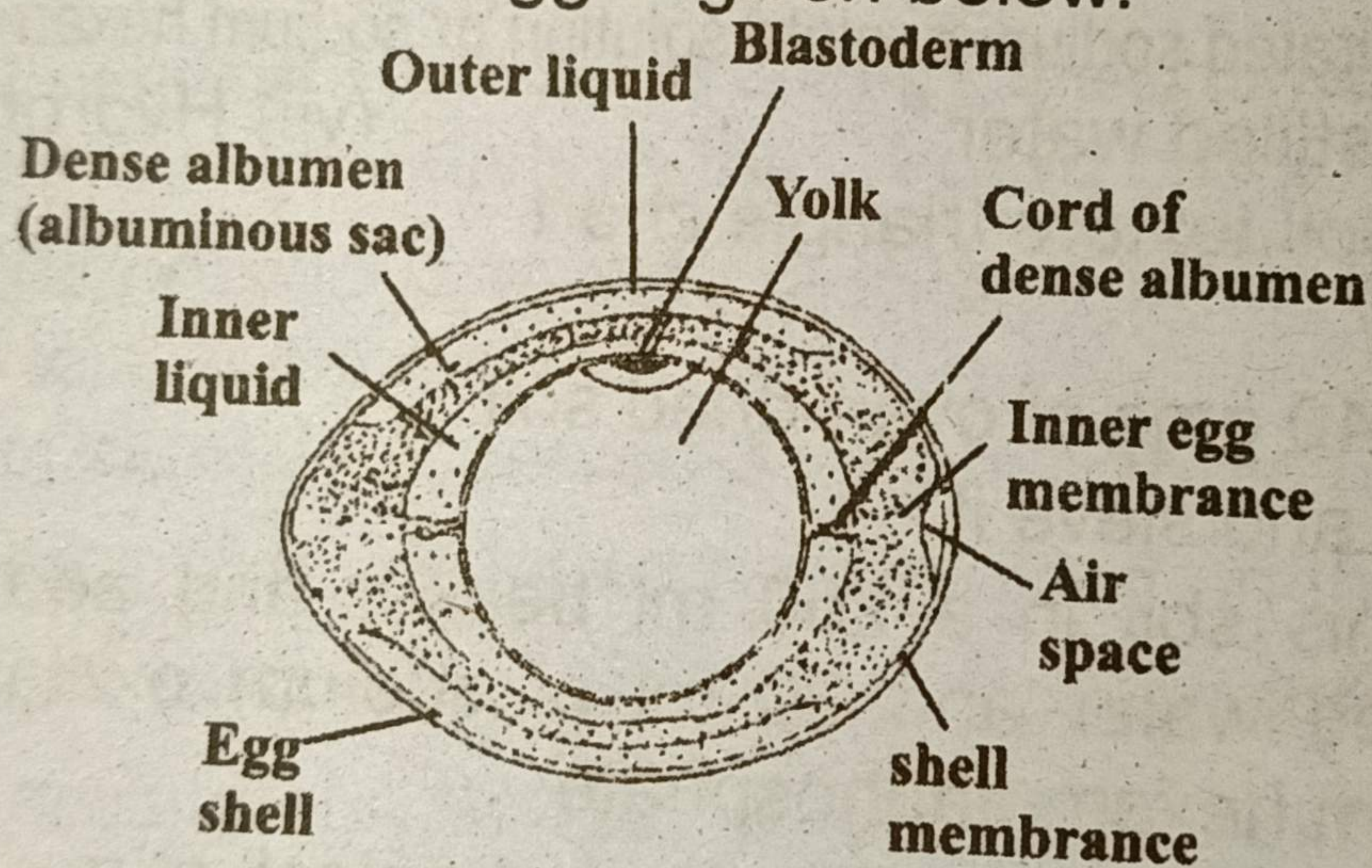


Fig. Internal structure of hen's egg.

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

- (i) What is difference between positive and negative phototropism?

Ans 1. Positive phototropism:

The movement of plant toward source of light is called positive phototropism.

2. Negative phototropism:

The movement of plants away from source of light is called negative phototropism.

- (ii) Define muscle twitch.

Ans The response of muscle with respect to a stimulus is known as muscle twitch.